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A review of economic analyses on the potential impact of Brexit

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Contents

Abstract

This paper summarises the economic analyses of the potential impact of Brexit on the United Kingdom, European Union (EU) and euro area performed by members of and contributors to the Brexit Task Force, a group reporting to the International Relations Committee of the European System of Central Banks. The studies were carried out between 2017 and the initial months of 2019 and have been independently published by the authors. The aim of this Occasional Paper is to present the studies in an organic manner, highlighting common features and results.

The different pieces of analysis employ a wide range of methods to (i) investigate the impact of Brexit on the economy and trade, (ii) assess possible scenarios for the bilateral relationship between the EU and the United Kingdom after Brexit and (iii) investigate the role of the main macroeconomic channels of transmission of the Brexit shock: trade (including the role of European value chains), migration and foreign direct investment. Other transmission channels such as financial linkages or uncertainty, and the financial stability implications of Brexit were not covered in the studies reviewed here.

The results of these studies provide additional quantitative and qualitative foundations for some widely shared conclusions on the consequences of Brexit. The cost of Brexit in terms of gross domestic product loss is estimated to be significantly greater for the United Kingdom than for the euro area and the EU as a whole. This result is consistent across models, methodologies and scenarios and applies to both the trade and migration channels. Nevertheless, the results differ across individual Member States. Ireland would be particularly affected because of its close ties with the UK economy. Given the estimated costs of withdrawal, the closer the final relationship is to the United Kingdom's EU membership, the lower the macroeconomic costs of Brexit will be. The barriers to trade and investment between the EU and the United Kingdom that are expected to arise after Brexit will increase the costs of bilateral trade, as well as damaging inter-European production value chains and the allocation of capital across Member States.

KEY WORDS: Brexit, trade, migration, global value chains, FDI

JEL codes: F14, F15, F21, F22

Non-technical summary

On 29 March 2017 the Government of the United Kingdom notified the European Council of its intention to withdraw from the European Union (EU) following the result of the referendum held in June 2016. Negotiations between the United Kingdom and the EU started in June 2017. In November 2018 the parties reached agreement on two texts: a Withdrawal Agreement governing the terms of United Kingdom's exit from the EU and a Political Declaration on the framework for the future relationship. However, the UK Parliament failed to ratify the Withdrawal Agreement before the initial deadline for withdrawal, specified by the EU Treaties as being two years after the withdrawal notification (on 29 March 2019). The deadline for the United Kingdom's exit from the EU was subsequently postponed three times to avoid a no-deal Brexit, and both the Withdrawal Agreement and the Political Declaration had to be renegotiated in October 2019. Brexit finally took place on 31 January 2020, and negotiations on the future relationship started shortly after, given that the transition period is due to end by 31 December 2020. Nevertheless, uncertainty remains over the final outcome of this process.

This Occasional Paper summarises the contributions to the analysis of the economic consequences of Brexit made by a group of economists from different central banks of the European System of Central Banks (ESCB) under the umbrella of the Brexit Task Force, a group reporting to the International Relations Committee of the ESCB. The studies presented in this Occasional Paper were conducted between 2017 and the initial months of 2019 and are listed in the first part of the References section. Hence, these results do not constitute the ECB's own assessment of the potential economic impact of Brexit.

The papers employ a wide range of methods to investigate the economic and trade impact of Brexit. These methods include a literature review, the estimation of gravity equations, simulations with open-economy macroeconomic models, (New Keynesian) dynamic stochastic general equilibrium models and computed general equilibrium models. Statistical analysis is also used, along with an interdisciplinary approach combining economic, institutional and legal tools.

Different scenarios for the bilateral relationship between the EU and the United Kingdom after Brexit are investigated, taking as their baseline the situation pre-Brexit. Overall, two main types of stylised scenario are considered. The first is a final relationship characterised by the application of World Trade Organisation (WTO) most-favoured-nation (MFN) terms of trade (the relationship that would ensue from a no-deal Brexit after the transition period). The second is the establishment of a free trade agreement (FTA) of some kind between the EU and the United Kingdom. It is worth noting that the assessments refer mainly to the medium and long-term impact of Brexit and do not investigate the possible short term disruptions of a no-deal exit (a "cliff-edge" or a "hard" Brexit).

Three main channels of transmission of the Brexit shock are considered: trade in goods and services (including the interlinkages between countries through production

value chains), migration and foreign direct investment (FDI). These transmission channels are closely related to the four fundamental freedoms of the EU Single Market: free movement of goods, services, people and capital. Other channels, such as financial linkages or uncertainty are not considered in this analysis. These are potentially very relevant transmission channels but they are complex to specify and their introduction would require a different set of analytical tools. Likewise the financial stability implications of Brexit are not assessed in the set of papers reviewed here.

The main insights into the impact of Brexit obtained from the papers reviewed can be described by going through the different transmission channels considered.

It is clear that Brexit will give rise to trade barriers – in the form of both tariffs and non-tariff barriers (NTBs) – between the EU and the United Kingdom. If no trade agreement is struck, exporters from both areas will face MFN tariffs in their bilateral trade. Tariffs will differ depending on the specific sectors involved in trade but are likely to be significantly higher on average for UK imports than for EU imports. This general conclusion remains the same if we take into consideration country interlinkages through production value chains – although the indirect effect of these interlinkages on average tariffs is higher for the EU. In the absence of an FTA, NTBs will also increase, with an uneven impact across sectors and Member States. It is important to note in addition that the vulnerability of Member States' productive systems to Brexit will depend not only on their sectoral specialisation but also on the characteristics (size, efficiency, external diversification) of the firms directly exposed to trade with the United Kingdom, as the analysis shows in the case of Spain.

The simulations of the impact of higher trade barriers on the UK and EU macroeconomic outcomes – performed with different types of models and scenario specifications – consistently show that the economic consequences are more negative for the United Kingdom than for the euro area. The exercises also illustrate that the macroeconomic impact would be smaller under an FTA. However, average EU results cannot be extrapolated to individual Member States: specific analysis focusing on the Irish economy shows a very significant effect on this economy resulting from the United Kingdom's withdrawal. This effect is due to Ireland's geographical proximity and to the particular situation with the Irish/Northern Irish land border. Another interesting set of results relates to the effectiveness of monetary policy in softening the impact of Brexit in the United Kingdom. This will depend on the nature of the shock: a pure supply shock cannot be effectively addressed through demand policies. Finally, estimates of steady-state welfare losses point again to higher losses for the United Kingdom than for the EU, albeit with significant variation among EU Member States.

Turning to migration flows, the free movement of people between the United Kingdom and the EU will be hampered, with (possibly significant) consequences for potential output and the labour market. Results point to a significant fall in migration flows from the EU to the United Kingdom after Brexit. The intensity of the fall would be similar under a WTO scenario to that under an FTA scenario, as the migration regime is not necessarily linked to the trade regime. Conversely, Brexit would lead to an increase in net migration flows towards the EU, helping to soften the negative shock of disintegration. The negative effect of lower immigration on the United Kingdom's

macroeconomic performance would be lower than the impact through the trade channel but would not be insignificant.

On FDI, the third transmission channel analysed in the papers, the analysis finds some preliminary evidence of a slowdown in FDI flows both in and out of the United Kingdom after the referendum in June 2016. The lower FDI may reflect the possible loss of both the EU's single passport for services and UK firms' access to the Single Market. It may also reflect the likely emergence of trade barriers, making the United Kingdom's participation in EU production chains less straightforward.

The broad set of results coming from the papers reviewed in this publication are highly consistent both among themselves and with the evidence reported by other studies (see Bisciari, 2019). They point to the high costs of withdrawal for the UK economy – far outstripping the aggregate impact on the EU or the euro area economies. Nevertheless, looking at the Member States individually, the results give a more nuanced picture, as the particular case of Ireland illustrates. It should also be recognised that estimates of the macroeconomic impact of Brexit have a low degree of precision. As mentioned before, some potentially important aspects linked to confidence effects or to the financial sector channel are complex and difficult to introduce into the models. The potential policy reaction across a wide array of policy instruments, particularly in the case of the United Kingdom, is another consideration not adequately taken into account in the quantitative analysis.

Obviously, given the estimated costs of disintegration, the closer the final relationship is to the United Kingdom's EU membership, the lower the macroeconomic cost of Brexit will be. This reflects the negative consequences of establishing barriers to the free circulation of goods, services, people and capital. Hampering trade and investment will increase the costs of bilateral trade, with an impact on production interlinkages and value chains. It will affect the cross-border allocation of capital, leading to quite significant losses for some countries and sectors. Indeed, a common finding of the papers is that Brexit will reduce the gains from trade on both sides of the Channel. In the long run, this will result in a lower level of gross domestic product for the United Kingdom's economy and – to a lesser extent – for the EU economy as well.

Foreword

Since the Brexit referendum – more than four years ago – Brexit has become an increasingly important subject of economic research. The uncertainty related to the United Kingdom's withdrawal from the European Union (EU) has generated a continuous stream of news, commentary and analysis. Flowcharts of possible Brexit scenarios have been designed and revised, pointing to different varieties of "hard" and "soft" Brexit, as the negotiations and the political background have changed over time. While a Withdrawal Agreement has now entered into force, the terms of the future relationship between the EU and the United Kingdom are still being negotiated. This is happening against the overwhelming background of the COVID-19 pandemic, which has brought about its own uncertainty, and a global recession.

The European Central Bank and the national central banks of the European System of Central Banks (ESCB) have invested significant efforts into analysing the implications of Brexit from an economic, financial stability and trade relations perspective, in addition to their continuous monitoring of political and institutional developments. The Brexit Task Force (BTF) of the ESCB's International Relations Committee was established with the specific purpose of monitoring and reviewing the process of the United Kingdom's withdrawal from the EU from a holistic point of view, working closely with other ESCB committees.

In particular, the analysis of the economic and trade consequences of Brexit raised many challenges. In some cases, existing models and forecasting approaches revealed their limitations and had to be updated. This publication is the result of the cooperation and exchanges between researchers across the ESCB in their efforts to analyse the economic and trade impact of Brexit. It was with this aim that the BTF promoted the production of an impressive set of papers, thereby contributing to the rigorous analysis of the economic and trade consequences of Brexit for the economies of the EU-27 and its Member States, the euro area and the United Kingdom.

Irrespective of the outcome of the negotiations on the future relationship, Brexit-related analysis and research will remain a significant topic for the European Central Bank and the national central banks of the ESCB in the years to come.

We would like to thank Pilar de L'Hotellerie-Fallois and Filippo Vergara Caffarelli for their leadership in organising and inspiring the cooperation between central banks on these topics and for their work in pulling together this Occasional Paper. We would also like to thank the authors of the papers reviewed in this publication for their contributions.

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1 Introduction: the implications of Brexit for the economic and financial relationship between the EU and the United Kingdom

This Occasional Paper surveys the analyses performed by a group of economists from several central banks of the European System of Central Banks (ESCB) – under the guidance of the Brexit Task Force (BTF), a group reporting to the International Relations Committee (IRC) – focusing on the economic and trade consequences of Brexit for the economies of the United Kingdom, European Union (EU) and euro area. This collective effort resulted in a series of studies carried out between 2017 and the initial months of 2019 and published separately.

The authors of these papers employed a wide range of research tools to investigate the impact of Brexit on the economy and trade under different possible scenarios for the bilateral relationship between the EU and the United Kingdom after Brexit. They assessed the role and strength of different channels of transmission of the Brexit shock, in particular trade, migration, foreign direct investment (FDI) and global value chains (GVCs). It is important to notice that the mandate to analyse the economic and trade consequences of Brexit did not include the implications of Brexit for financial stability, which would have required - in any case - a different methodological approach. Likewise other potentially relevant transmission channels of Brexit such as financial linkages or confidence effects were not included in the studies reviewed as they are not easily incorporated into the analytical tools used to estimate the economic and trade impact.

This first chapter aims at providing an adequate institutional context for the analysis of the economic impact of Brexit at the time the studies reviewed in this Occasional Paper were performed. In order to do that, the chapter describes the Brexit negotiations in a synthetic way, focusing on how this process translated into a set of possible Brexit scenarios and the main elements behind those scenarios.[1] Chapter 2 is devoted to presenting the impact of Brexit on the economy and trade by pulling together the results of the papers mentioned above. Chapter 3 concludes with the main lessons learned from this analysis.

1.1 The decision to exit the EU and its implications

The referendum on the exit of the United Kingdom from the EU took place on 23 June 2016. The consultation was the result of an electoral promise made by Prime Minister (PM) David Cameron during the 2015 general election, which he won with an absolute majority. The unexpected outcome of the referendum in favour of leaving the EU (by

[1] The rest of this introductory chapter draws on (i) the BTF reports sent to the IRC between September 2017 and June 2020 which summarise the discussions and work of the task force and (ii) analysis by the Banco de España (see Vega Croissier (coordinator), 2019).

52% to 48%) led to the resignation of David Cameron – who had campaigned in favour of staying in the EU – and the appointment of Theresa May as the new PM.

In order to fulfil the mandate of the referendum result, PM May activated Article 50 of the Treaty on European Union (TEU), which governs the withdrawal process, in March 2017. The clock began to count down on the two-year period allowing for the effective withdrawal of the United Kingdom, with 30 March 2019 set as the latest date for it to take place. This period could only be prolonged by a unanimous decision of the European Council or, alternatively, by the United Kingdom revoking its decision to exit the EU.[2]

A crucial issue for grasping the consequences of Brexit for the EU and the United Kingdom economies is, of course, the type of new relationship that will exist between the two parties after the exit[3]. This issue has been a major source of uncertainty during Brexit negotiations. The economic integration among EU Member States is constructed on the basis of the Single Market – which entails the four fundamental freedoms (free movement of goods, services, capital and persons) – and the Customs Union. Once Article 50 was activated, a range of alternatives was foreseen for the future relationship between the United Kingdom and the EU. These alternatives may be described in terms of the different regimes that the EU has used in the past to build its relationship with third countries.

The existing regimes represent different degrees of detachment from the Single Market and/or the Customs Union, as illustrated in Figure 1. The European Economic Area (EEA), which includes Norway, Iceland and Liechtenstein, represents one of the closest relationships[4] between the EU and third countries, with participation in the Single Market but not in the Customs Union, which implies the existence of customs checks at the borders. The cases of Turkey (which has a customs union arrangement[5] with the EU but is not in the Single Market) and Switzerland (which has a variety of agreements at the sectoral and country level) represent tailored arrangements. Free trade agreements (FTAs) similar to the one signed with Canada (the Comprehensive Economic and Trade Agreement, CETA) operate outside the Single Market and the Customs Union but allow for a substantial reduction in trade barriers for most goods and selective access to services. They also include aspects related to investment and public procurement. Finally, should the parties not be able reach an agreement, their trade relationship after Brexit would be governed by the World Trade Organisation (WTO) rules. Most-favoured-nation (MFN) tariffs and non-tariff barriers (NTBs) would apply to bilateral EU-UK trade in goods and services.

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2 This possibility was recognised by the Court of Justice of the European Union in the judgment in Case C-621/18 of 10 December 2018.

3 Beyond Theresa May's "Brexit means Brexit" statement.

4 An even closer relationship has previously been mooted, namely the so-called Norway+ or Common Market 2.0 scenario, which combines the Single Market with a customs union arrangement.

5 The customs union arrangement does not include all goods, as agri-food is not completely liberalised.

Figure 1

Existing models for the post-Brexit EU-UK relationship (September 2017)

	EU Free movement of people	EU Free movement of goods	EU Tariffs	EU Non-tariff barriers	RoW(*) Tariffs	RoW(*) Non-tariff barriers	EU Free trade in services	EU Foreign investment	EU EU budget contribution
EU	✓	✓	✗	✗	common external tariff	partial and R.O.	✓	✓	✓
EEA	✓	✓	✗	only R.O.	✓	✓	✓	✓	✓
CU(**)	✗	✓	✗	partial without R.O.	common external tariff	✓	✗	✗	possible
Swiss-style bilateral agreements	✓	most	very low	low and R.O.	✓	✓	partial	✗	possible
CETA (Canada)	✗	most	very low	partial and R.O.	✓	✓	partial	partial	✗
WTO	✗	very limited	✓	✓	✓	✓	very limited	✗	✗

Notes: CU stands for customs union arrangement, RoW stands for rest of the world, R.O. stands for rules of origin. (*) Except RoW countries covered by an FTA. (**) CU only covers merchandise trade; WTO rules will apply to trade in services.

1.2 An account of the negotiation process

Negotiations between the United Kingdom and the EU started in June 2017, three months after the activation of Article 50 of the TEU.[6]

The United Kingdom's negotiating position, as established by the PM and members of the Government, was articulated around several "red lines" – control over immigration, an end to the United Kingdom's "vast" contributions to the EU budget and an end to the jurisdiction of the Court of Justice of the European Union (CJEU) – and around the aspiration of the United Kingdom to sign its own trade agreements. For these conditions to be met, the United Kingdom would have to exit the Single Market and the Customs Union. This meant that an FTA with the EU was the most likely form of future relationship, as illustrated in Figure 2.

The EU's position in the negotiations was established through a series of guidelines for the negotiating team[7], which were approved by the European Council. These guidelines included the need to achieve substantial progress on the separation agreement (or Withdrawal Agreement, WA) before starting to negotiate the new

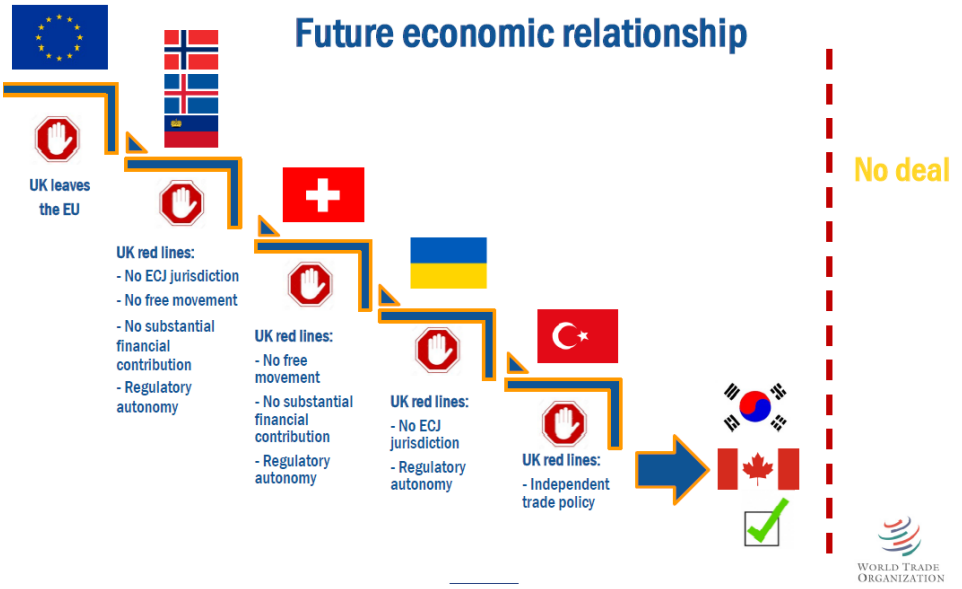
[6] In the intervening period, PM May had called a general election in the United Kingdom in which the Conservative party lost its absolute majority. The UK Government then secured a confidence and supply agreement with the Northern Irish Democratic Unionist Party (DUP) to obtain the necessary majority in the House of Commons.

[7] On EU side, negotiations were entrusted to the team set up by the European Commission, namely the Task Force for the Preparation and Conduct of the Negotiations with the United Kingdom under Article 50 TEU (TF50), led by Chief Negotiator Michel Barnier. TF50 liaised in turn with a task force led by Didier Seeuws, reporting to the Secretary-General to the Council of the European Union.

relationship, the indivisibility of the four freedoms, the impossibility of participating in the Single Market on a sector-by-sector basis ("no cherry-picking") and maintaining an open border between Ireland and Northern Ireland.

Figure 2

Possible institutional scenarios according to the original UK Government red lines

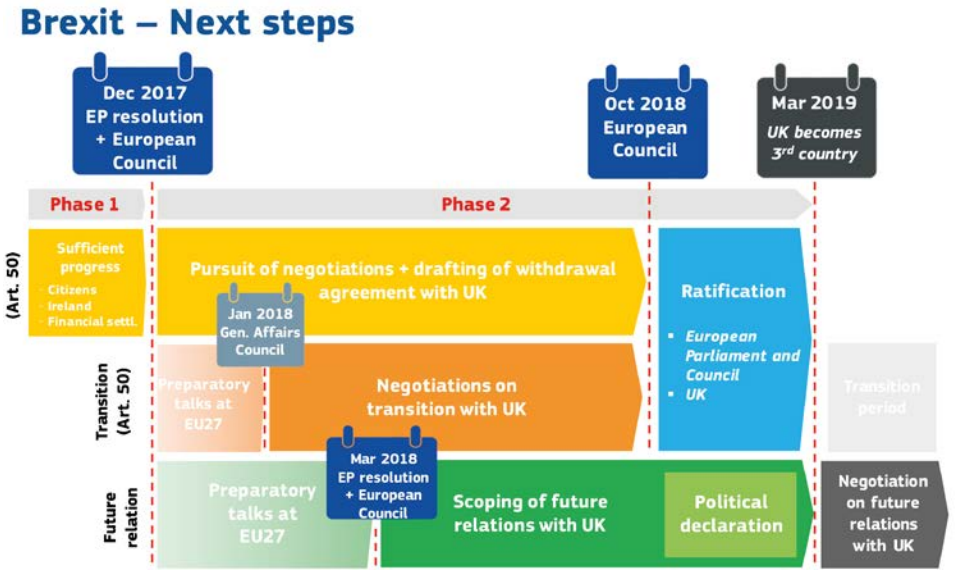


Source: European Commission (2017).

Accordingly, the negotiation schedule was divided into two phases, as described in Figure 3. Phase 1 was to be devoted to negotiating the terms of the withdrawal, with a specific focus on three issues: (i) the rights of EU citizens in the United Kingdom and of UK citizens in the EU, (ii) the settlement of the United Kingdom's financial obligations towards the EU and (iii) finding a solution for an open border between Northern Ireland and Ireland. The aim was to achieve "substantial progress" in all three areas before starting Phase 2.

Phase 1 lasted until the end of 2017. In its December 2017 meeting, the European Council decided that "sufficient progress" on the negotiation of the withdrawal terms had been achieved, which paved the way for the start of Phase 2 in January 2018. Of the three issues negotiated in Phase 1, the agreement around the Irish border proved to be the most contentious. To ensure that "sufficient progress" had been made on this issue, the UK Government undertook to find a "specific solution" within the framework of the future relationship; a default option ("backstop") was to be included in the WA, under which Northern Ireland would maintain full regulatory alignment with the rules of the Single Market and the Customs Union. Over the months that followed, the proposals put forward by the UK Government for this "specific solution" were deemed to be non-viable by the EU negotiators, and the precise configuration of the backstop in the WA remained a bone of contention until the autumn of 2018.

Figure 3
Timeline of negotiations (June 2018)



Source: European Commission.

The second phase of the negotiations took place during 2018. These negotiations were carried out on three fronts: (i) the finalisation of the legal terms of the WA, with a special focus on the Irish border issue; (ii) the characteristics of the transition period, to be included in the WA; and (iii) the scoping of the future relationship in a PD.

The European Council issued new guidelines on the future relationship in March 2018, calling for "as close as possible a relationship" with the United Kingdom. The guidelines confirmed the need to uphold the integrity of the Single Market and the Customs Union and to preserve the autonomy of the EU decision-making processes. Meanwhile, the position of the UK Government towards the future relationship was initially defined by PM May in March 2018 (in a speech that she gave at Mansion House, the official residence of the Lord Mayor of London) and further clarified and modified in a White Paper (called "the Chequers plan") published in July 2018. The speech confirmed that the United Kingdom aimed to take back control of laws and borders by leaving the Single Market, the Customs Union and the jurisdiction of the CJEU, without abandoning the idea of frictionless trade with the EU.

It is worth mentioning that one important issue on which the United Kingdom changed its position on the future relationship in the summer of 2018 was financial services. By going from the previous proposal to establish treaty-based mutual recognition mechanisms (something rejected by the EU negotiators) to a framework built around the EU's existing equivalence frameworks, the United Kingdom paved the way for a closer alignment between the negotiating positions on this point.

The negotiation process proved to be difficult, and the uncertainty over the final outcome persisted right until the end. Agreement between the UK Government and the EU on the WA and the PD was finally reached on 13 November 2018. On 25 November 2018, the European Council endorsed the WA and approved the PD. In

principle, this left enough time for ratification by the European and UK Parliaments before the scheduled Brexit day of 30 March 2019.

The November 2018 WA provided for a transition period until the end of 2020 that could be extended by up to two years to the end of 2022. During this period, the United Kingdom would continue to be part of the Single Market and the Customs Union. Then, unless and until a trade agreement was reached, a backstop would come into effect for Ireland in the form of a single customs territory between the United Kingdom and the EU-27. This would consist of a customs union arrangement and level playing field safeguards. Additional regulatory alignment provisions for Northern Ireland would keep in place full access to the Single Market for goods, avoiding the need for tariffs, quotas or checks on rules of origin at the Irish border.

For the future economic relationship between the EU and the United Kingdom, the PD established "the parameters of an ambitious, broad, deep and flexible partnership across trade and economic cooperation" akin to a comprehensive FTA. For trade in goods, a "free trade area, combining deep regulatory and customs cooperation" was envisaged. On financial services, the parties were assured that the future relationship would be based on equivalence decisions taken independently by them, with full respect for their regulatory autonomy. The PD foresaw the possibility of exchanging information, ensuring transparency and conducting consultations on each side's regulation. For other services, trade liberalisation well beyond WTO commitments was foreseen. Negotiations on the future relationship could only start after Brexit.

Although the agreement reached in November 2018 was endorsed by the UK Government and the European Council, the package (WA and PD) failed to be approved by the parliaments. The UK Parliament rejected it three times owing to strong opposition to the Irish backstop, so the package was not even submitted to the European Parliament, which was the last step before final approval.[8] In the end, a no-deal Brexit was narrowly avoided by the European Council's granting two consecutive extensions of the Article 50 deadline, first to 12 April 2019 and then to 31 October 2019.

Over the following months the Brexit process came to a standstill as political developments in the United Kingdom led to the replacement of Theresa May as PM by Boris Johnson in July 2019. The change in the UK Government brought with it a substantial change in the United Kingdom's Brexit strategy. The EU agreed to renegotiate specific parts the package, and on 17 October 2019 the EU and UK negotiators reached an agreement on revised versions of the WA and the PD, which were endorsed and approved by the European Council of 17-18 October 2019.

The main changes introduced to the WA concerned the Protocol on Ireland and Northern Ireland. Instead of the backstop, the parties agreed on a permanent solution to avoid a hard border on the island of Ireland. According to this solution, Northern Ireland will legally remain part of the United Kingdom's customs territory and apply the United Kingdom's customs and product standard rules, but it will also remain aligned

[8] A last-minute agreement between the UK Government and the EU over an additional interpretative instrument related to the WA and a joint statement supplementing the PD and clarifying some aspects of the backstop, reached in March,, was not enough to secure approval by the UK Parliament.

with a set of Single Market regulations. If goods entering Northern Ireland from the rest of the United Kingdom are destined for the EU, they will be subject to the EU customs and regulatory checks. Otherwise, if they are destined for Northern Ireland's local market, either they will face no customs or regulatory checks, or they will be eligible for a reimbursement of the EU tariffs applied to them. The revised Protocol includes a consent mechanism whereby the Northern Ireland assembly will be required to vote on the continued application of the Protocol every four years.

The revised PD sets the conditions for a looser future relationship between the EU and the United Kingdom than the one negotiated by Theresa May's government, and it explicitly states that the future relationship on goods and services will take the form of an FTA.

The UK Parliament rejected the possibility of approving the new WA in an accelerated procedure before 31 October 2019, the Article 50 deadline, and the UK Government asked for a further extension of the deadline. Such an extension, to 31 January 2020, was granted by the European Council on 29 October 2019. Meanwhile, the UK Parliament passed a law calling early elections on 12 December to break the political gridlock. The Conservative Party won the general elections by a large majority, and Boris Johnson was confirmed as PM with a renewed mandate to finish Brexit.

The EU (Withdrawal Agreement) Bill was eventually approved by Parliament and received Royal Assent on 23 January 2020. The process of ratification by the EU was smooth: after the Constitutional Affairs Committee voted in favour of a positive recommendation regarding the WA, the European Parliament gave its consent on 29 January 2020, and the Council finally adopted the decision to conclude the Agreement by written procedure on 30 January.

The United Kingdom exited the EU on 1 February 2020 and it is expected that the transition period will irrevocably end by 31 December 2020.[9] Negotiations on the future relationship started shortly after Brexit took place. Nevertheless, in September 2020 such negotiations continue to be surrounded by uncertainty, given that the positions held by the parties on some core issues are still wide apart. Indeed, it cannot be ruled out that an agreement is not reached, with economic consequences that would be similar to a no-deal Brexit.

1.3 Possible scenarios for the Brexit process

The papers reviewed in this Occasional Paper were written during the negotiation process, between 2017 and the first months of 2019. Although the final version of the PD points towards an FTA as the targeted model for the future relationship (barring a no-deal Brexit at the end of the transition period), over the two-year negotiation process there was high uncertainty over the features of this future relationship and on the likelihood and length of the transition period. This resulted in a set of more or less

[9] The UK Government had included a provision in the WA Bill forbidding its members to ask for an extension of the transition period beyond the 31 December 2020. Accordingly, the deadline for the United Kingdom to ask for such an extension, set on 30 June 2020 in the WA, was missed.

plausible scenarios that evolved with the dynamics of the negotiations. Figures 4a, 4b and 4c illustrate the relevant alternatives at three different points in time.

In March 2018, at the beginning of Phase 2 (Figure 4a), a transition period up to December 2020 had just been agreed. At that point, the first step (no-deal/WTO outcome or transition period) depended on whether or not the WA was subsequently approved. The interaction between the red lines set by the United Kingdom and the guidelines issued by the EU authorities then led to a CETA-like future relationship being defined as the central outcome in the final step. This did not exclude either a no-deal outcome at the end of the transition period or an EU membership-like outcome, should the United Kingdom opt for entering the EEA, for example. Other outcomes were also possible (i.e. a customs union arrangement) but were judged less relevant. This set of scenarios was used as the basis of the analytical exercises performed in several of the papers reviewed in Chapter 2.

Figure 4a

Brexit scenarios (March 2018)

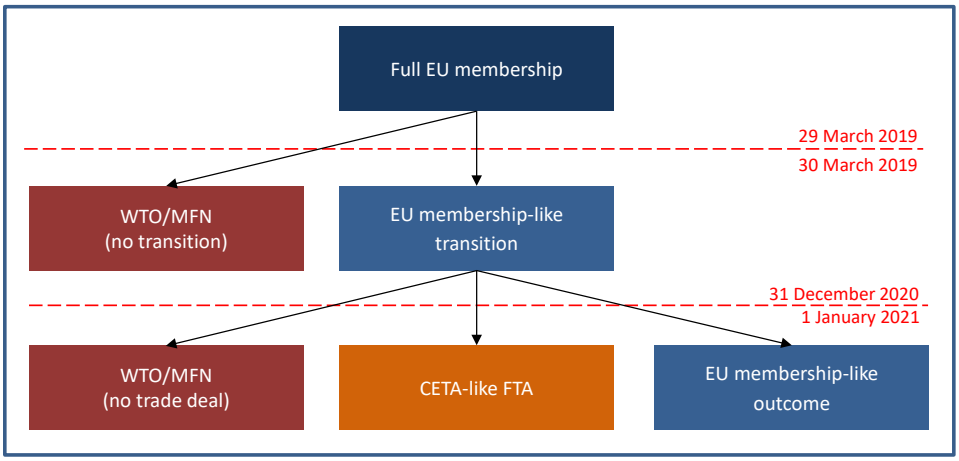
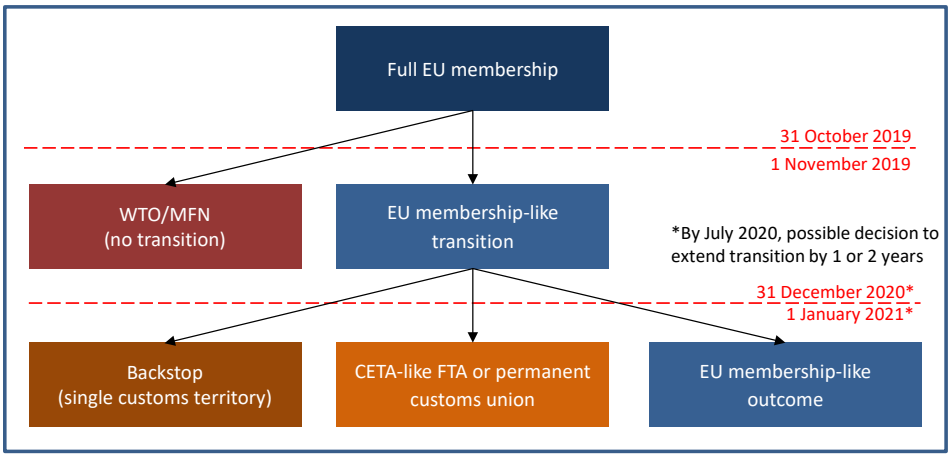


Figure 4b describes the scenarios after the extension of the Article 50 deadline to October 2019, which delayed the starting point of the transition to 1 November 2019. The general nature of the alternatives did not change. In the first step, a no-deal/WTO outcome was a distinct possibility in the event that the WA and PD were not approved; in the event that they were approved, a transition period would start, although the end point could change.[10] In the second step, after the exit of the United Kingdom, the most plausible alternatives (subject to the approval of the WA and the PD) were a CETA-like FTA, on the one hand, and the backstop on the other. Other options – i.e. a permanent Customs Union-like agreement – could not be ruled out.

[10] As already mentioned, in December 2018 the CJEU ruled that the United Kingdom had the right to revoke the withdrawal notification. However, this possibility is not included in Figures 4b and 4c.

Figure 4b

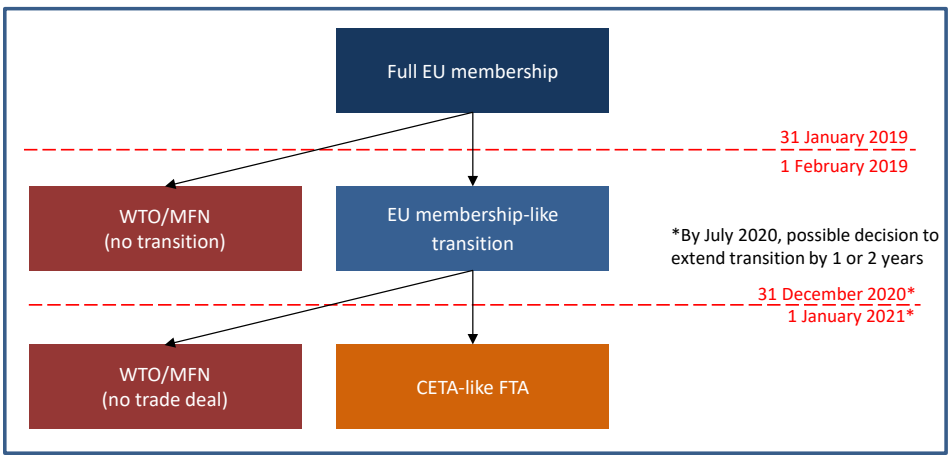
Brexit scenarios (September 2019)



Finally, Figure 4c reflects the possibilities after the European Council extended the withdrawal deadline to 31 January 2020, at the end of October 2019. The end of the transition period remained at 31 December 2020 (with the possibility of extending it by up to two years). On the future relationship, the new Protocol on Ireland and Northern Ireland no longer envisages a single customs territory (the backstop). It provides instead for a special regime applicable to Northern Ireland only, and consequently leaves the United Kingdom free to strike independent trade deals with third countries. As mentioned, the final version of the PD foresees a “comprehensive and balanced” trade agreement between the United Kingdom and the EU; failing that, bilateral trade would revert to MFN terms. Those continue to be the prospects during the transition period.

Figure 4c

Brexit scenarios (December 2019)



It is important to recall, as was mentioned before, that the financial stability implications of Brexit are particularly difficult to incorporate into macroeconomic

scenarios, although they could be quite significant in the case of a hard Brexit.[11] For this reason as well as the fact that they were not included in the mandate to analyse the economic and trade consequences of Brexit, those risks do not fall within the scope of the analytical work described in the next chapter.

[11] See for example, the Bank of England's analysis published in November 2018.

2 The economic and trade impact of Brexit

This chapter brings together the specific contributions to the analysis of the economic consequences of Brexit contained in the individual papers reviewed in this Occasional Paper.[12]

In order to present the different pieces of analysis in a more effective way and help to extract the main lessons, which is done in Chapter 3, the summaries of the papers are grouped into sections relating to the main Brexit transmission channels, namely trade, migration and FDI, which correspond to the EU fundamental freedoms: free movement of goods, services, people and capital. Additionally, there is a first section consisting of a literature review and a final section containing a collection of studies on specific countries.

Section 2.1 presents a survey of the vast body of official and academic studies on the long-term impact of Brexit on gross domestic product (GDP) and welfare for both the UK economy and the EU economies (Bisciari, 2019). This paper reports a wide range of results, depending on the model specifications and the channels of transmission analysed in each study.

Section 2.2 is the first of two sections relating to the trade channel. It summarises three papers analysing the increase in the costs of trade between the United Kingdom and the EU that will result from the reintroduction of tariffs and NTBs, taking into account the existence of production interlinkages between the two areas. Cappariello (2017) computes the level of tariffs that EU firms would face in order to export directly to the United Kingdom after withdrawal, assuming that the United Kingdom keeps the present EU tariffs unchanged and applies them to EU exports. Byrne and Rice (2018a, b) estimate the impact of NTBs, in particular border checks and documentary compliance, on Irish-UK trade and on trade between the other EU Member States and the United Kingdom. Cappariello et al. (2018) calculate the indirect costs of Brexit due to imposition of tariffs on intermediate and final goods, taking into account the dense network of value chains linking the EU and UK productive systems.

Section 2.3 includes four papers devoted to estimating the macroeconomic impact of Brexit through the trade and migration channels using model simulations. Pisani and Vergara Caffarelli (2018) use a New Keynesian dynamic stochastic general equilibrium (DSGE) model augmented with a simple GVC structure to analyse different post-Brexit trade regimes between the euro area and the United Kingdom. In this way they quantify the macroeconomic costs for the United Kingdom and the euro area, which turn out to be much larger in the first case. Campos and Timini (2019) estimate the impact of Brexit on trade and migration flows between the EU and the United Kingdom using gravity models. Berthou et al. (2019) simulate different trade and migration Brexit scenarios for the EU and the United Kingdom using the National Institute Global Econometric Model (NiGEM) developed by the UK's National Institute of Economic and Social Research (NIESR); this paper finds that Brexit is economically

[12] The summaries of their content are based on the contributions by the authors.

harmful for the United Kingdom and also, but to a much lesser extent, for the EU. Finally, Cappariello et al. (2020) analyse the long-term effects of Brexit on trade, welfare and prices, taking into account EU-UK GVC interconnections. They find, again, that the impact on the United Kingdom is significantly larger than that on the rest of the EU.

Section 2.4 focuses on FDI: de Almeida et al. (2019) document recent developments in FDI flows and stocks vis-à-vis the United Kingdom, uncovering a downward shift after the 2016 referendum on Brexit. They also use a gravity model to estimate the impact made by the reversal of integration on FDI flows.

Country evidence is presented in Section 2.5. There are two sets of papers that focus on Ireland and one study on Spain. Conefrey and co-authors (2018a, 2018b, and 2019) investigate the long-run consequences of Brexit for Ireland, the member of the euro area (and of the EU) most exposed this economic shock. Meanwhile, Marongiu Buonaiuti and Vergara Caffarelli (2018) analyse the issue of the Irish border from an economic, institutional and legal point of view, discussing the initial negotiating proposals of the EU and the United Kingdom and the compromise solution included in the WA. Finally, Gutiérrez Chacón and Martín Machuca (2018) investigate the vulnerability of Spanish firms to Brexit. They conclude that characteristics such as geographical diversification and productivity levels may mitigate the potentially adverse impact of the United Kingdom's exit on Spanish firms with a presence in the UK market.

While, in general, the various papers all describe a very similar set of scenarios, the precise details of each scenario may differ across the papers. All in all, the papers consider three types of scenario, as described from an institutional point of view in chapter 1. In the first, it is assumed that the EU and the United Kingdom will not be able to strike a trade agreement after Brexit. In this case, bilateral trade will be subject to the MFN tariffs notified to the WTO, as well as NTBs. For this reason, this scenario is called the WTO or the MFN scenario. In the second scenario, an FTA is concluded between the United Kingdom and the EU. Consequently tariffs, and often also NTBs, are significantly reduced with respect to their respective MNF levels. This is usually called the FTA scenario. Finally, some papers also consider a no-Brexit scenario that often serves a baseline.

We refer the interested reader to the original papers for a full description of the scenarios they use and their precise parameterisation. For the sake of clarity, each paragraph reiterates the main elements of the scenarios analysed.

2.1 A review of the Brexit-related economic literature

Brexit has stimulated an intense research and analysis effort in the economics profession, leading to the publication of a large variety of contributions on the issue.

Bisciari (2019) surveys studies on the long-term impact[13] of Brexit on GDP and welfare[14] for both the UK economy and the EU economies. The author considers official and academic studies published between 2016 and 2018, including some papers released just after the EU Summit of 25 November, where EU-27 leaders endorsed the Brexit deal concluded by Theresa May.

The main Brexit transmission channel in the long term is trade in goods and services. Indeed, trade between the United Kingdom and the 27 remaining EU Member States may once again be subject to tariffs and NTBs that had been dismantled thanks to the United Kingdom's membership of the EU Single Market and Customs Union. Some studies include additional transmission channels (Table 1) such as FDI, migration, the exchange rate and the contributions to the EU budget from the United Kingdom. Financial services are in general considered as a service that can be traded, and financial institutions are companies that can relocate, but financial stability issues are largely not covered. As the focus of the survey is on the long term, neither short-term disruptive effects from a disorderly no-deal Brexit nor short-term uncertainties are taken into account. A drop in productivity is also added as a transmission channel, either as an exogenous shock or endogenously within the models, which is relevant to the United Kingdom in particular.

Table 1

Channels of transmission of a hard Brexit on the UK and EU-27 economies

		For the EU- 27 countries	
		Positive or neutral	**Negative**
For the UK	**Positive or neutral**		EU budget UK deregulation
	Negative	FDI Migration Productivity shock	Trade Uncertainties

Source: Bisciari (2019).

Studies very often show that Brexit affects the growth rate of the economy only temporarily, while the level is affected permanently. In empirical long-term impact studies, Brexit leads to losses in welfare and GDP for both the United Kingdom and the EU-27 relative to a baseline scenario where the United Kingdom remains within the EU. This does not necessarily mean that real GDP will decline at any moment in time.

The PD on the future relationship agreed in November 2018, together with the draft WA, left many options open for the future bilateral EU-UK relationship. The survey, finished around that time, encompasses various institutional post-Brexit trade scenarios ranging from the United Kingdom remaining within the EU to an orderly no-deal Brexit where trade relations are organised according to WTO rules, including

[13] Some studies focused on the short term, which are outside the scope of Bisciari's (2019) survey, predicted a significant immediate cost of Brexit, especially for the United Kingdom. After initial turmoil on the UK financial markets and a substantial depreciation of the British pound, these predictions did not seem to materialise, partly thanks to the policy response by the Bank of England as of August 2018, and the delayed activation of the art. 50 TEU process, which was instead assumed to occur right after the referendum.

[14] Welfare is usually defined as either consumption or income per capita.

MFN tariffs. Intermediate scenarios include FTAs, such as the one between the EU and Canada (CETA), a customs union arrangement, similar to that between the EU and Turkey, or United Kingdom's membership of the EEA, similar to Norway's membership. The looser the economic relationship between the EU and the United Kingdom, the greater the autonomy for the United Kingdom to decide on policies, but also the higher the losses attached to Brexit.

In fact, Brexit is a "lose-lose" situation for both the UK economy and the EU economies – all the more so in an (even orderly) no-deal scenario (WTO; Table 2).

Table 2

Long-term impact of Brexit on GDP/welfare in a WTO scenario

Percentage point of GDP/welfare deviation from EU-like scenario

Institution	Losses		Channels	Methodology
	UK	EU-27		
LSE (2017)	-2.7	-0.3	Trade, EU budget	Comparative static, trade models
LSE (2018)	-3.3		Trade	
IMF (2018)	-4.0	-0.5		
CAE (2018)	-2.7	-0.8		
IFO (2017)	-1.7	-0.3	Trade	
IFO (2018)	-3.2	-0.6		
CPB (2016)	-4.1	-0.8	Trade	CGE macro model
KUL (2017)	-4.5	-1.5	Trade, global value chains	Comparative static, trade model with sector-level input-output linkages
IMF (2018)		-1.5	Integration	Various methods
NIESR (2016)	-3.2		Trade, tariffs, FDI, EU budget	Macroeconomic model (NiGEM)
	-7.8		Idem + labour productivity shock	
NIESR (2018)	-5.5		Goods and services trade volumes, FDI, net migration, EU budget + limited labour productivity shock	
UK Gov (2018b)	-7.7		Trade, new trade deals, deregulation	CGE macro model (+ gravity)
	-9.3		Idem + migration (zero net inflows of EEA workers)	
	-9.9		Trade, business investment-productivity	Idem (with capital accumulation)
UK Treasury (2016)	-7.5		Trade, FDI, uncertainty persistence	Back-of-the-envelope calculations for trade based on estimates of trade destruction and trade-income elasticity
LSE (2018)	-8.1		Trade	
	-8.7		Trade and migration	

Source: Bisciari (2019).
Note: LSE (2017) = Dhingra et al. (2017); LSE (2018) = Levell et al. (2018); IMF (2018) is a Selected Issue of the Article IV Consultation Report on the euro area in July; CAE (2018) = Vicard (2018); IFO (2017) = Felbermayr et al. (2017); IFO (2018) = Felbermayr et al. (2018b); CPB (2016) = Rojas-Romagosa (2016); KUL (2017) = Vandenbussche et al. (2017); NIESR (2016) = Ebell and Warren (2016); NIESR (2018) = Hantzsche et al. (2018).

The United Kingdom is found to be much more affected than the EU-27, since the United Kingdom represents a small share of EU-27 trade, while the EU-27 still account for close to a half of UK imports and exports. Nevertheless, estimates of the Brexit losses vary widely from one study to another, especially for the United Kingdom. The magnitude of the results depends on the model specifications and on the channels considered. For the United Kingdom, adding channels other than trade (such as FDI,

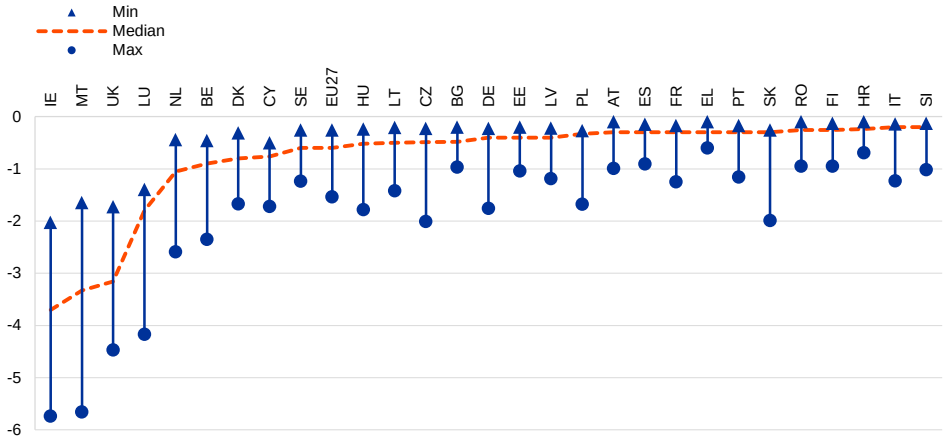
migration and productivity) tends to increase the negative impact on economic activity in the long term. Higher GDP losses are also found in reduced-form approaches, based on econometric estimates of trade-income elasticity, or in models with imperfect competition (increasing returns to scale, heterogeneous firms) in comparison to models with perfect competition.

In the seven studies that analyse the economic impact of the trade channel on individual EU countries, it is shown that small open economies closely related to the United Kingdom are hit harder than others (Chart 1).

Chart 1

WTO scenario losses differ across the studies, but the ranking of countries is largely similar

Percentage point of GDP/welfare deviation from an EU-like scenario (results from seven studies)



Notes: Countries are ranked by decreasing median GDP/welfare losses. Losses are reported in Dhingra et al. (2017), Felbermayr et al. (2017 and 2018b), IMF (2018b), Rojas-Romagosa (2016), Vandenbussche et al. (2017) and Vicard (2018). In Rojas-Romagosa (2016), results are combined for Belgium and Luxembourg; here, the losses have been applied to Belgium and Luxembourg separately. The wide variation for Malta (and Luxembourg) may reflect the difficulties in the treatment of highly service-oriented economies and possible measurement errors in the data used in the source papers.
Source: Bisciari (2019).

This is the case for Ireland – and to a lesser extent for the Netherlands and Belgium – owing to geographical proximity, for Luxembourg because of the specialisation in financial services, and for Cyprus and Malta as they are small countries with Commonwealth links to the United Kingdom.[15] GDP or welfare losses are smaller in the four main euro area countries owing to their lower exposure to trade with the United Kingdom and their larger home markets. Higher GDP losses are not only associated with higher values for the shock variables (in particular NTBs), as should be expected; the results are also sensitive to the values set for key parameters such as trade elasticities relating trade volumes to the presence of higher tariff and non-tariff barriers. GDP losses reported in GVC approaches are significantly higher than in pure trade models.

[15] In some service-oriented economies such as Malta, the impact of trade barriers on financial services does not necessarily translate fully into welfare losses, as a significant share of services activity is carried out by internationally oriented firms that have limited links with the domestic economy.

In all scenarios, the economic losses due to Brexit are estimated ceteris paribus and assuming unchanged policies. However, the United Kingdom could mitigate the economic losses by implementing appropriate monetary, fiscal, trade and/or regulatory policies, and it would regain more autonomy to do so in a WTO scenario than in softer Brexit scenarios. It should be borne in mind that one of the aims of Brexit is for the United Kingdom to regain control of its borders and policies.

Reaching a trade agreement for the future relationship between the United Kingdom and the EU could limit the GDP losses both for the United Kingdom and the EU Member States compared with a no-deal scenario (Table 3).

Table 3

Long-term impact of various Brexit scenarios

Percentage point of GDP/welfare deviation from an EU-like scenario

Institution	Scenario	GDP / Welfare losses		Tariffs	Non-tariff barriers (NTBs)
		UK	EU-27		
LSE (2017)*	**WTO**	-2.7	-0.3	MFN	8.3 %
	EEA	-1.3	-0.1	Zero	2.8 %
LSE (2018)*	**WTO**	-3.3	n.a.	MFN	8.3 %
	Backstop	-1.7	n.a.	Zero	Goods: 2.8 %
					Services: 7.3 %
IMF (2018)	**WTO**	-4.0	-0.5	MFN	Varying across sectors
	FTA	-2.5	-0.2	Zero	Half of WTO
CAE (2018)	**WTO**	-2.7	-0.8	Included	
	FTA	-2.2	-0.6	in NTBs	Derived from the
	Switzerland	-1.8	-0.5		coefficients of the
	EEA	-0.8	-0.2		gravity equation
IFO (2017)	**WTO**	-1.7	-0.3	MFN	Gravity EU/UK coefficient
	FTA	-0.6	-0.1	Zero	South Korea coefficient
	FTA and a CU	-0.4	-0.1	Zero	Idem minus 5 % NTB for goods
	EEA	-0.4	-0.1	Zero	As FTA minus 50 %
IFO (2018)	**WTO**	-3.2	-0.6	MFN	Gravity EU/UK coefficient
	FTA	-1.8	-0.3	Zero	South Korea coefficient
CPB (2016)	**WTO**	-4.1	-0.8	MFN	Average : 12.9 %
	FTA (2029)	-3.4	-0.6	Zero	Average : 6.4 %
KUL (2017)	WTO	-4.5	-1.5	MFN	8.3 %
	EEA	-1.2	-0.4	Zero	2.8 %

Source: Bisciari (2019).
Note: papers are quoted as in Table 2. CU stands for a Customs Union.
* LSE studies (2017 and 2018) also feature the loss of benefits from further EU27 integration.

If the new relationship were of an FTA type, like the one between the EU and South Korea, the losses in general would be less than half those in a no-deal scenario (Table 4); if the United Kingdom remained in the Single Market or the Customs Union, the GDP losses would be significantly smaller again.

Table 4

GDP losses in various Brexit scenarios

Deviation from EU-like scenario, in percentage points

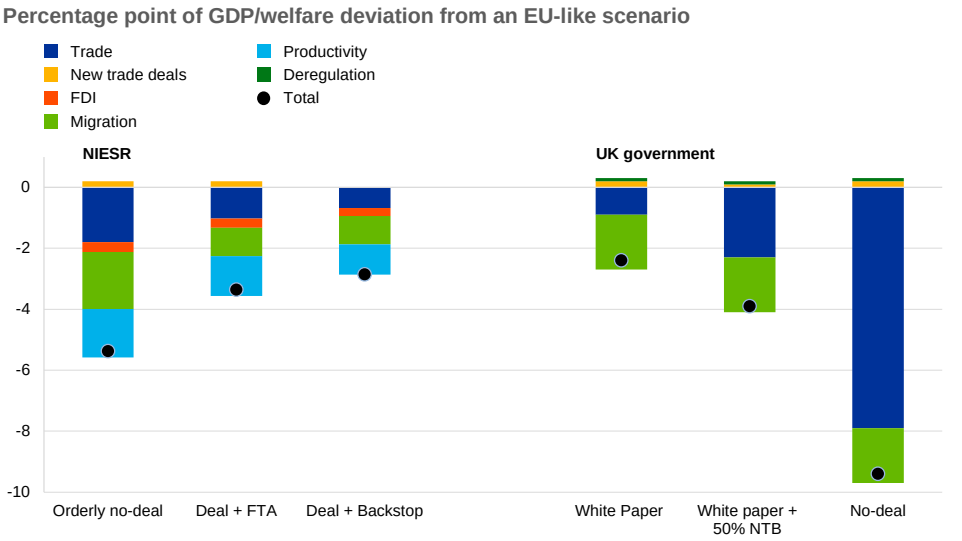
	WTO	(South Korea like) FTA	FTA and customs union	EEA
Ireland	-2,03	-0,88	-0,77	-0,52
UK	-1,73	-0,57	-0,36	-0,4
Malta	-1,65	-0,71	-0,23	-0,46
Luxembourg	-1,4	-0,46	0,02	-0,37
Cyprus	-0,51	-0,23	-0,13	-0,15
Belgium	-0,46	-0,2	-0,14	-0,13
Netherlands	-0,44	-0,21	-0,15	-0,14
Slovakia	-0,35	-0,23	-0,19	-0,15
Denmark	-0,31	-0,16	-0,12	-0,1
Poland	-0,27	-0,14	-0,12	-0,08
EU-27	-0,26	-0,11	-0,09	-0,07
Sweden	-0,26	-0,12	-0,09	-0,08
Hungary	-0,24	-0,09	-0,08	-0,06
Germany	-0,23	-0,1	-0,09	-0,06
Czech Republic	-0,23	-0,09	-0,09	-0,06
Estonia	-0,23	-0,11	-0,1	-0,07
Latvia	-0,22	-0,1	-0,08	-0,06
Lithuania	-0,21	-0,11	-0,1	-0,06
Bulgaria	-0,2	-0,11	-0,1	-0,08
France	-0,19	-0,09	-0,07	-0,06
Finland	-0,17	-0,07	-0,06	-0,05
Portugal	-0,17	-0,08	-0,07	-0,05
Spain	-0,15	-0,07	-0,06	-0,04
Italy	-0,15	-0,07	-0,06	-0,04
Greece	-0,13	-0,07	-0,05	-0,05
Romania	-0,13	-0,07	-0,05	-0,04
Slovenia	-0,13	-0,07	-0,05	-0,04
Austria	-0,11	-0,05	-0,04	-0,03
Croatia	-0,11	-0,06	-0,05	-0,04

Source: Bisciari (2019), based on Felbermayr et al. (2017).
Note: Countries have been ranked by decreasing WTO GDP losses.).

Estimates of the effects of the agreement reached in November 2018 show that a significant share of the economic loss that would occur in a WTO scenario would not materialise for the United Kingdom either in the backstop scenario or in a free trade area for goods combined with an FTA for services, as foreseen by the 2018 PD (Chart 2). This explains the economic interest for the United Kingdom and the EU in parting under an agreed future relationship. The revised PD of October 2019 also points to an FTA as the intended model for the future relationship.

Chart 2

Expected mitigating impact of the November 2018 deal on Brexit losses for the United Kingdom in a no-deal scenario



Note: NIESR: simulation for the period until 2030.
Source: Bisciari (2019).

2.2 Estimates of tariff and non-tariff barriers to trade after Brexit

This section summarises three papers that mainly use statistical accounting techniques to analyse quantitatively the rise of tariff and non-tariff barriers to trade after Brexit. The papers also take into account how the dense network of trade interlinkages between the United Kingdom and the EU through production value chains would contribute to increasing the costs of withdrawal.

2.2.1 Tariff costs for EU countries in a new trade regime with the United Kingdom

The study by Cappariello (2017) estimates the average tariffs that producers of each of the remaining 27 EU countries would face when exporting to the United Kingdom in the event that a trade agreement is not reached in the Brexit negotiations, and trade between the EU and the United Kingdom is conducted under WTO MFN terms. Under this scenario, the United Kingdom would introduce tariffs on its imports from the EU-27; the impact on average tariffs would depend both on the intensity of the import relationship of each EU-27 country with the United Kingdom and on the sectoral composition of the import flow.

Cappariello's analysis is based on the assumption that the United Kingdom would apply MFN tariff rates equal to the EU's current MFN rates on its imports from the EU-27 countries. The hypothesis that, at least at the beginning, the United Kingdom

will inherit the EU's tariff schedule is indeed plausible since the adoption of a new tariff schedule within the WTO would entail a protracted process.[16] Under this hypothesis, the study estimates that the average duty imposed by the United Kingdom on imports of goods from the EU-27 would be 5.2%, whereas the duty levied on UK exports to the EU would be equal to 3.9% (Table 5).

Table 5

Estimated bilateral tariffs between the United Kingdom and the EU-27 by sector

Percentage of imports

SITC Rev.4 Product		Bilateral simple average of MFN (2015)		Import sector share	
		on EU-27 goods	on UK goods	UK from EU-27	EU-27 from UK
0.0	Food and live animals	15.0	12.0	10.4	6.6
1.0	Beverages and tobacco	8.1	5.4	1.9	1.8
2.0	Crude materials, inedible, except fuels	1.9	0.5	2.1	1.9
3.0	Mineral fuels, lubricants and related materials	1.8	1.1	3.4	12.8
4.0	Animal and vegetable oils, fats and waxes	3.9	3.6	0.4	0.3
5.0	Chemicals and related products, n.e.s.	2.4	2.7	16.3	18.0
6.0	Manufactured goods classified chiefly by material	2.8	2.6	10.8	11.0
7 net of 7.8 and 7.9	Machinery excluding road vehicles and other transport equipment	2.0	1.9	20.8	19.0
7.8	Road vehicles	9.1	9.0	18.9	12.3
7.9	Other transport equipment	2.6	2.5	1.8	3.8
8 net of 8.4 and 8.5	Miscellaneous manufactured articles excl. clothing and footwear	2.2	2.4	9.2	8.7
8.4	Articles of apparel and clothing accessories	11.0	11.0	2.1	1.6
8.5	Footwear	10.0	11.0	0.8	0.5
9.0	Commodities and transactions not classified elsewhere in the SITC	-	-	1.1	1.7
	Total	5.2	3.9	100.0	100.0

Source: Cappariello (2017).

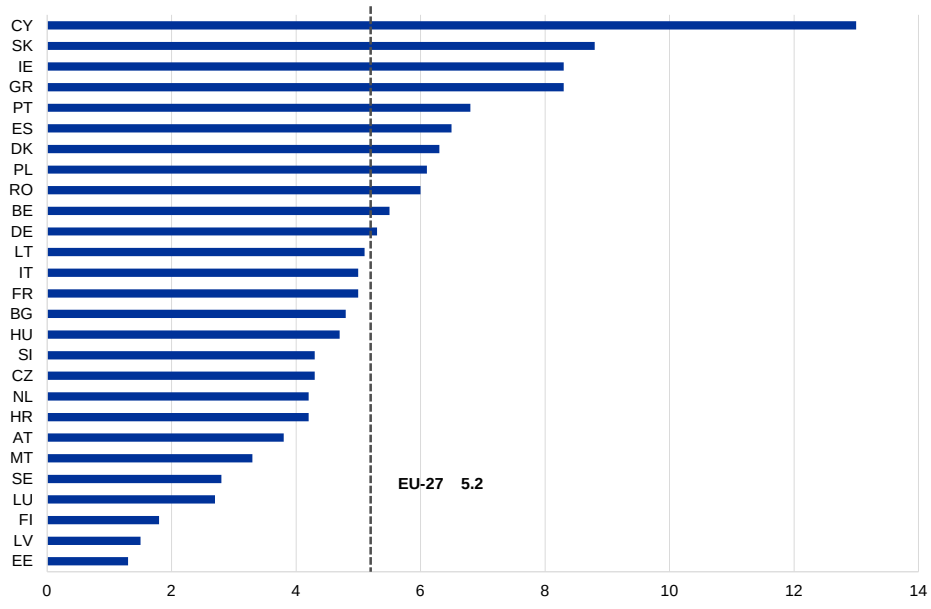
It is clear that the EU MFN tariffs substantially protect four sectors: food and live animals, beverage and tobacco, road vehicles, and clothing and footwear. European car exports to the United Kingdom would carry the highest costs in absolute terms: EU road vehicle producers would have to deal with the impact of tariffs worth €5.3 billion. In other industries, notably machinery and chemicals, both representing a significant share of UK imports from the EU-27, the level of tariffs would instead be quite low. Considering that road vehicles represent almost one-fifth of the value of goods delivered by the EU-27 to the United Kingdom, and given that the average tariff on road vehicles is 9.1%, the new regime could significantly affect the average tariff faced by European exporters, with a potential negative impact on sales to the United Kingdom.

[16] In May 2020, the UK Government published a proposal that implied lower tariffs than the current EU MFN tariffs for trade after Brexit. The estimates in Cappariello (2017) can therefore be considered an upper bound.

In addition, the different composition of exports by sector means that there is a large degree of heterogeneity in average tariffs across EU-27 members. Chart 3 presents the average tariff that would be imposed on goods imported by the United Kingdom from each of the 27 remaining Member States. In the case of half of these countries, the average tariff would be higher than 5% of the value of goods exported to the United Kingdom. For a subset of economies – Germany, Spain, Belgium and Slovakia – this is due to specialisation in the road vehicles industry. In other cases, such as Portugal and Romania, the high average tariff is almost fully explained by the relatively high incidence of clothing industry exports. Meanwhile, the share of specific food and live animal products in exports explains the high tariffs that would weigh on goods imported from Ireland and Denmark (meat), Greece (vegetables and fruit) and Cyprus (dairy products). For Spain, exports to the United Kingdom predominantly reflect specialisation in the road vehicles industry, but the relatively high level of tariffs also derives from the high incidence of trade in agricultural products (particularly vegetables and fruit). The estimated average tariffs that would apply to French and Italian goods exported to the UK market would be just below the EU-27 average.

Chart 3

Average tariffs on UK imports of goods from EU-27 countries



Note: The dotted line is the EU-27 average.
Source: Cappariello (2017).

In terms of the percentage of the total value added of the manufacturing sector (Table 6), the relative burden of the new tariffs on the goods imported by the United Kingdom would be particularly high for smaller EU states that have geographical proximity and/or historical ties with the United Kingdom, such as Belgium, Cyprus, Ireland and the Netherlands. This confirms that the stakes in the negotiations with the United Kingdom are not the same for all European countries. This could affect EU positions in the negotiation of future trade agreements.

Table 6

Estimated tariffs on UK imports of goods from EU-27 countries

EUR millions and percentages

COUNTRY	EU-27 goods			in % of value added in manufacturing
	Value of tariffs	Value of imports	Average tariff	
Austria	162	4,212	3.8	0.3
Belgium	1,542	27,959	5.5	3.1
Bulgaria	24	507	4.8	0.5
Croatia	8	196	4.2	0.2
Cyprus	29	215	13.0	3.5
Czech Republic	283	6,609	4.3	0.8
Denmark	298	4,736	6.3	1.0
Estonia	3	257	1.3	0.1
Finland	50	2,790	1.8	0.2
France	1,710	34,317	5.0	0.9
Germany	4,484	84,187	5.3	0.9
Greece	80	967	8.3	0.8
Hungary	161	3,441	4.7	0.8
Ireland	1,415	17,075	8.3	3.8
Italy	1,117	22,256	5.0	0.5
Latvia	10	657	1.5	0.5
Lithuania	54	1,069	5.1	1.6
Luxembourg	18	667	2.7	0.7
Malta	8	250	3.3	-
Netherlands	1,787	42,315	4.2	3.0
Poland	677	11,114	6.1	1.2
Portugal	212	3,124	6.8	1.2
Romania	128	2,132	6.0	0.8
Slovakia	243	2,755	8.8	2.1
Slovenia	19	446	4.3	0.3
Spain	1,236	19,146	6.5	1.3
Sweden	262	9,311	2.8	0.5
EU-27	16,112	309,183	5.2	1.1

Source: Cappariello (2017)
Notes: UK imports from the EU-27 are drawn from the ComTrade database. These values are in US dollars and have been converted into euro using an annual average exchange rate of €1 = USD 1.1095..

2.2.2 The impact of non-tariff barriers on goods trade

Membership of the EU brings two important levers of trade. First, the EU Customs Union implies the absence of tariffs and customs checks between Member States. Second, membership of the Single Market guarantees that NTBs are minimised. In

particular, there are EU-wide agreements on product standards and rules of origin. This means that firms which import goods from outside the EU can then trade those goods across borders within the EU without being subject to additional checks. Upon leaving the EU, the United Kingdom will no longer be party to these agreements, so there is likely to be a significant increase in NTBs. Byrne and Rice (2018a, b) assess the impact of NTBs (in the form of delays associated with border checks and documentary compliance) on trade with the United Kingdom.

Border delays and NTBs have been shown to be a potentially larger barrier to trade than tariffs (Hummels 2007; Hummels and Schaur 2013). The importance of NTBs in the negotiations on CETA highlight their role as the most significant impediment to trade in developed markets with low tariffs. NTBs reduce trade through two main channels. First, they can increase the cost of doing business. Some NTBs of this kind are quite specific – such as adherence to individual product standards – while others are more general – such as more stringent customs and documentary related procedures. Second, NTBs can restrict full access to markets (as in the case of quotas). The specific effect of a post-Brexit increase in NTBs on EU trade with the United Kingdom has received comparatively little attention.

For EU Member States conducting trade with the United Kingdom, an increase in NTBs after Brexit could reduce trade in two ways. First, outside the Customs Union, UK importers would be exempt from adherence to EU regulatory standards on goods imports from non-EU countries. This would harm the competitiveness of European exporters selling EU-compliant goods to the UK market. Second, under any scenario, delays associated with increased customs handling times and documentary compliance requirements will exceed those experienced under the current arrangement of frictionless trade and will therefore increase costs for EU exporters. While the extent of checks at the UK border is not yet clear, the Union Customs Code[17] sets out procedures required for EU exporters when exporting to a third country. These procedures include declarations at point of export, outward customs arrival, outward clearance, import, inward customs arrival and where goods consignments must be held in temporary storage. In addition to this paperwork, goods are required to pass UK customs inspection procedures and are likely to be subject to additional handling delays due to the increase in the volume of imports subject to such procedures.

In their analysis of the effect of potential increases in border delays and documentary compliance on trade between Ireland and the United Kingdom after Brexit, Byrne and Rice (2018a) measure NTBs as the sum of border waiting time and the time needed to complete all documentary compliance, as reflected in the “Trading Across Borders” module of the World Bank’s Doing Business survey. Estimating the effect of potential increases in NTBs on trade requires two ingredients: the elasticity of trade to NTBs for high-income countries (both in aggregate and at the goods level) and an estimate of the likely increase in NTBs at the EU/UK border after Brexit. To estimate this elasticity, a difference gravity model and a standardised measure of NTBs from the Doing Business survey are used. The model relates the volume of trade to the level of NTBs, controlling for distance, exchange rates and other variables that traditionally

[17] Regulation (EU) No 952/2013 of the European Parliament and of the Council of 9 October 2013 laying down the Union Customs Code (OJ L 269, 10.10.2013, p.1).

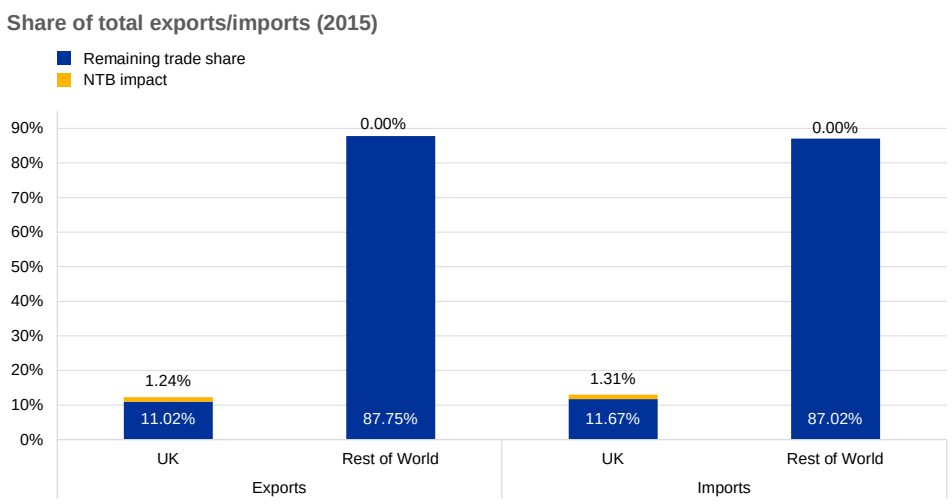
determine the volume of trade. This methodology is similar to that used by Djankov et al. (2010).

The estimate of the potential increase in border waiting times comes from a regression that assesses the impact on NTBs of doing trade with a country outside one's own free trade area, controlling for whether trade is carried out through a sea border, as well as for income per capita and trade openness. This model suggests a 90% increase in NTBs for countries trading with the United Kingdom compared with the status quo. Of course, this is only an estimate of the likely increase in NTBs at the EU/UK border. The scale of the increase will be heterogeneous across countries and goods. However, the model provides a framework to assess the impact of any given increase in NTBs, in combination with the elasticity estimated in the first step.

Should the United Kingdom leave the EU Customs Union, trade between Ireland and the United Kingdom would decline by 9.6% as a direct result of an estimated increase in these delays at the border. In particular this equates to a 1.4% decline in total Irish exports and a 3.1% decline in total Irish imports under the current composition of trade between the two countries (Chart 4). Fresh foods, raw materials (such as metals and some intermediate inputs into firms' supply chains) and bulky goods are most exposed to delays (Charts 5 and 6). Finally, trade in petrol and other fuels and in chemicals and related goods does not appear to be exposed to delays.

Chart 4

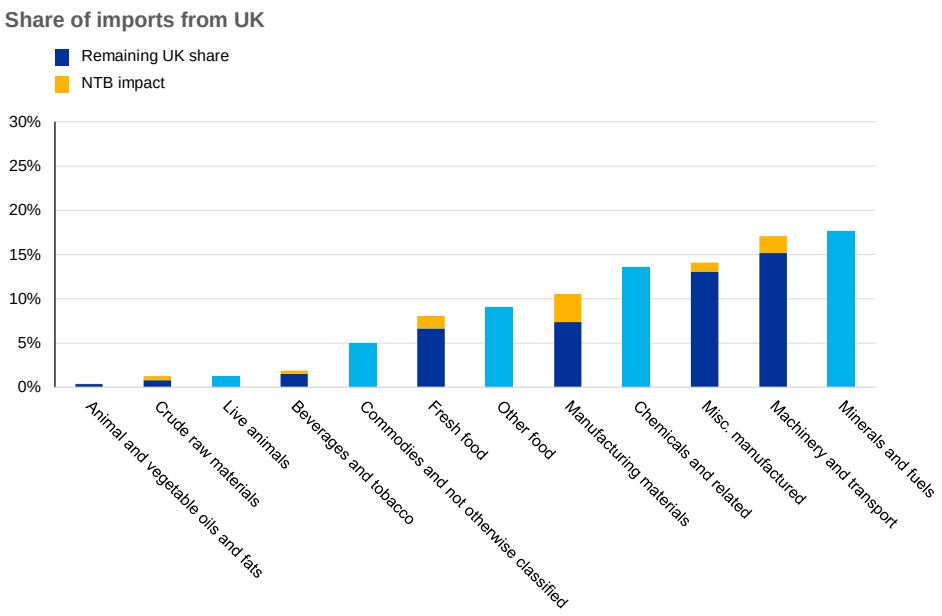
Effect on aggregate exports and imports



Source: Byrne and Rice (2018a).

Chart 5

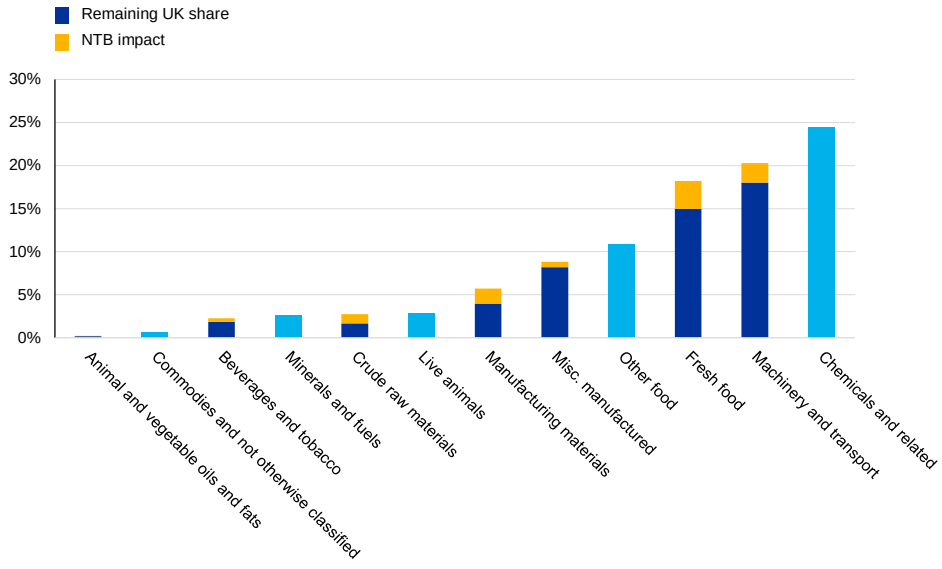
Sectoral effect on Irish imports from the United Kingdom



Source: Byrne and Rice (2018a).

Chart 6

Effect on Irish exports to the United Kingdom by sector

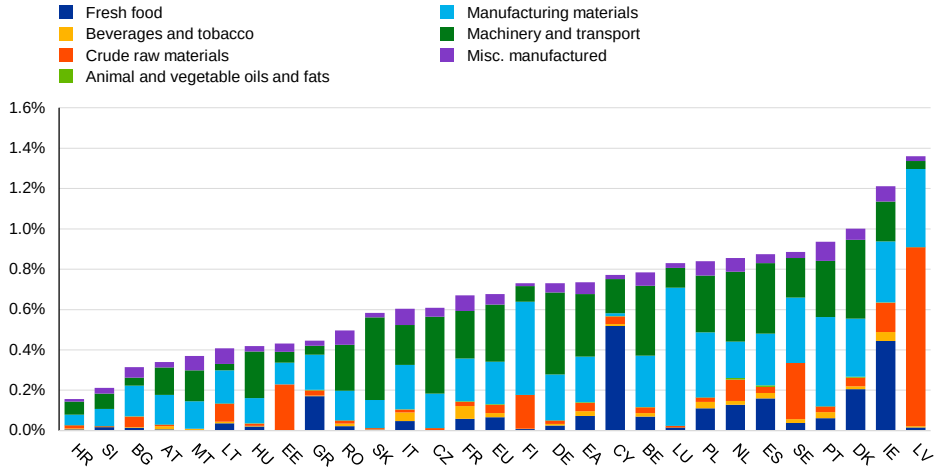


Source: Byrne and Rice (2018a).

Byrne and Rice (2018b) apply this approach to all EU countries. Again, the extent to which countries are affected by increases in NTBs after Brexit depends on the volume and type of goods they trade with the United Kingdom. Chart 7 presents the predicted declines in exports to the United Kingdom (as a fraction of total exports) at the goods level for all EU countries, the EU as a whole and the euro area.

Chart 7

Predicted decline in exports to the United Kingdom (percentage of total exports)



Source: Byrne and Rice (2018b).

Latvia appears most exposed to border delays owing to its significant UK exports of crude raw materials (in particular timber), goods that are highly sensitive to delays given their role as intermediate inputs into supply chain networks and the fact that they are often perishable (Chen et al. 2018). The effect for Ireland is largely driven by its exports of fresh foods and manufacturing materials. Croatia and Slovenia appear least exposed. This is due to both the overall share of the UK market in their total exports and the small quantity of their UK exports identified as being time-sensitive.

2.2.3 EU-UK global value chain trade and the indirect costs of Brexit

The indirect effects of trade tariffs working through the complex network of production linkages between countries (known as global value chains, or GVCs) have often been neglected in the Brexit debate. Nevertheless, these effects are likely to be highly significant given the strong cross-border production integration between the two economies. Tariffs on imported intermediate goods (embedded in exported goods) will cumulate as many times as the intermediates cross the EU-UK border. Furthermore, a significant share of exports of goods and services reaches destination countries only indirectly through other countries' exports. These exports are therefore subject to trade costs that are not immediately evident (Italian intermediate exports to Germany incorporated in German goods destined for the UK market would be subject to tariffs while crossing the Channel, but this might not be obvious to Italian exporters).

Measuring the interconnections between countries and sectors is not an easy task. In fact, traditional trade statistics cannot provide an adequate representation of supply and demand linkages. Cappariello et al. (2018) make use of the World Input-Output Database (WIOD) (Timmer et al., 2015) to map production and consumption linkages between the two economies. Combining these data with new analysis tools (Borin and Mancini, 2017), the authors provide a measure of the cost of trade that takes into account the whole EU-UK GVC structure. The analysis is a static impact assessment

that does not consider how trade between the two regions will evolve owing to the introduction of tariffs (and NTBs).

The working assumption is that, in the post-Brexit EU-UK relationship, the United Kingdom would adopt the EU's current MFN tariff schedule (a worst-case scenario). In other words, it is assumed that UK goods exports will be subject to the tariffs currently applied by the EU (and the United Kingdom) to partners with which there is no specific trade agreement. To this end, a tariff schedule both for the EU and the United Kingdom is constructed at the sector and end-use levels using the MFN tariff rates. The United Kingdom in fact announced in May 2020 that UK MFN tariffs will be lower than the current EU MFN tariffs. Should this be confirmed, the results would represent an upper bound for the actual economic effects.

The calculated tariff schedule for both the EU and the United Kingdom is fed through the constellation of GVCs described in the WIOD in order to assess the associated trade costs of Brexit, including the full extent of the magnification due to the deep sectoral/country interlinkages (Table 7). The analysis (based on the methodology proposed by Miroudot et al., 2013) estimates that the impact on producers is much higher for the United Kingdom, where total (domestic and foreign) manufacturing input costs would increase by around 0.9 percentage points on average, while in the EU the increase would be marginal (0.1 percentage points). This result is due to the specific links between the two regions: around one-fifth of the total manufacturing inputs used by the United Kingdom come from the EU, while only 1.5% of total EU inputs are imported from the United Kingdom. In the United Kingdom, the sectors mostly involved in the EU-UK GVCs, such as motor vehicles and chemicals, would experience the largest effect. Finally, in the EU, the impact on production costs would be high in Ireland, owing to its proximity and interconnectedness with the United Kingdom, and close to or lower than the average in the larger EU Member States.

Table 7

Total effect of tariffs on production costs

Percentage of total costs for inputs, domestic and imported	
UK	**0.86**
Motor vehicles	2.97
Chemicals	2.22
Rubber and plastic	1.53
EU-27	**0.08**
Ireland	0.96
Germany	0.08
France	0.07
Spain	0.04
Italy	0.04

Source: Cappariello et al. (2018).

Table 8 shows the average tariffs that would be imposed on EU imports from the United Kingdom in manufacturing as a whole and in some specific sectors. The total tariff cost is 4.3%, and the share of the indirect tariff component, i.e. the tariff costs

deriving from the existence of value chains, is 10% of the total; this is the effect of tariff accumulation due to back-and-forth trade across the Channel. Similarly, Table 9 presents the total tariff cost for UK imports from the EU.

Table 8

Tariff magnification effects on EU imports from the United Kingdom

Percentage of the value of imports

EU imports from UK	Direct tariff	Indirect tariff	Cumulative tariff
Average	**3.88**	**0.42**	**4.3**
Motor vehicles	8.24	0.94	9.18
Chemicals	4.05	0.82	4.86
Rubber and plastic	5.3	0.61	5.91

Source: Cappariello et al. (2018).
Note: CT stands for cumulated tariff.

Table 9

Tariff magnification effects on UK imports from the EU

Percentage of the value of imports

UK imports from EU	Direct tariff	Indirect tariff	Cumulative tariff
Average	**5.93**	**0.07**	**6**
Food products	17.65	0.18	17.83
Crop and animal	5.51	0.13	5.64
Chemicals	4.38	0.08	4.46

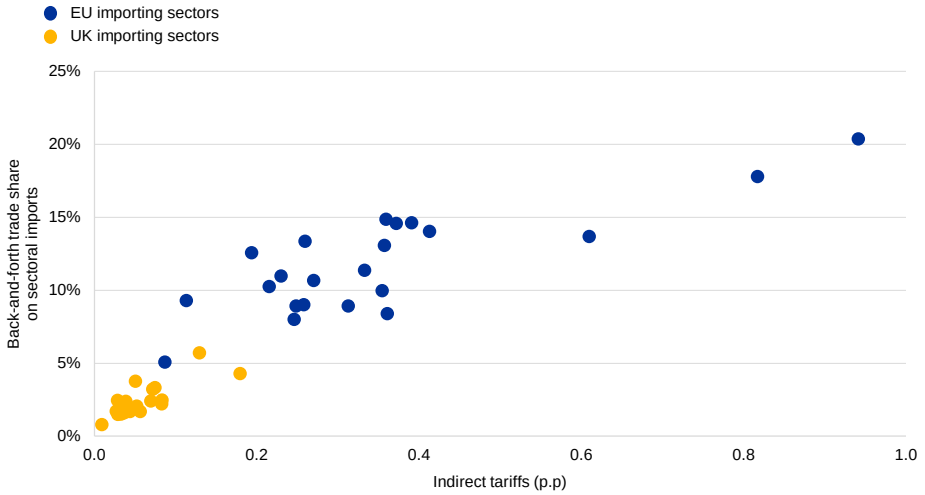
Source: Cappariello et al. (2018).
Note: CT stands for cumulated tariff.

The indirect tariffs due to GVCs are significant for European importers but not for those of the United Kingdom. European producers perform processing stages in the United Kingdom to a larger extent than UK producers do so in Europe. Therefore, the magnification of the tariff burden due to products crossing the Channel at different production stages weighs more on EU producers: for UK exports to the EU, the share of value added produced in the EU is around 9%, while for EU exports to the United Kingdom, the UK value added share is just 2%. As shown in Chart 8, the amount of indirect trade costs is positively correlated with the share of the back-and-forth trade between the two economies. In the longer run, this could lead EU exporters to divert their trade in intermediate goods currently processed in the United Kingdom to other EU countries.

Conversely, the sum of direct tariffs would be larger for UK importers owing to the composition of UK imports, which is skewed towards high-tariff sectors, in particular food products and motor vehicles. This latter effect prevails, and as a result, total tariffs, direct and indirect, would be around 2 percentage points higher on average for UK importers than for EU importers.

Chart 8

Back-and-forth trade and indirect trade costs

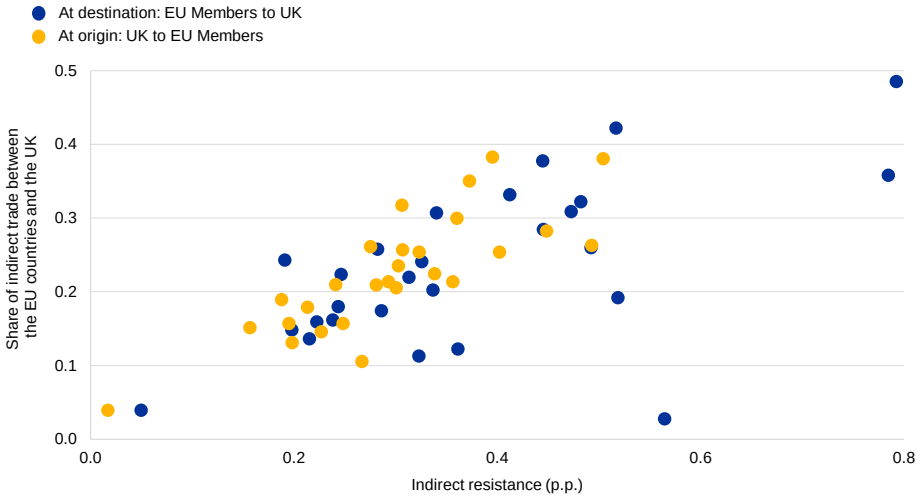


Notes: Authors' calculations on WIOD data. The chart plots, for each sector in both the EU and the United Kingdom, the indirect tariff and the share in bilateral imports of the value added originated in the other economy (a measure of back-and-forth trade).
Source: Cappariello et al. (2018).

Turning to the export side, using the methodology developed in Muradov (2017), it is possible to show that, given the density of intra-EU linkages and the sizeable share of indirect trade between the two regions (approximately one-fifth in either direction), exporters in both the United Kingdom and the EU Member States would face much higher costs once indirect trade is taken into account. In other words, the trajectory of exports towards their destination matters, and indirect routes entail tariffs that cannot easily be assessed by the original exporters (as intra-EU trade is free of tariffs) but which account for around 25% of the tariff costs for EU exporters and 22% of those for UK exporters. Not surprisingly, the shares of indirect tariffs and indirect trade between the EU Member States and the United Kingdom are highly correlated (Chart 9).

Chart 9

Indirect trade and indirect tariffs by EU Member State



Notes: Authors' calculations on WIOD data. The chart plots, for each EU Member State and the United Kingdom, the resistance at origin for UK exports to the EU Member States (in red), the resistance at destination for EU Member States' exports to the United Kingdom (in black) and the corresponding share in indirect exports.
Source: Cappariello et al. (2018).

2.3 Model-based assessments of trade and migration channels

This section reviews four papers that assess the trade channel by implementing Brexit scenario simulations with different types of models and equations. The trade scenarios are characterised by different levels of tariff and non-tariff barriers, as described in the previous section. Two of the papers also investigate the migration channel using models and equations.

2.3.1 A model-based assessment of post-Brexit trade regimes

Pisani and Vergara Caffarelli (2018) evaluate the macroeconomic impact on the UK and euro area economies of alternative trade tariff regimes following Brexit. They do so by simulating a New Keynesian DSGE model of the world economy featuring the United Kingdom, the euro area (EA) and a third economy encompassing the rest of the world (RoW)[18]. The model presents a comprehensive description of international trade. Each intermediate tradable good and service is used for the production of final non-tradable consumption and investment goods and enters, together with local capital and labour, into the production of every intermediate good and service. This feature is a key novel aspect for an open-economy New Keynesian model. In addition, there are also non-tradable intermediate services that mainly capture the role of

[18] RoW also includes non-EA EU Member States, and in all simulations the same tariff regime vis-a-vis UK would (obviously) apply to both EA and non-EA EU members. This choice is motivated by the common monetary policy and nominal exchange rate of the EA Member States vis-a-vis all the other economies.

retailing services. Other features of the model are in line with the existing literature.[19] The paper focuses on the trade channel and does not explicitly consider the possible role of international direct and portfolio investment, relocation of banking and financial sectors, immigration, uncertainty or the impact of risk premia on UK foreign borrowing and the nominal exchange rate.

Four scenarios are analysed. The first of these, the "most-favoured-nation" (MFN) scenario, corresponds to an outcome of no trade agreement between the EU and the United Kingdom: bilateral UK-euro area trade will be subject to the respective (EU or UK) MFN tariffs, as prescribed by WTO rules. Obviously, the euro area, as a part of the EU, shares EU tariffs. Upon Brexit, the United Kingdom also ceases its participation in all EU trade agreements with third countries. Consequently, bilateral UK-RoW trade will also be on an MFN basis. Bilateral UK-RoW tariffs therefore increase both in the United Kingdom and in the RoW in this scenario. As far as EU-RoW trade is concerned, all existing trade agreements are retained, and tariffs are unchanged.

Two "mitigating" scenarios and a more severe one are then considered. In the second scenario, it is assumed that a bilateral FTA between the EU and the United Kingdom is concluded and bilateral tariffs increase by significantly less. The trade agreement covers both goods and services, but trade in goods is liberalised far more than trade in services. Bilateral euro area-RoW tariffs are assumed to be unchanged.

In the third scenario, "UK open for trade" (OUK), the United Kingdom does not apply tariffs to euro area or RoW goods and services, i.e. the United Kingdom unilaterally sets its MFN rates to zero. By contrast, the euro area and the RoW raise tariffs on UK goods and services as in the MFN scenario. Again, bilateral euro area-RoW tariffs are unchanged. While admittedly politically controversial (IMF, 2016a), this scenario is a useful point of reference, since it allows an analysis of the United Kingdom's ability to substitute non-EU markets for the EU market.

The fourth scenario assumes that in the case of MFN – the most protectionist tariff regime – the imposition of tariffs also has an adverse effect on the efficiency frontier of the UK economy.[20] Higher tariffs would decrease the international openness of the UK economy. Lower UK imports (and, most likely, lower FDI) would reduce the United Kingdom's access to international technology. There would be negative consequences for UK total factor productivity (TFP).[21] The channel through which reduced openness affects TFP is not modelled (in the model, the latter is exogenous); the authors implicitly capture this effect by positing, in line with a scenario reported by OECD (2016), that TFP in the UK tradable sectors gradually decreases over a five-year period to a new lower level equal to 96% of the initial (pre-tariff) value, i.e. the TFP shock in the United Kingdom is equal to -4%: a permanent negative shock to UK TFP is added on top of the MFN tariffs.

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[19] See for instance Corsetti et al. (2008), Faruqee et al. (2008), Johnson (2014), IMF (2016b, Chapter 1), ECB (2009), D'Auria et al. (2009) and Annicchiarico et al. (2011).

[20] Given the lower level of import barriers in the FTA and the OUK scenarios, the United Kingdom would – to a large extent at least – maintain its openness, and hence there would be no (or limited) negative effects on its efficiency frontier.

[21] For the link between international openness, access to international technology and country- specific TFP, see OECD (2016) and Finicelli et al. (2013).

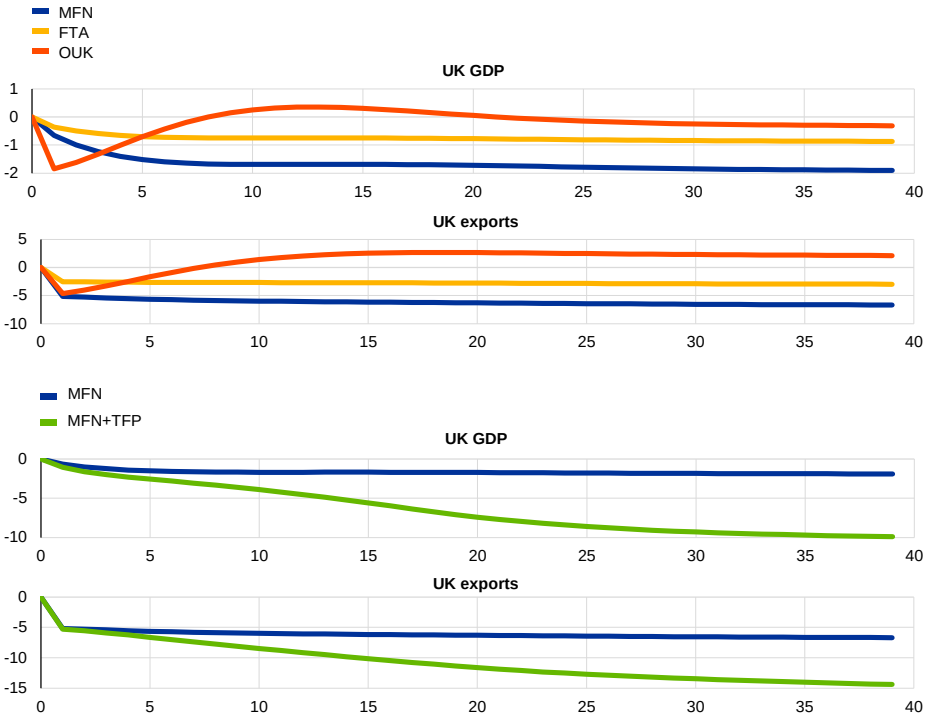
In all scenarios, tariffs and NTBs are calibrated in line with OECD (2016). In addition, it is assumed that tariff revenues are rebated on a lump-sum basis to domestic households, so as to focus only on their distortionary effects.

The simulations lead to the following results. First, the imposition of tariffs reduces UK exports and economic activity by a non-trivial amount: in the MFN scenario, real exports and real GDP decrease (in the long run) by about 7% and 2% (of the corresponding initial levels) respectively, and in the FTA scenario by roughly 3% and 1% respectively (Chart 10 and Table 10). Second, the macroeconomic costs would be reduced to some extent – but not eliminated – if the United Kingdom did not increase tariffs on imports from the euro area and reduced those on imports from the RoW (OUK scenario), even though the euro area and RoW increased tariffs on imports from the United Kingdom: in the short run, exports and GDP would decrease by about 4% and 2% respectively, and in the long run exports would increase by almost 2%, while GDP would decrease by 0.4%, because production of UK goods and services would benefit from the reduction in tariffs on intermediate imports from the RoW. Third, macroeconomic costs are particularly sizeable if the lower UK trade openness associated with MFN tariffs leads to a fall in UK TFP: in the long run, export and GDP would fall by 16% and 11% respectively. Fourth, Brexit spillovers to the euro area economy are negative but small (Chart 11 and Table 11). These results are in line with those reported in other studies, in particular OECD (2016).

Chart 10

UK macroeconomic variables and tariff regimes

Percentage deviation from the before-shock corresponding values, quarters



Source: Pisani and Vergara Caffarelli (2018).

Table 10

Tariff regimes, long-term macroeconomic effects on the United Kingdom

Percentage deviation from steady state

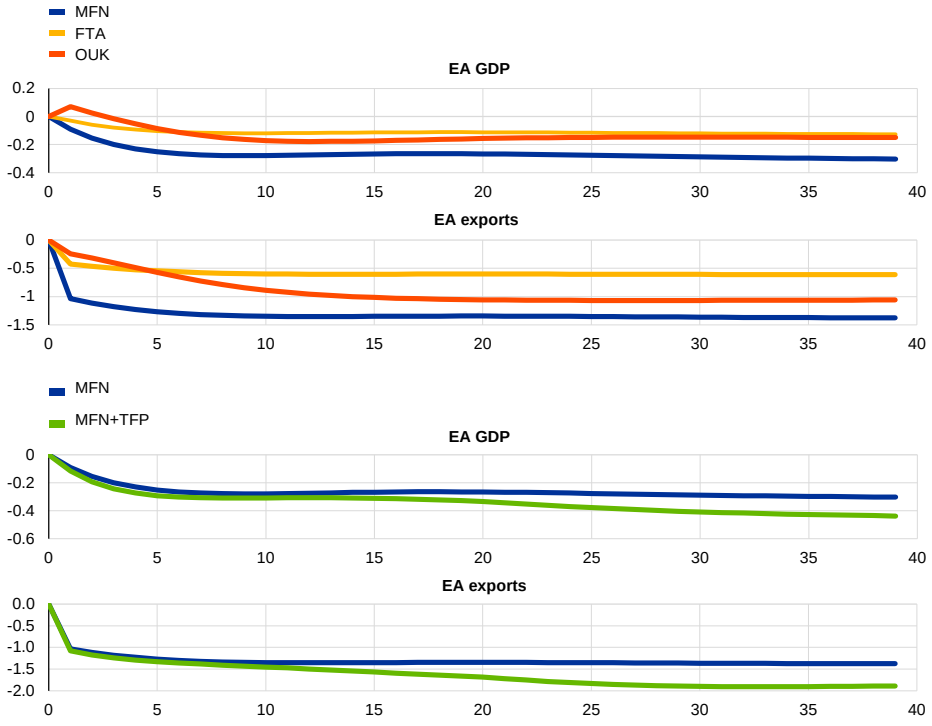
	MFN	FTA	OUK	MFN + TFP
GDP	-1.96	-0.90	-0.40	-10.59
Consumption	-1.32	-0.67	-2.31	-7.49
Investment	-2.82	-1.33	-1.61	-11.61
Exports	-6.81	-3.04	1.88	-15.93
Imports	-5.58	-2.70	-4.00	-7.40
Exports of goods to EA	-5.63	-0.93	2.84	-15.37
Exports of services to EA	-20.98	-11.22	-13.23	-28.29
Exports of goods to RoW	-3.42	-1.63	5.21	-13.35
Exports of services to RoW	-3.15	-1.26	6.26	-12.08
Labour	-0.71	-0.31	0.60	-0.56
Real wage	-2.02	-0.98	-1.72	-8.01
Real exch. rate vs EA	-1.37	-0.38	6.18	-5.04
Real exch. rate vs RoW	-1.62	-0.50	5.96	-5.36

Source: Pisani and Vergara Caffarelli (2018).
Note: Exchange rate: + = depreciation.

Chart 11

Euro area macroeconomic variables and tariff regimes

Percentage deviation from the before-shock corresponding values, quarters



Source: Pisani and Vergara Caffarelli (2018).

Table 11

Tariff regimes, long-term macroeconomic effects on the Euro area

Percentage deviation from steady state

	MFN	FTA	OUK	MFN + TFP
GDP	-0.33	-0.14	-0.15	-0.54
Consumption	-0.28	-0.11	0.02	-0.61
Investment	-0.46	-0.20	-0.15	-0.79
Exports	-1.40	-0.62	-1.05	-1.85
Imports	-1.30	-0.56	-0.38	-2.32
Labour	-0.10	-0.05	-0.10	-0.09
Real wage	-0.38	-0.16	-0.08	-0.70

Source: Pisani and Vergara Caffarelli (2018).
Note: Exchange rate: + = depreciation.

2.3.2 Using gravity equations to analyse the impact of Brexit

The process of European economic integration has been extremely complex and comprehensive in scope, as testified by the depth of the *acquis communautaire*, i.e. the legal order of the EU, and in particular by the establishment of the Single Market. Brexit is set to reverse this course at least partially. The extensive nature of EU-UK relations multiplies the number of potential transmission channels of the shock, which is likely to have profound effects on different aspects of the economy, both in Europe and beyond. Four main channels through which economic disintegration can impact the economy may be singled out: trade (in goods and services), migration, FDI and productivity. Campos and Timini (2019) estimate the effects of Brexit on two of these dimensions: trade and migration.

They carry out their analysis using a structural gravity model in the same fashion as Head and Mayer (2014)[22], with a three-step methodology. The first step is to calculate an augmented gravity model (in line with Anderson and van Wincoop, 2003). In the second step, they solve the system of equations that describe the conditional general equilibrium for trade and migration. This is to take into account the consequences of a change in bilateral trade or migration costs not only on the countries directly affected by the change, but also on third countries. Finally, following Pisani and Vergara Caffarelli (2018), they consider alternative post-Brexit scenarios, assuming different degrees of disintegration.[23] In the first, in the absence of any substantial agreement, bilateral trade flows between the United Kingdom and the EU revert to being subject to WTO rules, and migrants from both parties lose any special treatment (the WTO scenario). In a second scenario, the United Kingdom and the EU sign a bilateral trade agreement, encompassing both trade and migration flows (the FTA scenario).[24] The authors also consider a scenario in which the United Kingdom becomes a member of the EEA, maintaining full access to the Single Market and its “four freedoms” (free

[22] See also UNCTAD-WTO (2016), and Sirries (2017).

[23] See Section 2.3.1.

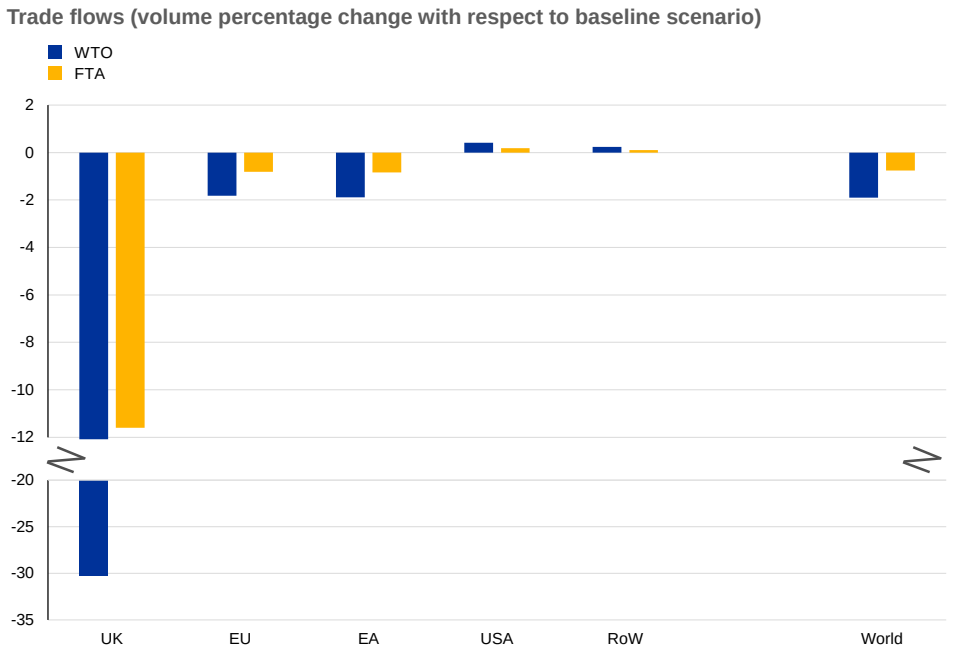
[24] See, among others, Glick (2017) and Orefice (2015).

movement of goods, services, capital and persons). In a gravity framework for trade and migration, this last scenario essentially boils down to maintaining the status quo and is used as the baseline for the scenario analysis.

The quantitative analysis shows robust negative effects both on trade and migration flows for the United Kingdom due to Brexit (Charts 12 and 13). In the WTO scenario, trade flows between the United Kingdom and the EU are predicted to drop by 30% and immigration by close to 25%. If the United Kingdom and the EU sign an FTA-like agreement (which does not include free labour mobility), the negative effects on trade are diminished in this scenario, but no significant difference in terms of migration with respect to the WTO scenario is found.[25] Regarding the EU, the negative effects on aggregate trade flows are much more limited in size. Nevertheless, it cannot be ruled out that specific products may be particularly hard-hit owing to higher tariffs or divergence in non-tariff measures. The effects on migration are expected to be positive, i.e. ceteris paribus, the EU is expected to have a positive migratory balance vis-à-vis the United Kingdom.

Chart 12

Gravity estimates of the effect on trade flows

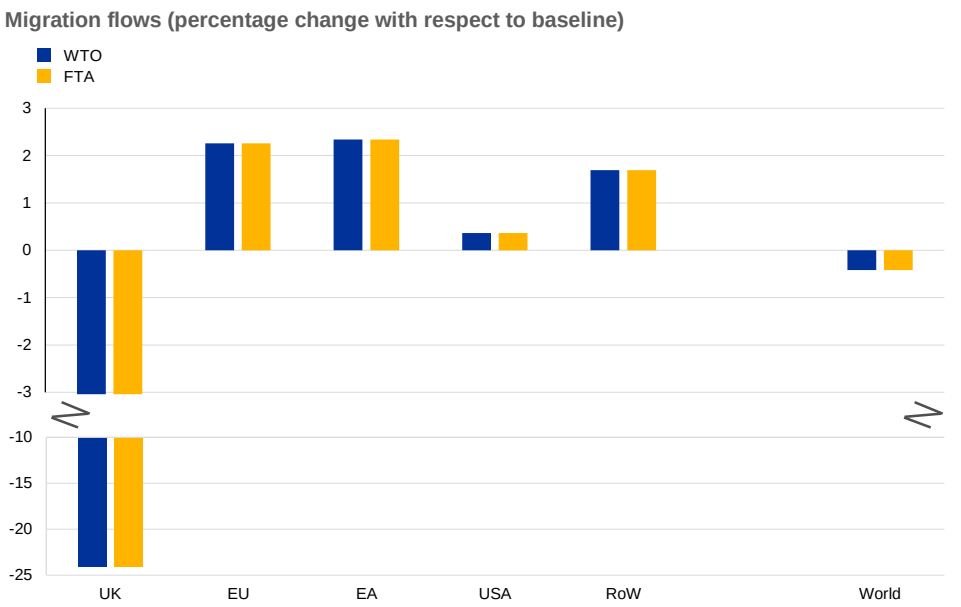


Source: Campos and Timini (2019).

[25] The absence of any significant mitigating impact from an FTA on migration contrasts with prior results (e.g. Orefice, 2015) that do not consider the universe of FTAs but only preferential trade agreements (i.e. non-reciprocal preferential schemes).

Chart 13

Gravity estimates of the effect on migration flows



Source: Campos and Timini (2019).

2.3.3 Assessing the macroeconomic impact of Brexit through trade and migration channels

Berthou et al. (2019) investigate the potential medium-term implications of a hard Brexit[26] across three specifications of the trade channel. The first two specifications model an increase in trade costs through tariff and non-tariff barriers respectively, while a third specification models a reduction in trade volumes based on evidence drawn from a structural gravity model. A fourth specification explores potential barriers to migration, also using the results from a gravity model.

NiGEM is used to quantify the potential macroeconomic impact of a no-deal Brexit scenario after a two-year transition period[27] under these specifications[28]. The analysis benefits from the complexity and versatility of NiGEM, using different approaches to identify and introduce the trade shock in the form of a demand and/or supply shock. Across specifications, results are obtained both in a set-up in which conventional monetary policy responses are allowed and in an alternative set-up in which short-term interest rates remain fixed.[29] Simulation results for the different

[26] Here ''hard Brexit'' means a situation where the UK-EU relationship reverts to WTO rules; the baseline is a soft Brexit with a transition period.

[27] Alternative Brexit outcomes are also considered in the paper, although they are not reported here.

[28] The authors use the term scenario to refer to these specifications; in this Occasional Paper, the term scenario is used only for the different outcomes of the Brexit process.

[29] The fixed-rate monetary policy rule is included in the analysis to obtain additional insights into the adjustment mechanism after the Brexit shock and its interaction with the monetary policy transmission mechanism; it has no implications in terms of the actual or proposed monetary policy response.

specifications under the alternative policy settings are summarised in Tables 12 and 13.

Table 12

Simulated effects of Brexit with policy reaction

Percentage deviation from baseline after five years for GDP, consumption and employment; percentage point deviation from baseline after five years for inflation, interest rate and trade balance

Endogenous monetary policy	Import price and export shares		Non-tariff trade barriers		Export volumes		Migration	
	UK	Euro area	UK	Euro area	UK	Euro area	UK	Euro area
GDP	-1.2	-0.2	-0.9	-0.2	-3.3	-0.1	-0.4	0.3
Consumption	-0.7	-0.4	-1.8	-0.7	0.5	0.1	-0.4	0.3
Employment	-0.9	0	-0.7	-0.1	-2	0	-0.7	1.1
Inflation	-0.7	-0.1	-0.4	0	-1.1	-0.1	0.4	-0.2
Interest rate	-1.1	-0.2	-0.5	0	-2.5	-0.1	0.4	-0.2
Trade Balance	-1.5	-0.4	1.5	0.2	-3.8	0	0.4	-0.2

Source: Berthou et al. (2019).

Table 13

Simulated effects of Brexit with no policy reaction

Percentage deviation from baseline after five years for GDP, consumption and employment; percentage point deviation from baseline after five years for inflation, interest rate and trade balance

Exogenous monetary policy	Import price and export shares		Non-tariff trade barriers		Export volumes		Migration	
	UK	Euro area	UK	Euro area	UK	Euro area	UK	Euro area
GDP	-1.7	-0.4	-0.4	-0.1	-5.9	-0.2	-0.2	0.1
Consumption	-1.5	-0.6	-1.1	-0.4	-2.2	0	-0.1	0.2
Employment	-1.1	-0.1	-0.3	0	-3.5	0	-0.6	1.1
Inflation	-0.7	-0.1	0	0.1	-1.4	-0.1	0.4	-0.2
Interest rate	0	0	0	0	0	0	0	0
Trade Balance	-1.2	-0.3	1.4	0.1	-3.3	-0.1	0.2	-0.1

Source: Berthou et al. (2019).

The first specification explores the economic consequences of higher tariffs on goods after Brexit through their simultaneous impact on import prices and export market size for both the United Kingdom and the euro area. The shocks are highly asymmetric, as the euro area accounts for around half of UK trade, whereas the United Kingdom represents a small share of each individual euro area country's total trade. Assuming no monetary policy accommodation, the simulations suggest that higher import duties have an immediate inflationary impact in the United Kingdom and lead to a lower level of economic activity. Over a five-year horizon, results point to inflation below the baseline and a lower level of economic activity (-1.7%). In addition, weaker growth in the capital stock hits potential GDP. The UK trade balance deteriorates, but the

Government balance remains unchanged compared with the baseline owing to the budget solvency rule. Results change if both monetary and fiscal policies are allowed to smooth the United Kingdom's exit: the former by cutting the policy rate, the latter by distributing the fiscal receipts stemming from higher import duties to households through lower taxes. The negative shock to UK GDP growth is lower by 0.5 percentage points at the five-year horizon. According to the simulations, the euro area would be significantly less affected by the United Kingdom's exit from the EU, with GDP 0.4% lower than the baseline five years after Brexit. The reduction in trade lowers employment, employees' earnings and, as a result, consumer spending; private sector investment in the euro area is proportionally less affected.

The potential emergence of NTBs – which may arise for instance owing to differences in regulatory regimes after Brexit – is investigated in a second specification. Sectoral estimates are used to gauge potential increases in (bilateral) trade costs for the EU and the United Kingdom resulting from Brexit. Broadly in line with studies of comparable scope, the evidence reported suggests that UK exporters may face higher NTBs than their EU counterparts if the United Kingdom leaves the Single Market. The potential macroeconomic implications of higher bilateral trade costs arising from NTBs are then analysed using NiGEM. The quantified shocks are expressed in tariff-equivalent terms and modelled as a pure cost shock. The model simulations suggest that there may be medium-term GDP losses, particularly for the United Kingdom but also for the euro area. A key insight obtained from this analysis is the change in simulated effects depending on the assumed response of monetary policy. In particular, the drag on GDP turns out to be more pronounced under a rules-based monetary policy response: for the United Kingdom, the GDP loss amounts to 0.4% at the five-year horizon under a passive monetary policy and 0.9% under a mechanical endogenous monetary policy reaction. The difference arises because, on impact, the increase in trade costs translates into an inflationary push, which causes monetary policy in both areas to tighten. The rise in interest rates depresses aggregate demand, with corresponding negative effects on other countries' exports. In this case, Brexit-related increases in trade costs act as a negative supply shock, and the scope for monetary policy to dampen their effects is limited.

The third specification of the trade channel is focused directly on trade volumes and the fact that Brexit leads to a reversal of the positive European trade integration effects on international trade flows. The results of the structural gravity models employed by Campos and Timini (2019) – reported in Section 2.3.2 – are used to calibrate the impact on trade volumes between the United Kingdom and the EU. Their estimates imply that in a no-deal Brexit scenario, the medium to long-run total trade volume of the United Kingdom would be reduced by around 30% compared with a non-Brexit baseline scenario. Feeding this estimate into the model simulations, the authors find that the impact of Brexit on UK GDP through this channel would amount to a deviation of -3.2% from the baseline five years after leaving the EU if the central bank were allowed to counteract the demand shock of reduced exports on the economy, and a deviation of -6% if the central bank did not react to this shock. For the euro area, GDP would fall by 0.1% and 0.2% respectively under endogenous or exogenous monetary policy responses. Robustness checks around that estimate indicate that the United Kingdom's GDP loss would be between 0.8% in the best case and 12% in the worst

case, while for the euro area GDP would remain unchanged in the best case and decrease by 0.25% in the worst-case scenario over the medium-term.

Finally, a fourth specification focuses on the effects of Brexit through migration flows, again using the results that Campos and Timini (2019) obtain from a structural migration gravity model that measures the effects of free labour mobility within the EU on bilateral migration flows. The simulations show that changes in migration flows following Brexit could lead to UK GDP deviating by -0.4% from its baseline at the five-year horizon if the central bank is allowed to counteract the negative supply shock to the labour force and by -0.2% if the central bank does not react to this shock. For the euro area, GDP would rise by 0.3% under endogenous monetary policy and 0.1% under exogenous monetary policy, as a higher migrant inflow implies a larger labour force (a positive supply shock).

In summary, depending on the way the trade channel is modelled, UK GDP would decline by between 2% and 6% over the medium term if the United Kingdom reverted to WTO rules. This would be the "cost of non-Europe" for the United Kingdom.[30] The shock is largely asymmetric, and the euro area is left relatively unscathed by the United Kingdom's exit, as its GDP is less than 1% lower than baseline over the medium term. The study also shows that results depend on the envisaged policy response: monetary and fiscal policies may act to cushion a Brexit-related demand shock, but the effectiveness of the policy response depends on the underlying source of the shock.

2.3.4 Estimates of the steady-state effects of Brexit

Cappariello et al. (2020) investigate the long-term effects of Brexit on trade, welfare and prices under two alternative scenarios: (i) an FTA between the United Kingdom and the EU that assumes no variation in tariffs between the United Kingdom and the rest of the EU but entails increases in non-tariff trade barriers and (ii) a UK exit from the EU with traded goods subject to the EU's MFN import duties under WTO terms and NTBs. A variation on the WTO MFN scenario is considered, namely the "new MFN" scenario, which follows the publication by the UK Government in March 2019 of a temporary schedule of duties which would apply to UK imports both from the EU and from outside the EU.[31] This scenario, which assumes a drastic and unilateral reduction by the United Kingdom of the MFN rates it applies to its imports, would in fact increase the international openness of the UK economy. A multi-country, multi-sector general equilibrium model featuring GVCs is used to derive country and sector-level results and to compare the outcomes under different modelling choices. The current steady state of the commercial relationship between the United Kingdom and the remaining EU countries is compared with the two alternative scenarios in which tariff and non-tariff barriers are higher.

[30] This is a reference to the seminal work by Cecchini et al. (1988).

[31] In May 2020, the United Kingdom published a new schedule of tariffs that will apply after the end of the transition period.

The model adopted belongs to a class of models widely used in trade studies to understand distortions introduced by tariffs to comparative trade advantages, and in turn to welfare. The granular approach makes it possible to take into account the sizeable cross-country and cross-sectoral heterogeneity as regards the impact of Brexit in terms of trade shares, potential tariffs on final and intermediate products, and NTBs (see also Cappariello, 2017 and Section 2.2.1). In addition, the paper highlights the importance of supply chain-related flows, which constitute about half of total trade between the United Kingdom and the rest of the EU.

The estimates of the effects of Brexit under the FTA scenario and the two WTO MFN scenarios show sizeable decreases in nominal bilateral trade between the United Kingdom and the EU, and in UK total trade volumes in particular. Table 14 reports the aggregate welfare and price effects. Welfare effects would be limited for the EU (-0.4% in the FTA scenario and -0.6% in both WTO MFN scenarios in terms of real household income) but they would be significant for the United Kingdom (between -2.1% and -3.1%). Small and open countries with trade linkages with the United Kingdom, along with service sectors, would be the most affected in the EU. The price level would decrease only slightly under the WTO MFN scenario in the EU, whereas it would increase under both scenarios in the United Kingdom. This is explained by the prominent role of final and, especially, intermediate products originated in Europe in the United Kingdom's consumption basket and production. The most affected sectors in the EU would be financial-related sectors, manufacturing of vehicles and parts, other professional activities, and textiles, with losses in value added ranging from 2.5% to 3% in the WTO MFN scenario. In general, sectoral and country results depend in part but not fully on exposure (both direct and via other trading partners) to bilateral trade. Different sector-specific trade elasticities, along with tariff and NTBs, also play a substantial role in the outcomes. Specifically, countries' exposure to particularly elastic sectors (e.g. service sectors) would emphasise negative welfare effects.

Table 14

Estimated macroeconomic effects of Brexit

Percentage changes

	EU-27			UK		
	FTA	MFN	New MFN	FTA	MFN	New MFN
Welfare	-0.38%	-0.56%	0.55%	-2.12%	-3.14%	-2.76%
Nominal GDP	-0.36%	-0.62%	-0.57%	-1.81%	-2.43%	-2.66%
CPI	0.02%	-0.06%	-0.02%	0.32%	0.73%	0.11%

Source: Cappariello et al. (2020).
Note: Welfare is defined as real household income, while nominal GDP is defined as the difference between total nominal output and consumption of intermediate products.

The paper offers further insights into the role of GVCs in estimating the impact of Brexit. As GVCs amplify trade cost shocks, disregarding their role leads to substantial underestimation of the effects of Brexit on welfare in all countries.

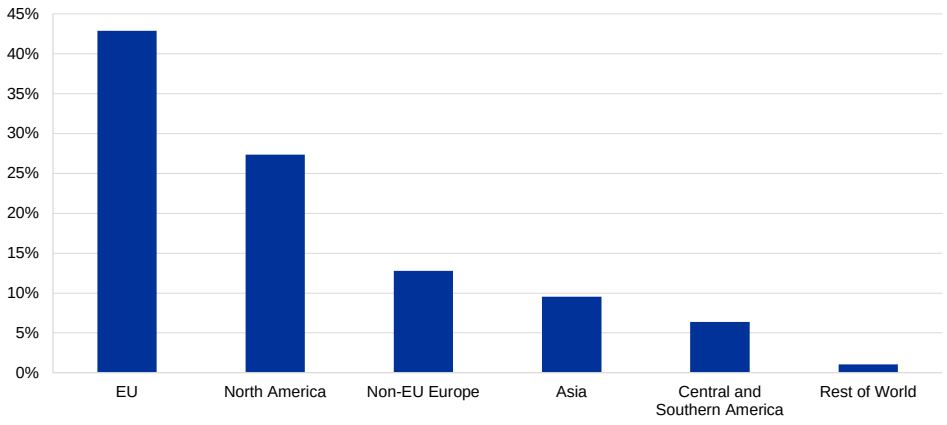
2.4 A tentative exploration of the effects of Brexit on foreign direct investment vis-à-vis the United Kingdom

EU integration has boosted inward EU FDI into the United Kingdom. The United Kingdom has a relatively significant stock of inward FDI, which reached 61% of its GDP in 2017 and has risen strongly since 2005. The United Kingdom's exit from the EU and the Single Market would result in reduced FDI flows between the two investment destinations. De Almeida et al. (2019) look at the available data to assess whether the Brexit referendum outcome in June 2016 and its aftermath have had an impact on UK-related FDI activity. Although FDI flows are notably volatile and biased by periodic non-systematic outliers, and there are some caveats on data sources and availability of time series data, the authors find preliminary evidence of a post-referendum slowdown in gross FDI flows between the EU and the United Kingdom.

The importance of EU Member States as sources of FDI into the United Kingdom is shown by Chart 14, which depicts the geographical origin of inward FDI stock in the United Kingdom in 2017, with some 43% coming from the other EU countries. The main aim of the paper is to check whether FDI flows of EU and non-EU countries vis-à-vis the United Kingdom were affected by the Brexit vote at the end of the second quarter of 2016. At that point in time, the United Kingdom could in theory have become a less attractive FDI destination for two reasons. First, with Brexit, the probability of the United Kingdom losing the EU's single passport for services, and thus Single Market access, increased. Second, the likely emergence of trade barriers meant that value chain participation would become less straightforward, causing companies to redirect FDI to other markets.

Chart 14

Origins of inward FDI stock in the United Kingdom (2017)



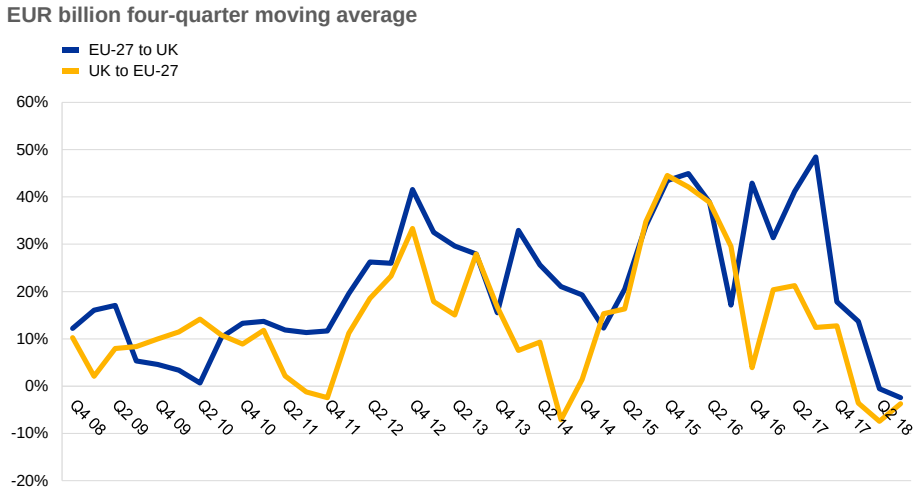
Source: de Almeida et al. (2019).

The Brexit referendum was held at the end of June, so it is possible to compare the period up until the second quarter of 2016, the "pre-Brexit era", with the period starting in the third quarter of 2016, the "Brexit era". Chart 15 shows a slowdown in FDI flows from the EU-27 into the United Kingdom, notably from the big EU economies and

Ireland. Quarterly data display substantial fluctuations which may mask the underlying trends, so the four-quarter moving average of quarterly FDI flows is shown. While the inflows in the years before the Brexit referendum averaged well over €20 billion per quarter, the four most recent quarters analysed (fourth quarter of 2017 to third quarter of 2018) show average outflows in excess of €2 billion per quarter. In addition, after the referendum there was also a fall in greenfield investment into the UK – an important form of FDI. This concerned projects and capital expenditures announced by other EU countries and by one of United Kingdom's most important non-EU partners, the United States.

Chart 15

FDI flows between the EU-27 and the United Kingdom (2008-2018Q3)



Source: de Almeida et al. (2019).

To further analyse the impact of Brexit on FDI activity, an approach based on gravity models is used to estimate the effects of the European integration process at two important moments: the United Kingdom becoming a member of the EU and the launch of the euro area. This allows the impact of Brexit to be considered as the reversal of UK integration into the EU. Using a fixed-effect gravity model to estimate the effects of these integration steps on bilateral FDI activity with the United Kingdom, the empirical results suggest that, back then, the United Kingdom played two roles: one as a gateway for international investor countries outside the euro area to access European markets and another as a hub to reallocate these inflows and those coming from euro area countries across the euro area itself. Thus, the disconnection of the United Kingdom from the EU may have further implications for FDI than just reversing the effect of EU membership. Larger trade barriers and lower integration between the UK market and those of euro area countries is likely to have a negative impact on FDI activity in the United Kingdom and may, in the short run, also have a negative effect on the euro area.

2.5 Country evidence

The final section of this chapter collects studies on two specific countries, Ireland and Spain, and addresses implications and vulnerabilities connected to Brexit in the two economies.

2.5.1 The macroeconomic implications of Brexit for Ireland

Given the reliance of the Irish economy on exports, assumptions on external demand are a key input into any forecast for the economy. These external demand assumptions are in turn critically dependent on the forecasts for growth in Ireland's three key trading partners: the United States, the United Kingdom and the euro area. In the case of the United Kingdom, Brexit may reduce growth and hence UK demand for Irish exports. It may also have an impact on euro area (and US) output. Conefrey and co-authors (2018a, 2018b, and 2019) look at the possible impact of different Brexit scenarios on the Irish economy.

As the United Kingdom is Ireland's single largest trading partner, Brexit has the potential to make a significant impact on the Irish economy. Just under 13% of Irish goods exports and 16% of its services are sold into the UK market. Around one-quarter of Irish goods imports come from the United Kingdom. For specific sectors, such as the employment-intensive agriculture and food sector, the dependence on the UK market is even larger than suggested by these aggregate figures (Donnellan and Hanrahan, 2016). Around 40% of Irish agri-food exports are destined for the UK market (Department of Agriculture, 2018). Lawless and Morgenroth (2016) show that, because some of the highest WTO tariffs apply to agricultural products, a hard Brexit could have severe negative consequences for this sector of the Irish economy.

The scenario analysis is carried out in two steps. The first step is to estimate the impact of different Brexit scenarios on the United Kingdom and the broader external environment, using NiGEM.[32] In the second stage, the simulation results from NiGEM are used as an input into COSMO[33], a macroeconomic model of the Irish economy. Using this approach, the impact of changes in the external environment (UK GDP, interest rates, exchange rates, etc.) on the Irish economy can be captured in a way that is internally consistent.

Three scenarios are examined to analyse the macroeconomic implications of Brexit for the Irish economy: (i) an FTA-like agreement along the lines of the UK Government's Brexit White Paper (the "Chequers plan"), (ii) an orderly WTO scenario and (iii) a disorderly WTO scenario (disorderly no-deal Brexit).[34] Chart 16 presents the

[32] See Ebell and Warren (2016) and Box A, "UK government Brexit White Paper", in Kara et al. (2018).

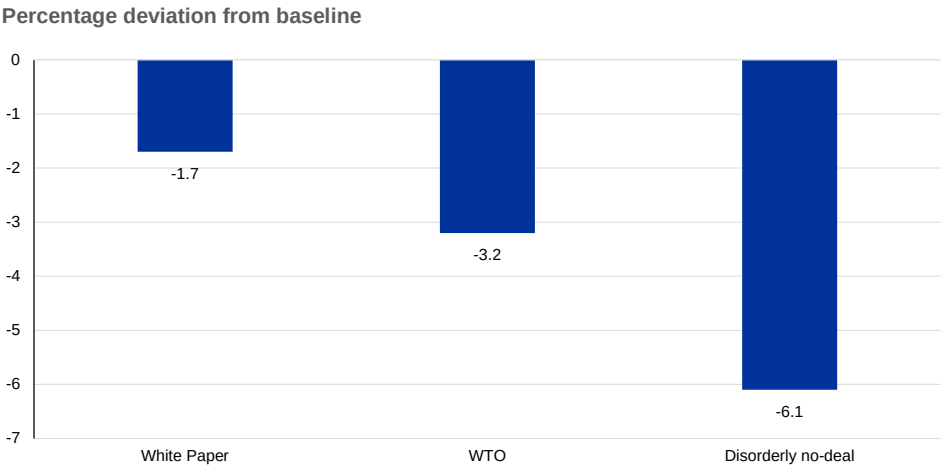
[33] COSMO ("COre Structural MOdel of the Irish economy") was developed by the Central Bank of Ireland and the Economic & Social Research Institute (ESRI) as part of a joint modelling project that ran from 2013 to 2015. The Central Bank's version of the COSMO model – used for this analysis – may contain some differences compared with the ESRI version.

[34] The WTO scenario analysis is published in Conefrey et al. (2018b), the White Paper analysis in Conefrey and Walsh (2018a), and the "disorderly no-deal" estimate in Conefrey et al. (2019).

long-run estimated effects on overall Irish output in the three scenarios. The results show that a disorderly no-deal Brexit would result in the largest decline in Irish output in the long run, at 6.1%, compared with falls of 3.1% and 1.7% in the case of an orderly WTO and an FTA-like agreement respectively.

Chart 16

Estimated long-run effects of Brexit on output in Ireland



Notes: The White Paper estimate is based on the analysis in Conefrey and Walsh (2018a). The WTO estimate is from Conefrey, O'Reilly and Walsh (2018b). The "disorderly no-deal" estimate is from Conefrey, O'Reilly and Walsh (2019).
Source: Authors' calculations.

In all three scenarios, a key channel through which Brexit reduces long-run output is via lower demand for Irish exports. There are a number of effects assumed to reduce output in a disorderly Brexit that are not included in the other scenarios. In particular, the disorderly scenario assumes that disruption at ports and airports results in an additional short-run reduction in exports on top of the decline due to lower demand from the United Kingdom. In addition, the simulation includes negative shocks to consumer spending and investment due to heightened uncertainty in the case of a disorderly Brexit. The inclusion of these additional shocks means that the loss of output in a disorderly Brexit is both more front-loaded and more severe than in the case of either an orderly WTO or an FTA-like scenario. A disorderly no-deal Brexit was avoided with the ratification of the Withdrawal Agreement between the EU and the United Kingdom in January 2020. Still some of the effects may arise in the case no FTA is stipulated in time, before the end of the Transition Period on 31 December 2020.

2.5.2 Brexit and the Irish border issue

The border between Ireland and Northern Ireland became a central issue in the Brexit negotiations in 2018 and was the main factor behind the failure of the UK Parliament to ratify the agreement reached by the negotiators in November 2018. Marongiu Buonaiuti and Vergara Caffarelli (2018) analyse the question of the Irish border.[35] Its complexity rests on the fact that the political elements are intertwined with the

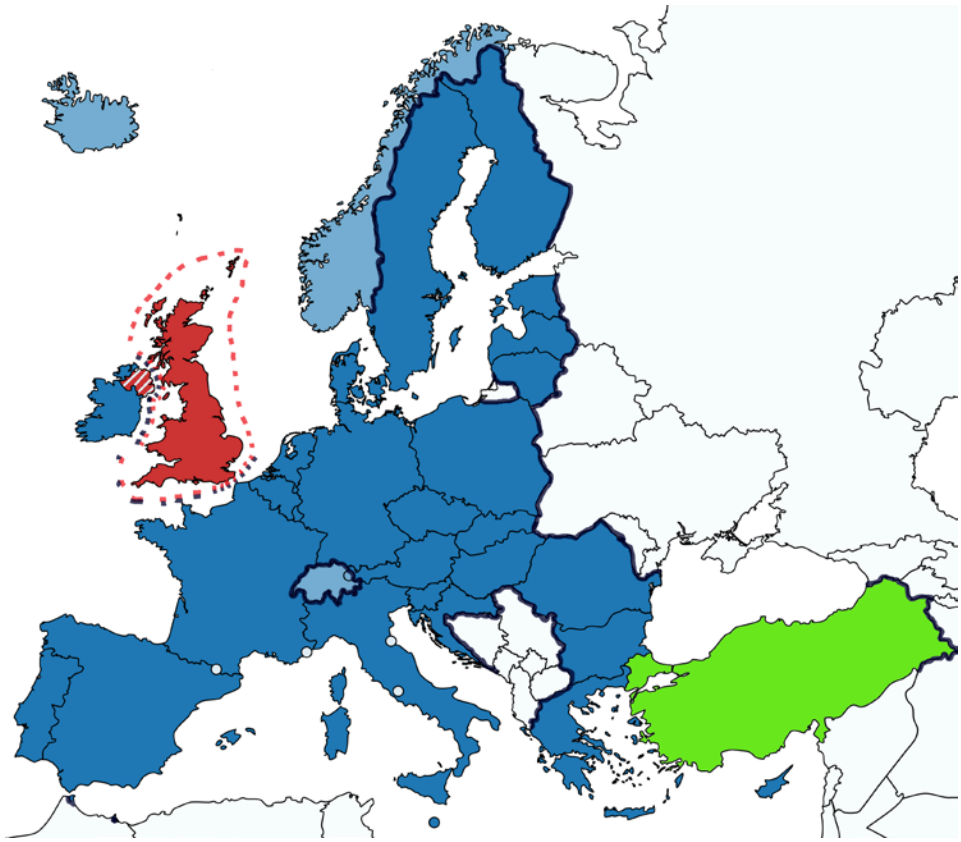
[35] See also Marongiu Buonaiuti and Vergara Caffarelli (2019).

economic ones. The political background relates to the Good Friday Agreement of 1998 that led to the present situation of total openness of the border. This has resulted in a high degree of economic integration within the island of Ireland – higher than that of Northern Ireland with the rest of the United Kingdom. In fact, North-South trade in the island is equal to 2.5% of the Irish Republic's gross domestic product, while trade between Northern Ireland and the rest of the United Kingdom – although higher in absolute terms – amounts to only 1.4% of Great Britain's GDP.

In order to reach a concrete solution to the problem, two proposals were presented during the negotiations – one by the United Kingdom and one by the EU – but neither was accepted until a compromise solution was then reached by the negotiators on 14 November 2018. The European Commission initially proposed that Northern Ireland, unlike the rest of the United Kingdom, would remain in the EU Customs Union and continue to be subject to a large part of the Single Market rules, while the rest of the United Kingdom would be excluded from it (Figure 5). The EU proposal was not meant to be the definitive solution to the border problem, but only a "backstop" which would become operational unless and until a more satisfactory solution was found. The UK Government instead proposed shifting the EU customs border to coincide with the United Kingdom's external border through the creation of a free trade area encompassing both the EU and the United Kingdom, so as to ensure that no further controls would need to be carried out between the United Kingdom and the EU (Figure 6).

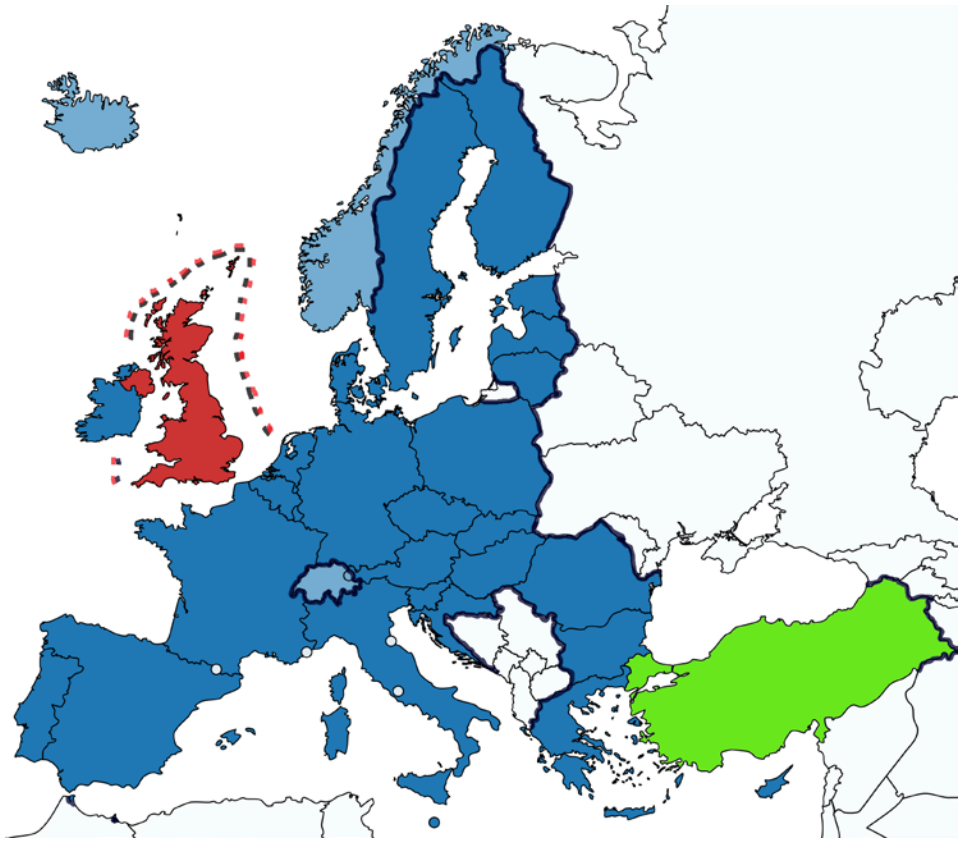
Figure 5

The European Commission's proposal



Note: The EU customs border, which includes Turkey and Northern Ireland, is highlighted in blue, the British one in red; the EU Customs Union includes the Member States (in blue), Andorra, San Marino, the Principality of Monaco and the Vatican (all in light blue), and Northern Ireland (in red and light blue); Turkey (in green) has a separate customs agreement with the EU.
Source: Marongiu Buonaiuti and Vergara Caffarelli (2018).

Figure 6
The United Kingdom's proposal



Note: The EU customs border, which includes Turkey, is highlighted in blue, the UK's one in red; the EU Customs Union includes the Member States (in blue), Andorra, San Marino, the Principality of Monaco and the Vatican (all in light blue); Turkey (in green) has a separate customs agreement with the EU.
Source: Marongiu Buonaiuti and Vergara Caffarelli (2018).

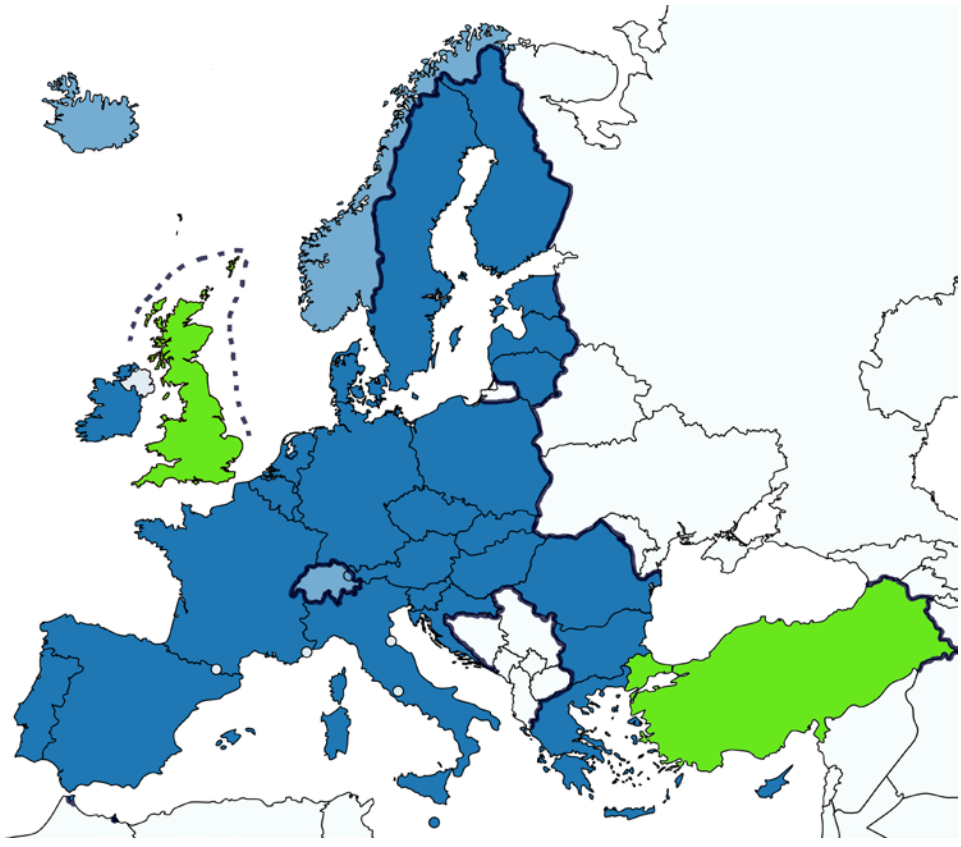
The United Kingdom found the EU proposal unacceptable, claiming it would compromise the constitutional unity of the country and the integrity of the United Kingdom's internal market. The United Kingdom's proposal was in turn unacceptable for the EU, because it would have implied a delegation of the implementation of the EU customs policy to a non-Member State, and the free trade area advocated by the United Kingdom would amount de facto to the United Kingdom's participation in the Internal Market for goods only. The sole point on which the two parties agreed was the commitment to maintain the Common Travel Area for persons between Ireland and the United Kingdom.

The authors focus on the conceivable remedies that could be put in place to overcome the objections raised to each of the two proposals. The EU proposal could be accompanied by two remedies to meet the United Kingdom's concerns: (a) the United Kingdom could waive tariffs and customs checks on imports from Northern Ireland and (b) Northern Irish companies could be granted a reimbursement of the EU tariffs paid on goods imported from the rest of the United Kingdom for local consumption. In this way, Northern Ireland would not be economically isolated from the rest of the country. Both the proposal and the remedies would be fully compatible with EU law and the

WTO legal framework.[36] Remedies for the United Kingdom's proposal could be found so as to avoid the need for the EU to delegate its customs policy to a non-member, i.e. by allowing customs checks upon entry to the United Kingdom to be carried out jointly by UK and EU customs officers, each for their "own" imports. Other issues raised by United Kingdom's proposal, however, appeared more difficult to solve, because they interfered with the fundamental EU legal principle of the indivisibility of the four freedoms and of the Internal Market.

The compromise solution for the backstop written into the WA on 14 November 2018 provided for a customs agreement between the EU and the United Kingdom, the "single customs territory", within which the degree of regulatory alignment between Northern Ireland and the EU would be greater than that for the rest of the United Kingdom. In fact, this solution corresponded to the initial EU proposal, combined with a customs agreement between the EU and the rest of the United Kingdom, which avoided the mutual imposition of tariffs (Figure 7) and limited customs controls between Northern Ireland and the rest of the United Kingdom to regulatory checks.

Figure 7
The compromise solution



Note: The EU customs border, which includes Turkey and the UK, is highlighted in blue; the EU Customs Union includes the Member States (in blue), Northern Ireland, Andorra, San Marino, the Vatican and the Principality of Monaco (all in light blue); Turkey and Great Britain (in green) have separate customs agreements with the EU.
Source: Marongiu Buonaiuti and Vergara Caffarelli (2018).

[36] See Pérez Crespo (2017) and Sacerdoti (2018).

The backstop linked the United Kingdom's trade policy to that of the EU for the (indefinite) period of time necessary to define the framework of the future UK-EU relationship, thereby postponing the achievement of full and effective UK "independence" in trade policy. This limitation on achieving the advocated autonomy in the field of foreign trade appeared to be the root cause of the strong resistance to the agreement that arose in the UK political debate. The final version of the protocol on Ireland and Northern Ireland,[37] agreed on October 2019 between the EU and UK negotiators, and contained in the ratified Withdrawal Agreement, provides for a regime for Northern Ireland very similar to that which would have arisen if the remedies proposed by Marongiu Buonaiuti and Vergara Caffarelli (2018) had been applied.[38]

2.5.3 The vulnerabilities of Spanish firms to Brexit

Spain has significant aggregate trade exposure to the United Kingdom. In fact, the United Kingdom is Spain's fifth largest trading partner, accounting for around 7% of all Spanish goods exports, although this exposure is smaller than that of the euro area as a whole to the UK economy (around 13% of goods exports). The share of Spanish imports from the United Kingdom is significantly lower (4% of total imports).

Gutiérrez Chacón and Martín Machuca (2018) analyse the trade exposure of Spanish firms to the UK economy, along with the specific characteristics of those firms, combining different sources of statistical data.[39] Merchandise trade with the United Kingdom involves around 7% of Spanish exporting firms and 10% of importing firms. The expansion in the base of exporters to the United Kingdom over the period 2012-2017 was accompanied by a constant increase in the number of regular exporters[40] (19% over the same period). Despite the uncertainty generated by Brexit and the slight fall in the number of exporters to the United Kingdom in relative terms, the share of regular exporters to the United Kingdom held steady in 2017. As is normal in other markets, most of these firms are SMEs (over 85% of total and regular exporters), although large firms account for around 90% of the volume of exports to the United Kingdom. Export growth is determined by the interaction between the number of exporting firms (extensive margin) and the volume of exports per firm (intensive margin). As seen in Chart 17, the expansion in exports to the United Kingdom between 2012 and 2016 was based on both these margins, in particular the intensive margin. The evolution of the intensive margin basically reflects the contribution of large firms, since these firms account for the majority of exports. The fall in exports to the United Kingdom in 2017 stemmed especially from the behaviour of the intensive margin. The available information on goods-importing firms is much less detailed. The number of importers from the United Kingdom rose by 56% between 2012 and 2017, a much higher rate than that recorded for exporters.

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37 See section 1.2.

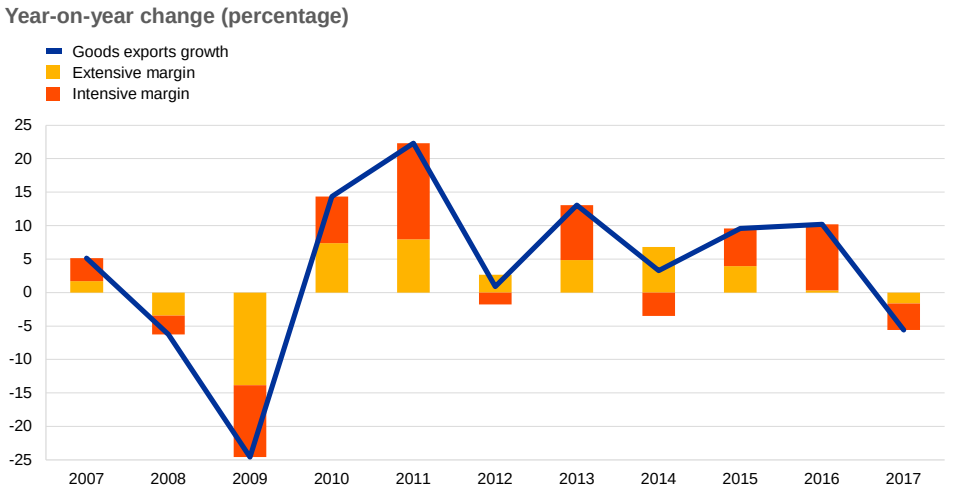
38 See Marongiu Buonaiuti and Vergara Caffarelli (2020).

39 The dataset combines aggregate data on cross-border transactions from the Spanish Institute for Foreign Trade (Institutio Español de Comercio Exterior, ICEX) with microeconomic information from the Banco de España's records of cross-border transactions and data from the Banco de España's Central Balance Sheet Data Office.

40 Regular exporters are those firms that export for at least for four years in a row.

Chart 17

Intensive and extensive margin: contribution to growth in exports to the United Kingdom (2007-2016)

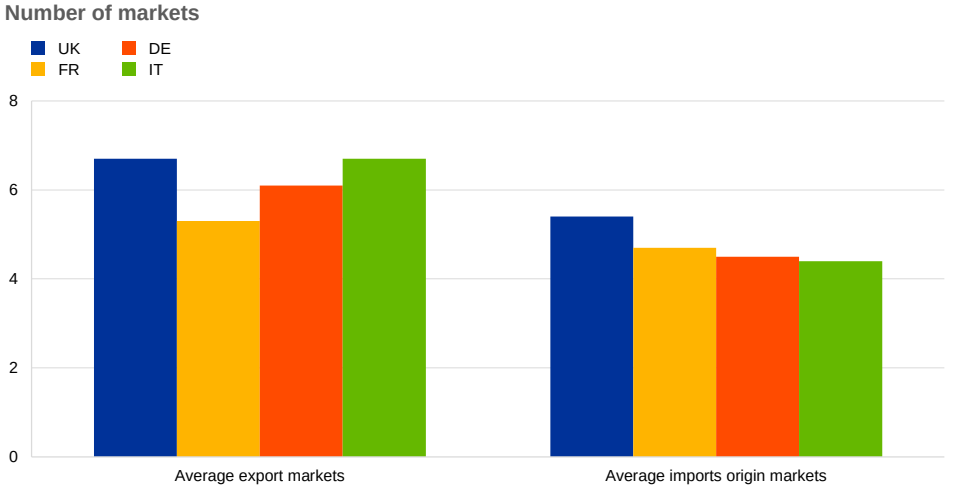


Source: Gutiérrez Chacón and Martín Machuca (2018).

Turning to the characteristics of firms, when those exposed to the United Kingdom are compared with the average firm trading goods with the main euro area economies, it is apparent that the former are, on average, larger in terms of both number of employees and turnover, and their value added per employee is higher (Chart 18). The higher productivity level helps to mitigate, at least partially, the potentially negative impact of trade barriers post-Brexit. The potential vulnerability of firms to Brexit depends not only on their characteristics but also on the magnitude of their exposure to the UK economy, which is generally lower than their exposure to the main euro area economies, reflecting the higher degree of geographical diversification of firms present in the UK economy (Charts 19 and 20).

Chart 18

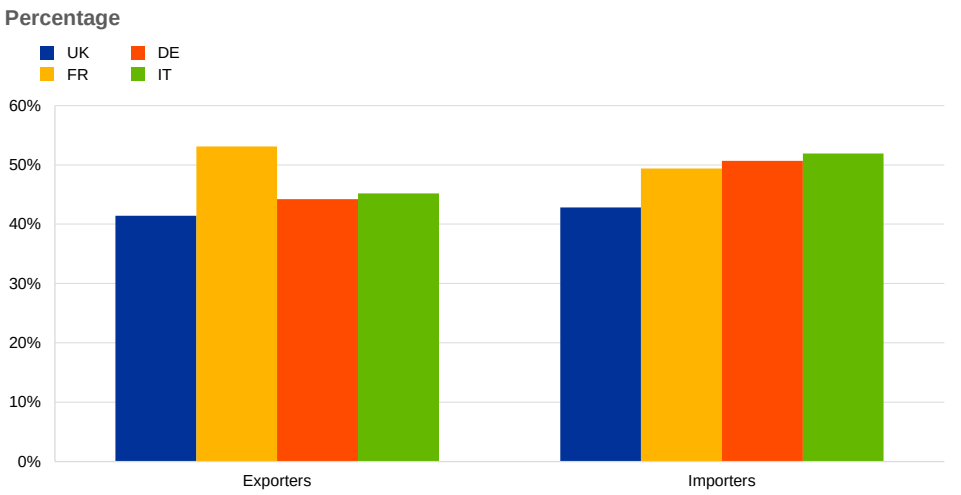
Geographical diversification of firms



Source: Gutiérrez Chacón and Martín Machuca (2018).

Chart 19

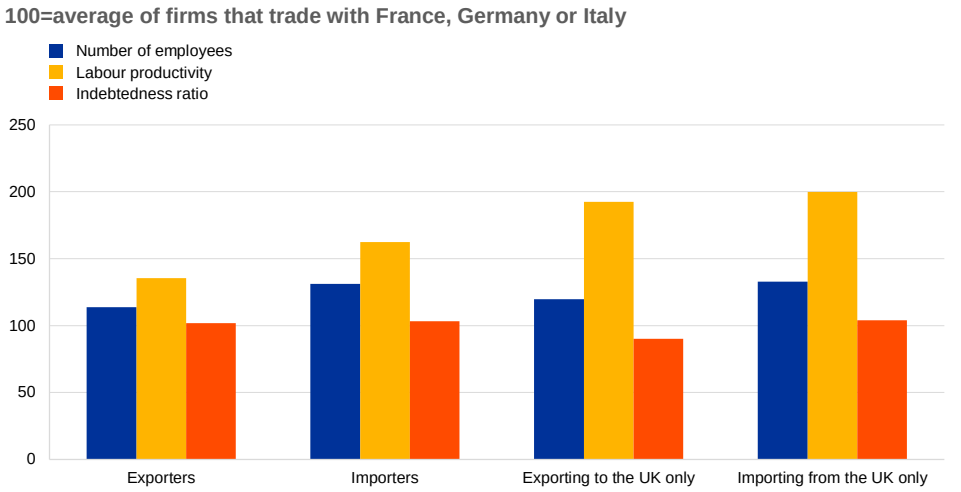
Average share of trade for each market



Source: Gutiérrez Chacón and Martín Machuca (2018).

Chart 20

Characteristics of firms that trade with the United Kingdom



Source: Gutiérrez Chacón and Martín Machuca (2018).

In short, the evidence would suggest that the potential adverse impact of Brexit on Spanish businesses may be mitigated by the higher geographical diversification of the firms that currently export to and import from the UK economy and by their higher efficiency levels. In any event, if the negotiations between the United Kingdom and the EU result in new trade barriers, Spanish firms that trade with the United Kingdom will be affected, and those potentially interested in penetrating the UK market will have fewer possibilities of doing so.

3 Conclusions

Brexit is an unprecedented event in the history of European integration – it is in fact a partial reversion of this process – and national central banks and the ECB have devoted significant resources and energy to analysing its effects. All the papers reviewed in this Occasional Paper were presented and discussed at several meetings of the task force, in Madrid and in Rome, and have been published independently by the authors. The aim of this publication is to report their results jointly, to highlight their complementarities and to bring to light some general conclusions. The results of these studies are broadly in line with the existing literature on the possible economic consequences of Brexit.

The papers employ a wide range of methods to investigate the impact of Brexit on the economy and trade. Bisciari (2019) surveys the official and academic studies on Brexit. Gravity equations are employed by Campos and Timini (2019) to estimate the effect of Brexit on trade and migration flows, and also by de Almeida et al. (2019) to estimate the effect on FDI. Open-economy macroeconomic models, such as NiGEM, are used by Berthou et al. (2019) to analyse the impact of Brexit on the EU and the United Kingdom, and by Conefrey and co-authors (2018a, 2018b and 2019) and Byrne and Rice (2018a, b) to analyse the Irish case in particular. Pisani and Vergara Caffarelli (2018) use a New Keynesian DSGE model, while Cappariello et al. (2020) use a computed general equilibrium model. Statistical analysis forms the basis of the work by Cappariello (2017) on UK post-Brexit tariffs vis-à-vis the EU, by de Almeida et al. (2019) on FDI, by Cappariello et al. (2018) on GVCs as an amplifier of tariffs and by Gutiérrez Chacón and Martín Machuca (2018) on the vulnerability of Spanish firms to Brexit. Marongiu Buonaiuti and Vergara Caffarelli (2018) address the issue of the Irish border from an economic, institutional and legal point of view.

Several of the papers reviewed assess the impact of Brexit using a scenario analysis. They take as the baseline either the pre-Brexit situation or a situation akin to EU membership and focus on the changes to the macroeconomic outcomes in alternative scenarios for the future economic relationship between the EU and the United Kingdom. The most frequently used alternative scenario is the one characterised by the prevalence of the WTO's MFN terms of trade as a result of a no-deal Brexit. Some papers also consider other scenarios, mainly characterised by the establishment of some sort of FTA between the EU and the United Kingdom.

The main channels of transmission considered in the analysis of the Brexit shock – trade, migration and FDI – are macroeconomic in nature. These channels closely relate to the four fundamental freedoms of the Single Market: free movement of goods, services, people and capital. Supply effects, through a productivity shock, are also considered in a few cases. Other potential channels of the impact of Brexit – such as financial linkages and uncertainty – and financial stability implications are out of the scope of the analysis presented here, and their introduction would require a different set of analytical tools.

The main insights into the impact of Brexit obtained from the papers reviewed can be better described by going through the different channels of transmission considered.

Starting with trade in goods and services, it is clear that Brexit will give rise to trade barriers – both tariffs and NTBs – between the EU and the United Kingdom. The impact of these trade barriers will be compounded by the dense network of value chains linking activity in the EU and the United Kingdom. Those tariffs and NTBs, applied to the flow of intermediate goods that today are freely traded back and forth across the Channel, will accumulate at each crossing, increasing the costs of production and narrowing firms' profits.

Some key results can be highlighted in this respect. If no trade agreement is struck between the EU and the United Kingdom, exporters from both areas will face tariffs at the MFN level in their bilateral trade. The United Kingdom and the EU (as well as each Member State individually) will face different average tariffs depending on their sectoral specialisation. Cappariello (2017) shows that the impact of MFN tariffs on average tariffs is likely to be significantly higher in the United Kingdom than in the EU. Taking into consideration country interlinkages through GVCs does not change this general conclusion, even though the indirect effect on average tariffs due to GVC interlinkages is higher for the EU (Cappariello et al. 2018). In the absence of an FTA, NTBs will also increase; again, their impact will be different across sectors (perishable goods will be more affected than non-perishable) and across Member States (Byrne and Rice, 2018a, b).

Simulation exercises performed with different types of models of the macroeconomic impact of higher trade barriers on the United Kingdom and the EU point to results in line with the existing literature. The results obtained using the NiGEM macro model (Berthou et al., 2019) consistently show more negative effects for the United Kingdom than for the euro area. This is the case whether the impact is modelled as a pure supply shock or as a combination of demand and supply shocks, and whether the shock is modelled through prices or quantities. Indeed, it is worth noting that the capacity of monetary policy to soften the impact in the United Kingdom disappears in the case of a pure increase in trade costs.

A New Keynesian DSGE model augmented with a simple GVC structure (Pisani and Vergara Caffarelli, 2018) confirms that Brexit carries stronger negative economic consequences for the United Kingdom than for the euro area. It also illustrates how the macroeconomic impact is lower if an EU-UK FTA is agreed. In addition, it shows that the impact on the United Kingdom is lower in a scenario where it does not apply any tariffs. By contrast, the estimated fall in the level of output in the United Kingdom is much steeper if MFN tariffs trigger a productivity loss. Finally, a general equilibrium trade model that takes into account production interconnectedness and different tariff levels for final and intermediate goods (Cappariello et al., 2020) shows that steady-state welfare losses are again higher in the United Kingdom than in the EU, albeit with significant variation among EU Member States. Conversely, the United Kingdom would be almost the only country to experience an increase in consumer price index inflation.

Migration flows are another important Brexit transmission channel. The free movement of people between the two areas will be hampered, possibly with significant consequences for the labour market both in the United Kingdom and in the EU. The impact on migration due to Brexit is analysed, together with the trade channel, in two papers. Campos and Timini (2019) use a structural gravity analysis to estimate the fall in migration flows from the EU to the United Kingdom after Brexit. The intensity of the fall is similar under both a WTO scenario and an FTA scenario, as a trade agreement is not assumed to have implications for migration regimes. Unlike with the trade channel, through which the effects on the both the UK economy and the EU economies work in the same direction – albeit with different intensity – the impact of Brexit on migration flows towards the EU is positive. Berthou et al. (2019) explore the macroeconomic consequences of Brexit through the migration channel by introducing estimates of migration flows (from Campos and Timini) in NiGEM. The effects are weaker than through the trade channel, but not irrelevant, and are again stronger for the United Kingdom than for the euro area. As these effects represent a supply shock, monetary policy is not able to soften the impact.

FDI is another relevant channel of the impact of Brexit – an especially important one, given the role of FDI in shaping the international allocation of capital and its spillovers to the domestic economy. It is well documented in the economic literature that, on average, foreign-owned firms are larger, more productive and tend to be more active in innovation and research than domestic firms. De Almeida et al. (2019) find preliminary evidence – in the absence of extensive data at this point of the Brexit process – of a slowdown in both inbound and outbound FDI flows with respect to the United Kingdom after the referendum in June 2016, confirming that Brexit could make the United Kingdom a less attractive investment destination. This would be the result of two effects: (i) the probability of the United Kingdom losing the EU's single passport for services and access to the Single Market and (ii) the likely emergence of trade barriers, making the participation of the United Kingdom in EU value chains less straightforward. A gravity analysis confirms the costs of disintegration through the FDI channel.

The last set of papers reviewed in this publication analyse the effect of Brexit in two countries, Ireland and Spain. The Irish economy will be significantly affected by the United Kingdom's withdrawal – and increasingly so the greater the level of disintegration in the new EU-UK trade relations (Conefrey and co-authors, 2018a, 2018b and 2019). The question of the Irish border is investigated by Marongiu Buonaiuti and Vergara Caffarelli (2018), who present evidence of the deep integration between Ireland and Northern Ireland, review the negotiating process and analyse various proposals. Finally, Gutiérrez Chacón and Martín Machuca (2018) assess the vulnerability of Spanish firms trading with the United Kingdom to Brexit. They conclude that these firms are resistant to the shock given the geographic diversification of their exports and their comparatively high efficiency.

The broad set of results coming from the papers reviewed in this publication are highly consistent with each other and with the evidence reported by other studies (Bisciari, 2019). They point to some clear consequences of Brexit. The first of these – as confirmed by results from across all the scenarios analysed – is that the negative

macroeconomic impact of Brexit on the UK economy will be far greater than the aggregate impact on the EU or euro area economies. However, looking at the Member States individually, the results give a more nuanced picture. In particular, Ireland will be significantly affected because of its close ties with the United Kingdom's economy, a result of its geographical proximity and of the unique situation of the Irish/Northern Irish border, which is the only non-maritime border between the United Kingdom and the rest of the EU.

However, it should also be recognised that any estimate of the macroeconomic impact of Brexit has a low level of precision. Quantitative results depend to a great extent on the channels considered in each particular exercise and the way they are modelled and specified. Indeed some aspects are difficult to introduce into the models. This is the case when assessing the impact through the financial sector or the disruptions that may occur in the short term in the case of a no-deal Brexit after the transition period. The economic policy reaction is another consideration that is difficult to take fully into account in the quantitative analysis. All in all, the estimates obtained in the papers reviewed here should be assessed against considerations of this kind.

A second, perhaps obvious conclusion to be drawn from the analysis is that, given the costs of disintegration, the closer the final relationship is to the United Kingdom's EU membership, the lower the macroeconomic cost will be. This highlights the negative consequences of establishing barriers to the free circulation of goods, services, people and capital. Some of the papers reviewed provide precise estimates of the barriers to trade – both tariffs and NTBs – that may arise, while others quantify the impact of setting obstacles to migration and FDI. Higher barriers to trade may entail quite significant effects for some countries and sectors.

All in all, hampering trade and investment will (i) increase the costs of bilateral trade, (ii) have an impact on production interlinkages and value chains and (iii) affect cross-border allocation of capital. Indeed, a common finding of the papers is that Brexit will reduce the gains from trade on both sides of the Channel. In the long run, this will result in a lower level of GDP for the UK economy and, to a lesser extent, for the other EU economies – again, with significant differences across countries and sectors. While a good agreement on the future trade relationship between the EU and United Kingdom before the end of the transition period would avoid the worst-case scenarios, the economic losses will be significant anyway.

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