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A Study of the Impacts of Brexit on Cross-border Trade Between the UK regions and Ireland

by

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Abstract: From the Brexit Referendum in 2016, up until the Brexit transition period in 2020 and onwards, the regions of the United Kingdom underwent several renegotiations within trade agreements associated with the Brexit process and the consequent withdrawal from the European Union. This caused increasing levels of economic policy uncertainty within the United Kingdom, which accordingly acted as a spillover effect on the economy of the Republic of Ireland, similarly increasing its economic policy uncertainty levels. Using a case study approach, this research paper aims to explain the impacts of Brexit on cross-border trade between the Republic of Ireland and regions of the United Kingdom. The paper further explores the impact of renegotiations in trade agreements on trade flows and economic integration, and examines what role uncertainty plays in reductions of imports and exports.

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List of Abbreviations

EPU	Economic Policy Uncertainty
EU	European Union
GB	Great Britain
GFA	Good Friday Agreement
NI	Northern Ireland
NI Protocol	Northern Ireland Protocol
ROI	Republic of Ireland
UK	United Kingdom

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1. Introduction

Since the Brexit referendum in 2016, when the United Kingdom (UK) voted to leave the European Union (EU), until the resulting withdrawal in 2020, trade dynamics in the affected regions have undergone significant transformations. The social, political and economic ramifications of Brexit are still in progress, creating uncertain environments. The unanticipated result of the referendum generated concerns regarding potential macroeconomic disruptions and trade disintegration, among many other things. This uncertainty around future policy has led to an increase in levels of economic policy uncertainty (EPU) in the UK and Ireland.

Uncertainty shocks to the economy are shown to have negative impacts on macroeconomic variables and can therefore produce declines in industrial production, consumption, productivity, employment and investment (Alexopoulos & Cohen, 2009; Baker, Bloom & Davis, 2016c). Increased EPU levels have larger effects on trade than it does on other economic variables. Renegotiations in trade agreements and reversals in trade policy as a result of Brexit have likely generated higher policy uncertainty, which in turn may cause trade disintegration to the point of creating disruptions in the agreements (Graziano, Handley and Limão, 2018). Following the Brexit referendum, heightened uncertainty levels due to trade agreement renegotiation has resulted in a reduction of export activity from the UK to the EU (Crowley, Exton & Han, 2020). The Brexit process has given rise to many renegotiations since its start in 2016, and the presumably increased levels of uncertainty and the consequent declines in trade volumes seem to have affected the regions of the UK, along with the island of Ireland, to the greatest extent. The theoretical framework of this research will lay its foundation in theories and previous findings associated with EPU and its impact on trade.

The withdrawal of the UK from the European Single Market on account of Brexit has not only created trade barriers between the UK and the EU but also within the UK, in the Irish Sea. The Northern Ireland Protocol (NI Protocol) was introduced with the intention of maintaining a soft trade border between Ireland, i.e. the Republic of Ireland (ROI), which remains part of the EU, and Northern Ireland (NI), belonging to the UK, and to protect the Good Friday Agreement (GFA) maintaining peace between the two regions since the Troubles (Duparc-Portier & Figus,

2020). The NI protocol enables NI to remain aligned with certain EU rules while being a member of the UK customs union in order to allow for trade to move freely across the Irish border (Duparc-Portier & Figus, 2020). This difference in trade policy between NI and the rest of the UK, i.e. Great Britain (GB), has resulted in trade frictions and potentially a reduction in trade between the regions (Duparc-Portier & Figus, 2020). Consequently, Brexit might create disparities in economic development between the different regions in the UK (Fingleton, Gardiner, Martin & Barbieri, 2022). Studying the effects of Brexit-related uncertainty on trade within the affected regions is therefore crucial in order to understand and implement policy aiming to reduce the adverse impacts of Brexit on the UK's regions.

The aim of this paper is to explore the impacts of renegotiations in trade agreements on trade flows, and using Brexit as a case study, to examine what role uncertainty plays in the trade changes between the ROI and the UK as a result. Therefore, the following research question is asked:

"How does uncertainty around Brexit impact cross-border trade between Ireland and the regions of the UK economy?"

The findings of this case study support the perception of NI becoming increasingly economically integrated with the ROI, indicating that the uncertainty shock caused by Brexit has redirected trade towards the Irish border, as opposed to trade across the Irish Sea. This paper is hereafter structured as follows: Section 2 will give a more in-depth historical background to trade relations prior to Brexit up until the Brexit vote, and Section 3 will provide a literature review of previous research concerning the concepts covered. Section 4 provides the theoretical framework of the research and Section 5 explains the methodology and data used to answer the research question. Thereafter, the findings and analysis are presented in Section 6 and the following discussion on the findings in Section 7. Lastly, section 8 will provide a conclusion to the research, summarising the paper.

2. Background

In order to understand why it is of great significance to study the implications of new trade agreements emerging from Brexit and the impacts they have on the affected regions, a background providing some historical context of the relevant trade relationships and political relations up until the current situation will be provided.

2.1 The Good Friday Agreement and the Northern Ireland Protocol

'The Troubles' was a 30-year long conflict which took place in NI between the unionists who wanted to remain part of the UK and the nationalists who wanted Irish unification, reuniting the ROI and NI into a single Irish state (Colfer & Diamond, 2023; Torrance, Curtis & McCaffey, 2023). During the conflict, the Irish border became regulated with security measures, controlling the movement of goods and people (Torrance, Curtis & McCaffey, 2023). During this militarisation on the Irish island, the border was policed by British soldiers and people crossing it were controlled by army checks and British customs regime (Torrance, Curtis & McCaffey, 2023). This hard border was intolerable to many people living on the island of Ireland during this long period of conflict, and has resulted in the persistent fear of the reemergence of a hard border up until this day. The conflict ended in 1998 with the Good Friday Agreement (GFA), also called the Belfast Agreement, by which both the British and the Irish governments received a role in the governance of NI, giving both the nationalists and the unionists a chance of representation (Colfer & Diamond, 2023). One of the objectives of the GFA was to avoid this previously observed hard customs border between the ROI and NI (Torrance, Curtis & McCaffey, 2023). Included in the arrangement of the GFA was also the idea of the UK and the ROI both being Member States of the EU (Torrance, Curtis & McCaffey, 2023). Economic integration within the EU has since 1992 been reliant on the 'European single market', which allows for "free movement of goods, services, capital and people" across the EU member states and some additional countries (Stellinger, 2015, p. 6). The intention of this avoidance of barriers has been to aid economic development by encouraging further trade and travel relations within Europe, as well as through better resource allocation within the single market.

Following the vote to leave the EU in 2016, concerns about the potential recurrence of a hard border reappeared for the first time since the Troubles (Torrance, Curtis & McCaffey, 2023). Leaving the EU also meant that the UK left the European single market on 31 December 2020. Since NI is part of the UK, a withdrawal of the UK from the single market would result in the creation of a hard border between NI and the EU, where the border would be placed on the Irish island between NI and the ROI would go down the Irish sea. The reason for the increasing concerns of a reemerging hard border extends further than that of the potential trade implications. People fear that such a reemergence of a hard border would result in the potential return of violence and increasing political tensions, returning to the previous militarisation of the Irish trade border. According to Colfer and Diamond (2023), Brexit risks resulting in the repetition of conflict and political turmoil on the Irish border, establishing a threat to the terms of the GFA, which maintains peace and political governance in NI. Thus, the concern of a hard border led to the creation of a new protocol, the NI protocol, which set out the intention to maintain a soft border on the island in order to protect the GFA, and with the aim of maintaining stable economies on both sides of the border and in the EU single market (Duparc-Portier & Figus, 2020). The Protocol then ensures the free movement of goods between the two countries while preserving the conditions of the GFA, keeping NI aligned with EU trade trade laws and regulations in order to stay in the EU single market (Torrance, Curtis & McCaffey, 2023). NI would therefore temporarily have a different trade policy to that of the rest of the UK, although remaining in the UK customs territory (Duparc-Portier & Figus, 2020). Hence, an absence of the NI Protocol might cause disruptions to trade as well as the maintenance of political stability on the Irish island.

Since the onset of Brexit, concerns have not only been raised regarding the border on the island of Ireland but due to the NI Protocol also the potential hard border between NI and the rest of the UK (Colfer & Diamond, 2023). This "Irish Sea border" was created in a revised version of the NI Protocol in 2019 due to NI remaining part of the EU goods and customs union, as opposed to the rest of the UK (Torrance, Curtis & McCaffey, 2023, p. 56). The new border posed legal controversies throughout 2021 and 2022 wherein trade could no longer move freely within the UK, and where some felt that the UK trade union was being compromised (Torrance, Curtis & McCaffey, 2023). Therefore, as a consequence of Brexit, uncertainty has been created

concerning whether a hard trade border will be placed on the island of Ireland, threatening the political stability in the region which has been built up since the GFA in 1998, or in the Irish Sea, compromising trade within the union between NI and Great Britain.

In order to understand current uncertainties regarding the different trade borders it is therefore essential to understand the outcomes of the GFA and the protocol. Tables 1 and 2 display the several changes as a result of the GFA and the NI Protocol with respect to the border, and subsequently its impact on trade and the movement of goods and people.

Table 1: Border policies before and after the Good Friday Agreement in 1998

	Pre GFA	**Post GFA**
Movement of Goods	Securitised border	Goods moving freely
Border	Securitised	Invisible (EU single market)
Movement of People	Controlled by the border	Free movement of people
Conflict	'The Troubles' in Northern Ireland	Conflict ended by the GFA in 1998

Source: Uberoi (2016)

Table 2: Border policies before and after the Northern Ireland Protocol in 2018

	NI Protocol	**Renegotiation/Hard Brexit**
Movement of Goods	Hard border in Irish Sea between Northern Ireland and Great Britain with custom checks in Belfast (within UK)	Hard border on Island of Ireland between North and South: custom checks at hard Irish border (between UK and EU)

Source: Uberoi (2016)

2.2 The Brexit Vote and Border Expectations

In the Brexit referendum on the 23 June 2016, in which the British population was given two options: the vote to remain a member of the EU versus the vote to leave the EU, 51.9% voted to leave (Uberoi, 2016, p.4). Visibly, in Figure 1, the votes to leave and votes to remain were unevenly spread across the UK regions, where the vote to leave won a majority in England and Wales, and the vote to stay won a majority in Scotland and NI (Uberoi, 2016). In NI, 55.8% of voters voted to remain in the EU, as displayed in Table 3 (Uberoi, 2016).

<figure>
Orkney &
Shetland

London

Leave majority
Remain majority

Gibraltar

© Crown copyright. All rights reserved. House of Commons Library (OS) 100040654 and (OSNI) 2085 (2016).
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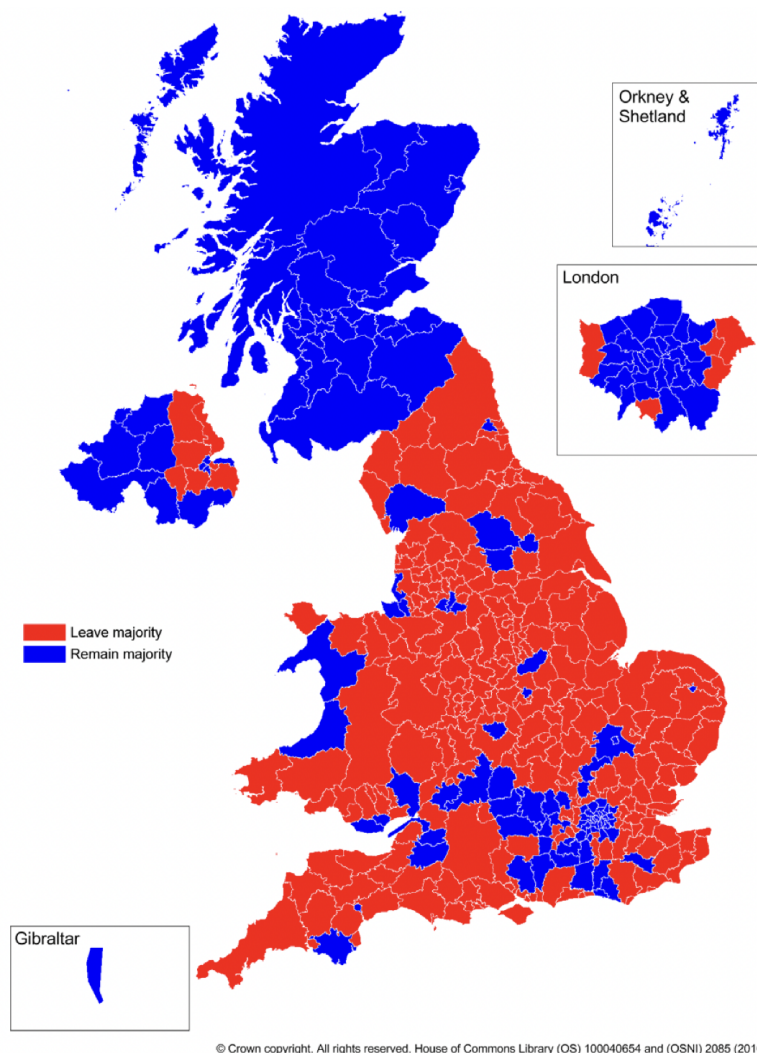
Figure 1: Majority leave votes and majority remain votes by counting area
Source: Uberoi (2016)

Table 3: *The proportion of leave and remain votes across the UK*

	Leave (%)	Remain (%)
England	53.4%	46.6%
Wales	52.5%	47.5%
Scotland	38.0%	62.0%
Northern Ireland	44.2%	55.8%

Source: Uberoi (2016)

Therefore a Northern Irish majority wished to stay in the EU and the single market, which helps to comprehend the political and economic justifications for the widespread support towards the NI Protocol. Again, this supports the expectation of an Irish sea border within the UK along with the subsequent trade agreements in favour of this trade border rather than the one on the Irish island. This also creates the expectation of an increase in the trade between NI and the ROI. This expected increase, along with an expected consequent decrease in trade between NI and Great Britain, suggests further trade integration on the island of Ireland, and increased trade disintegration within the UK.

3. Literature Review

Seeing as Brexit is a recent and ongoing event, the effects and consequences brought with it are still being explored. This implies that the field lacks extensive literature on the effects of the most recent events and trade renegotiations of Brexit, and that there is continuously new research added to the literature. To understand the effect of Brexit on UK and Irish trade, it seems appropriate to first look at the literature regarding trade relations prior to Brexit and subsequently on how they have changed progressively throughout the Brexit time period. Therefore section 3.1 will look at trade prior to the Brexit referendum and section 3.2 at how trade has changed since the start of Brexit. Section 3.3 then presents a review of the literature on economic policy uncertainty regarding trade agreements in general as well as Brexit, and section 3.4 on the concept of regional shocks and the impact of Brexit on NI.

3.1 Pre-Brexit Trade across the Irish Border

Prior to Brexit there was already research concerned with the amount of trade moving across the Irish border from the North to the South. Fitzsimons, Hogan and Neary (1999) find that there were larger trade volumes moving across the border between 1970-1992 than what had been previously believed. Lawless, Neary and Studnicka (2019) similarly use the gravity model to expand on this finding, and using firm-level data on exports between 2000-2015, demonstrate the result of the removal of the physical trade border on the island as a result of the GFA in 1998, generating an increase in trade volumes. They point out that the ROI's trade with NI during this period makes up a rather small share of its total trade, but that the significance of their trade relationship is increasing which corresponds to the growing integration between the two economies (Lawless, Neary & Studnicka, 2019). They further argue that this relationship between cross-border trade and economic integration can be useful for estimating the extent or grade of disruption which might be caused by renegotiations in trade agreements. The steady border policies established by the Good Friday Agreement in 1998 would be disrupted in the case of a 'hard Brexit', in which the ROI and NI would belong to different customs regimes (Lawless, Neary & Studnicka, 2019). This prompted the drafting of the Withdrawal Agreement, which includes the NI Protocol, and allows NI to partly remain within the EU single market (Lawless, Neary & Studnicka, 2019).

3.2 Post-Brexit Trade Relations

The literature on the implications of Brexit on the trade relations between the ROI and the UK regions, and the responses to renegotiations and new trade agreements, is somewhat limited but continuously growing. The regions in the UK are the ones most exposed to the impacts Brexit might bring, and due to the ROI's trade relationship with the UK, some of its regions face the same risk as some regions in the UK (Chen, Los, McCann, Ortega-Argilés, Thissen & van Oort, 2017). Brownlow (2023) argues that the Northern Irish economy in some aspects maintains more similarities to the Irish economy than that of the UK, and that this perception was strengthened by the establishment of the NI Protocol. This demonstrates the importance of investigating the impact of Brexit on the island of Ireland along with Great Britain. Murphy (2022) investigates in her article the short-term effects of Brexit on trade and the NI Protocol, and discovers that while trade between the ROI and Britain was reduced, trade between the ROI and NI actually increased, similarly suggesting that the two economies might become further integrated. This paper will explore the changes in trade between the different regions further, along with the explanations for the transformations.

The rules of the NI Protocol, which regulates Northern Irish trade with the EU and Great Britain and aims to prevent a hard border on the Irish island, create dissimilarities between NI and Great Britain's trade agreements (Duparc-Portier & Figus, 2020). This in turn has led to trade disputes, political tensions, and reductions in exports between the two regions, despite belonging to the same country (Duparc-Portier & Figus, 2020). Duparc-Portier and Figus (2020) argue that the mentioned trade disruptions, along with non-tariff barriers to trade between NI and GB, have large negative impacts on the Northern Irish economy, proposing that decreasing the disruptions is necessary for the wellbeing of the NI economy. Their findings prove significantly useful for this paper as it will focus on the impact of Brexit on trade on the island of Ireland along with Great Britain, and the effect of disruptions in trade agreements on trade. Hence, this research will go into more detail on the impact on trade volumes between the different regions and the effect of disruptions and subsequent uncertainties on trade. It will also by contrast explore the possible beneficial effects of Brexit on the Northern Irish economy and consider if the NI Protocol might be of their economic advantage.

3.3 Economic Policy Uncertainty in Relation to Trade Agreements and Brexit

In order to understand the role played by uncertainty in determining the trade effect of an economic shock or a renegotiation of a trade agreement, it is useful to consider previous research conducted on the impact of uncertainty on trade and other economic activity. The overall finding in the recent literature supports the theory that uncertainty shocks will generate negative economic outcomes, causing declines in economic activity: (Alexopoulos & Cohen, 2015; Bachmann Elstner & Sims, 2013; Baker, Bloom & Davis, 2016c; Bloom, 2009; Cho & Kim, 2023) etc. This common finding will be a source of inspiration for this research paper, such that it will consider the effect of uncertainty on several economic variables which are indicated by the literature and compare them to explore the extent of and the relative impact on trade.

Tam (2018) finds that uncertainty can affect trade through different channels, which can be direct or indirect. The author explains possible spillover effects of EPU and finds that global trade flows can be affected to a large extent by an increase in the EPU of the US, a large economy with many trading partners. Rice (2020) has conducted a case study research on the ROI investigating the impacts of EPU on a small open economy. He finds that the ROI's EPU is strongly affected and determined by global policy events, being most affected by such events in the UK and several other countries. Therefore, not unexpectedly, the Irish EPU was inevitably affected to a large extent by the Brexit referendum in 2016, reaching very high levels (Rice, 2020). This illustrates the concept of spillover effects of uncertainty, in which the ROI was affected through a direct channel, i.e. as a trading partner of the UK. The results of the case study are useful for the theoretical framework of this research paper, however the economic effects considered do not include trade-specific effects, or effects in relation to the UK, which will be analysed here.

Crowley, Exton and Han (2020) consider the effects of uncertainty created by renegotiations in trade agreements on trade by conducting a natural experiment on the Brexit referendum, proving especially useful for this paper. They show that the uncertainty over future policy conditions can have a negative effect on present trade volumes, which they found was the case after the Brexit referendum in 2016. With respect to this finding, it can be anticipated that a similar situation

might occur after the end of the Brexit transition period, i.e. with the withdrawal of the UK from the EU single market, namely that intensified uncertainty might cause reductions in UK trade, a perception which will be explored in this paper. Crowley, Exton and Han (2020) investigate the impact of renegotiations of trade agreements, which might invalidate the current trading rights free of tariffs, on firm entry into and exit from exporting to foreign markets. They further argue that exports to EU markets would have remained significantly higher by means of higher entry into, and lower exit from, the EU market, had UK exporters been assured of continued free trade with the EU after Brexit. Therefore, depending on the findings of this paper, it might be appropriate to suggest that trade agreements could be integrated into economies with an uncertainty-reducing objective.

Limão and Maggi (2015) highlight in their paper the beneficial aspect of trade agreements in such a way that they can help reduce trade policy uncertainty. They argue that increasing integration globally has intensified the importance of reducing trade uncertainty regarding tariffs, exceeding the importance of reducing the level of tariffs or trade barriers. Accordingly, they argue that trade agreements can boost trade not only by reducing tariffs, but also by mitigating the levels of trade policy uncertainty, and that trade agreements which lead to lower uncertainty levels help stimulate investment directed towards the export sector and increase anticipated trade volumes. Their findings suggest that policymakers should encourage trade agreements in times of trade uncertainty. In this research paper, the trade agreements associated with Brexit, and the NI Protocol, will be considered from this perspective, in order to explore whether uncertainty in the relevant regions has been affected by them.

3.4 Regional Shocks and Impacts of Brexit on Northern Ireland

In the case of Brexit, it seems relevant to explore the regional shocks, in terms of the economic shocks undergone by the different regions, associated with the embedded trade agreements. Fingleton et al. (2022) explore this in their paper with respect to the UK, measuring the productivity of different regions and under different situations, with the expectation that Brexit will lead to trade reductions as a result of new barriers to trade and trade frictions. The authors discuss the pre-existing regional differences in productivity, employment and income levels, where there is an increasing divide between the north and south of the UK, and where the

northern regions have experienced lower productivity levels. They proceed to find that the resulting decrease in exports from the UK to the EU have an adverse effect on regional productivity, and that in the long run, Brexit can potentially worsen the existing productivity disparities between the UK's regions, for example between London and the rest of the UK, rather than lowering them. This analysis of the effects of Brexit on intra-UK regions will be expanded in this research, although focusing on the trade effects of changes in economic integration between NI and the rest of Great Britain.

In order to understand the influence of Brexit more specifically on NI, Duparc-Portier and Figus (2020) examine the emergence of tariffs and non-tariff barriers under potential Brexit scenarios. They observe that a large share of the total goods purchases to NI in 2018 came from GB. This, according to the authors, along with new non-tariff barriers, suggests that changes in barriers with GB affect NI's economy more so than other regions, and find that this explains a majority of the negative economic outcomes of Brexit on the country. Since NI depends on EU regulations for goods, they assume that increased disparities between the UK and the EU will consequently be mirrored creating increased disparities between GB and NI. Since the establishment of the NI Protocol, there have been reductions in the trade and specifically in exports to NI as a result of increased trade frictions with GB (Duparc-Portier and Figus, 2020). Duparc-Portier and Figus (2020) find that the Northern Irish economy, under no circumstances, benefits from the introduction of Brexit, when compared to a case in which they would have remained within the EU. However, their results suggest that NI might be able to benefit from its current situation, by which further trade integration of the Northern Irish market with the EU market can be favourable for the economy and therefore be able to benefit both from the EU goods market and from certain agreements within the NI protocol. This by reducing production costs and thus the unfavourable outcomes of the implementation of new trade borders (Duparc-Portier and Figus, 2020). Hence, if the economic benefits could overpower the political challenges faced by NI, they could possibly achieve a mutually beneficial situation. The results prove useful for this research and for the border expectations which will be further discussed, although this research will not study the impacts of Brexit on UK trade relations with the EU, but rather intra-UK trade and UK's trade with the ROI.

To summarise the main points to be taken from the literature review, this paper intends to explore the effect of trade agreements and the subsequent increase in policy uncertainty levels on the trade flows between the UK regions and the ROI, taking into account the unique historical context of the regions and how this affects levels of uncertainty and trade expectations up until this day. Using the findings of previous literature, this paper will further consider the regional shocks of Brexit on the Northern Irish economy, creating regional disparities within the UK.

4. Theoretical Framework

Although this paper will not measure the effect of increased Brexit-related uncertainty on economic variables, the theories associated with EPU and its effect on trade will be used as a basis for the theoretical framework. In this paper, the Brexit referendum will be interpreted as an economic shock, causing a substantial increase in economic policy uncertainty, along with the consequent introduction of several new trade agreements and renegotiations over a period of time, also creating uncertainty. Hence, looking at the impact of EPU on trade can help us understand how trade in the UK and the ROI are affected by Brexit. Therefore, the perception that EPU has a larger negative impact on trade than on other economic factors will help formulate the theoretical framework for this paper, and trade reductions in the UK and the ROI as a result of uncertainty caused by renegotiations in trade agreements associated with Brexit will be studied using the framework.

4.1 Measuring Economic Policy Uncertainty and its Impact on Economic Activity

To explain uncertainty, Bloom (2014) uses a mixture of Frank Knight's definition of the concept of uncertainty, namely as the inability to predict the probability of an event taking place, and the concept of risk. The existing literature on the concept suggests that uncertainty related to economic policy increases heavily during recessions and after large economic and political shocks (Bloom, 2009; Bloom, 2014). Alexopoulos and Cohen (2009) also argue that sudden increases in uncertainty can result in recessions, and cause drops in industrial production, employment, consumption, productivity and investment. Baker, Bloom and Davis (2016c) similarly present this relationship between economic uncertainty shocks and negative economic outcomes, a concept discussed previously in the literature review, and provide evidence of increased stock price volatility and lower investment and employment due to policy uncertainty. There are several different ways to measure EPU, one common measure being based on the use of newspaper coverage. Baker, Bloom and Davis have (2016c) developed an index for EPU using newspaper articles to measure the frequency of coverage on policy-related uncertainty. They use several large newspapers in the economy of interest to study the frequency of terms

associated with economy, policy, and uncertainty in an article, with the requirement of all three appearing in some form in the same article, in order to formulate the index. Figures 2 and 3 have been created using their EPU index for the UK and the ROI, in order to follow the fluctuations in uncertainty prior to and during the Brexit timeline.
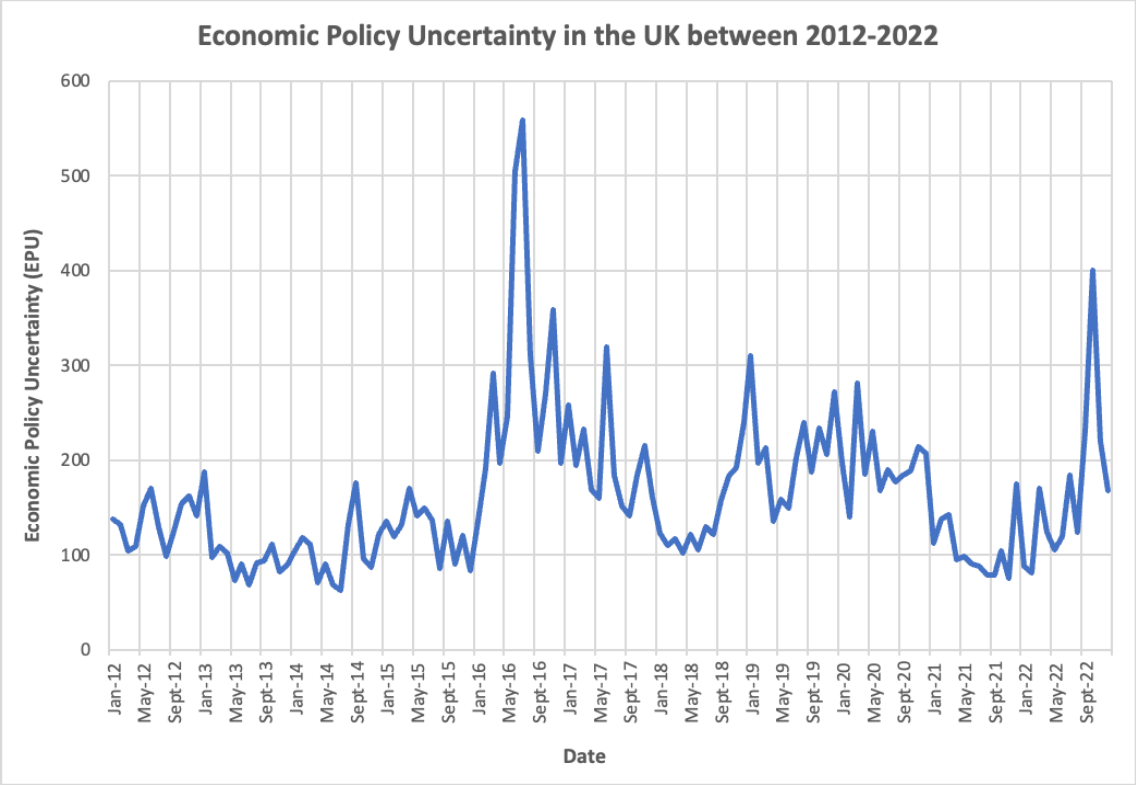

Figure 2: Economic Policy Uncertainty index in the UK

Note: The numbers are derived from a Monthly EPU index for the UK
Source: Baker, Bloom and Davis (2016b)

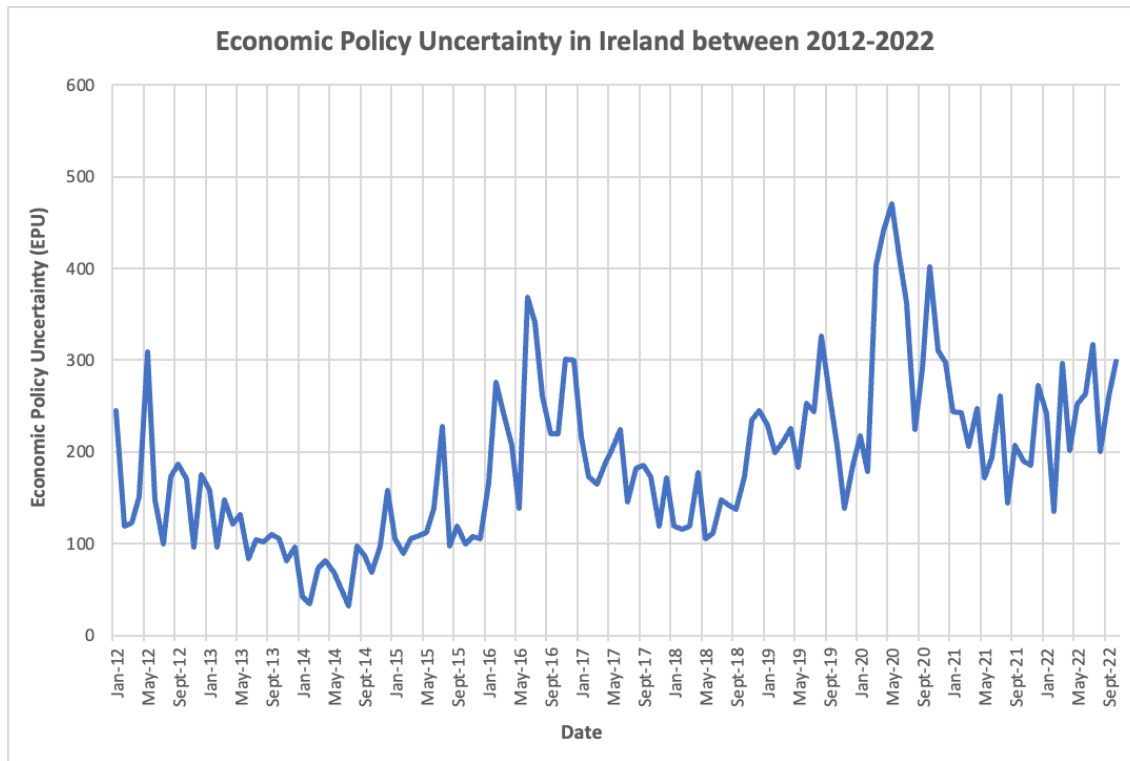**Economic Policy Uncertainty in Ireland between 2012-2022**

Figure 3: Economic Policy Uncertainty index in Ireland

Note: The numbers are derived from a Monthly EPU index for Ireland
Source: Baker, Bloom and Davis (2016a)

The figures show heightened EPU numbers since the beginning of Brexit and fluctuations throughout the time period. The EPU numbers for the UK show a massive spike in uncertainty shortly after the Brexit referendum taking place in June 2016. This is by far the largest spike recorded since EPU was first measured with this index, i.e. between 1998 and 2023, reaching EPU levels of around 558,2. This can be compared to the previous peak of around 256,1 EPU in October 1998 (Baker, Bloom & Davis, 2016b). This strongly suggests that the referendum acted as an uncertainty shock to the British economy. Similarly, the ROI saw a significant spike in uncertainty during the same period, also amounting for the highest Irish EPU level measured since starting in 1982 until now, and reaching levels higher than those seen during the Troubles, with a spike of 223,0 EPU in 1992, compared to around 369,0 in June 2016 (Baker, Bloom & Davis, 2016a). As mentioned in the literature review, the ROI's EPU is strongly influenced by global events, and notably by policy events in the UK. Therefore, this spike can be interpreted as a spillover effect from the British EPU. Uncertainty seems to continue fluctuating in both countries throughout the rest of the Brexit process, however there is no apparent additional shock

in uncertainty in the UK which measures to the one in 2016, while the ROI's EPU reaches even higher levels in 2020.

Figure 2 shows that during the transition period in 2020, when the UK was no longer to be a member of the EU but still to remain part of the European single market and customs union, UK EPU numbers began to fluctuate somewhat, reaching above pre-Brexit uncertainty levels although remaining at significantly lower levels than during the referendum in 2016. Thereafter, following the end of the transition period in 2021, levels seem to decrease drastically. Irish EPU, on the other hand, reaches very high levels at the beginning of the transition period, exceeding those observed in the ROI during the referendum, and remaining high throughout this period. In order to understand this large difference in Irish and UK uncertainty in 2020, it might be relevant again to consider expectations emerging from the trade agreements as a result of Brexit. During the transition period, there were still new negotiations taking place regarding the future relationship between the UK and the EU and the implementation of the NI Protocol. The UK transitioning out of the EU and European single market meant a potential shift from a soft to a hard trade border between the EU and the UK, whether it be in the Irish Sea or on the island of Ireland. This would presumably lead to heightened uncertainty among the Irish population that a hard border might be placed on the island, risking resulting in the return of strict border controls or even conflict. Although the COVID-19 pandemic hit both countries during this time period in the beginning of 2020, which can be presumed to have had an impact on uncertainty, it seems likely that this large spike in Irish EPU is extensively due to border expectations as a result of Brexit negotiations, since the UK was likewise hit by the pandemic. However, it is worth noting that the pandemic additionally had a large impact on the Irish economy and related uncertainty.

4.2 Economic Policy Uncertainty and Trade

Increased uncertainty has also shown to greatly reduce international trade, as mentioned in the literature review (Novy & Taylor, 2020). In their paper, Novy and Taylor (2020) find that uncertainty shocks are accompanied by drops in industrial production and negative shocks to trade, but that the impact on trade is significantly larger than that for industrial production. Additionally, they provide evidence that uncertainty shocks justify the larger volatility of trade in comparison to domestic economic activity, including output. Crowley, Exton and Han (2020)

explore the idea that renegotiations in relation to trade agreements generate uncertainty. Using the case of the Brexit referendum, they show a reduction in exports resulting from the uncertain trade policy caused by the unanticipated vote to leave the EU in 2016. This as a result of lower entry into, and higher exit from, EU markets by UK exporters, who were no longer assured free trade with the EU (Crowley, Exton & Han, 2020).

Graziano, Handley and Limão (2018) show the effects of trade disagreements and reversals in trade policy on trade integration, using Brexit uncertainty as an example. They discuss the positive relationship between trade agreements and economic integration, and accordingly the reverse outcome in the case of policy disagreements. They consider Brexit as an instance of the latter, that is they consider the UK leaving the EU as a disruption of a long-established trade commitment. The considerable policy uncertainties associated with trade agreements may lead to trade disintegration and even disruptions in the agreements. The authors find that the uncertainty around Brexit in terms of the probability of it occurring has led to a decline in trade flows and exports between UK and the EU (Graziano, Handley and Limão, 2018). They stress this ability of policy expectations alone to cause considerable changes in trade flows. This paper will explore this conception of changing trade flows within the UK, as well as between the UK and the ROI, on account of Brexit uncertainty both before and after the UK's withdrawal from the EU.

4.3 Formulation of Theoretical Framework

The overall finding in the uncertainty literature is that economic policy uncertainty has a negative impact on economic activity. Additionally, several authors seem to suggest that its impact on trade is significantly large in relation to other economic factors. Using this information, along with data on EPU numbers and effects of heightened uncertainty, this paper will explore whether the policy uncertainty stemming from trade agreements and associated renegotiations will decrease trade in the countries most affected by Brexit, specifically GB, NI and the ROI.

Table 4: Effects of Economic Policy Uncertainty shocks on alternative variables

Effect (in %)	Source	Note
Employment		
-0.35	Baker, Bloom & Davis (2016c)	Effect foreshadowed in the US over a period of 6-7 years
-1.0	Bloom (2009)	Effect after 6 months
-0.6 to -2.2	Alexopoulos & Cohen (2015)	Maximum impact on employment, felt around the 20th month
-0.14	Caggiano et al. (2017)	Peak response in recessions, nonlinear effect on EPU shocks on unemployment
Investment		
-6.0	Baker, Bloom & Davis (2016c)	Effect foreshadowed in the US over a period of 6-7 years
-3.5 to -9.7	Alexopoulos & Cohen (2015)	Estimations of what a shock similar to the size of 9/11 would cause
-1.5	Cho & Kim (2023)	Effect within a year
Industrial production		
-1.1	Baker, Bloom & Davis (2016c)	Effect foreshadowed in the US over a period of 6-7 years
-1.0	Bloom (2009)	Estimated effect in the following 6 months after a shock
-0.5 to -1	Alexopoulos & Cohen (2015)	Estimations of what a shock similar to the size of 9/11 would cause
-1.1	Caggiano et al. (2017)	Peak response in recessions
Trade volumes		
*-10.0	Novy & Taylor (2020)	12 months after global economic crisis, trade fell by 20%, half of which can be explained by uncertainty (*percentage effect not explicitly stated in paper)
Imports		
-3.3	Tam (2018)	Long-run decline in US imports due to US EPU shock
-3.6	Tam (2018)	Long-run decline in Chinese imports due to US EPU shock
Exports		
-3.2	Tam (2018)	Long-run decline in US exports due to US EPU shock
-6.0	Tam (2018)	Long-run decline in Chinese exports due to US EPU shock
Output		
-1.0	Bloom (2009)	Estimated effect in the following 6 months after a shock
-1.5	Lennard (2020)	Peak fall in output after 6 months
-1.0 to -4.5	Alexopoulos & Cohen (2015)	Estimations of what a shock similar to the size of 9/11 would cause
-0.8	Cho & Kim (2023)	Effect lasts for approximately 5 quarters

Note: Some of the sources use different measurements of Economic Policy Uncertainty and will therefore not be able to compare exactly

Table 4 has been created combining numerous findings from existing literature and shows how several macroeconomic variables, namely employment, investment, industrial production, output and trade, are affected by an increase in economic policy uncertainty or by an EPU shock. The effects are shown in percentages and have been measured or estimated over different periods of time. Although the peak responses vary in time and size, the overall result observed is that an increase in economic policy uncertainty has caused declines in all the macroeconomic variables explored, supporting the general conclusion in previous literature.

In their paper, Novy and Taylor (2020, pp. 749-750) estimate the effects of trade specifically as a result of uncertainty shocks. The authors estimate that global trade decreased by 20% in the first year after the global economic crisis, during the Great Trade Collapse, and focusing on the impact of uncertainty shocks, they find that "up to half of the unusually large decline in trade in 2008–2009 was in response to this spike in uncertainty". Based upon this finding, this paper suggests that it is reasonable to assume that at least 10% of the decrease in trade volumes during this time could be explained by the associated uncertainty shock, proving significantly useful for the development of this theoretical framework.

Comparing the size of the effects on the economic variables used in the table, it is evident that trade is hit the hardest by an increase in uncertainty, showing the highest percentage declines. While the 10.0% decrease in trade volumes measures the largest effect of an EPU shock, the percentage declines in imports and exports due to US EPU shocks, estimated by Tam (2018), likewise show significantly high in relation to other economic variables. EPU shocks were also estimated to have a rather large impact on investments, as demonstrated in the table, although still not as high as on trade.This perception of EPU and trade supports the conclusion reached by Novy and Taylor (2020), suggesting significantly higher effects of uncertainty on trade levels in comparison to other economic factors. Moreover, the possibility of uncertainty in one country to affect not only its trading partners' trade volumes, but also the trade of countries to which they have only indirect trade relations, shows the considerable impact uncertainty has on trade. Tam (2018), in an article exploring the impact of EPU on global trade flows, demonstrates declines in imports and exports in the US and in China due to a US EPU shock. The author is therefore demonstrating these spillover effects of uncertainty between countries, which can occur both

through direct channels, such as trading partners, and indirect channels, such as income or exchange rate channels.

Assuming that uncertainty shocks affect trade to a greater extent than other economic activity, based on findings and estimations derived from previous literature, this paper will explore whether several uncertainty-generating events, such as renegotiations in trade and policy agreements, during the Brexit timeline can be considered the reason behind, or contributors to, potential reductions in trade. Ultimately, we expect uncertainty to have a large impact on trade volumes, likely resulting in trade contractions between affected regions. However, in reference to the border expectations, we might expect trade to react differently, for example by increasing on the island of Ireland due to further trade integration and trade moving from the UK to the ROI.

5. Methods and Data

5.1 Methodology

This research paper will use a case study approach in order to interpret and illustrate the relationship between trade agreements and uncertainty, as well as the consequential impact on trade volumes between regions. As explained by Yin (2003, p. 9), a case study is the preferable research method to use when the researcher intends to answer a "how" or "why" question which concerns a contemporary event over which the researcher has limited to no control, which seems suitable for the research question of this paper. When designing a case study there are several aspects to consider. Firstly, the research question often determines whether the case study will be of an exploratory (what) or explanatory (how or why) nature (Yin, 2003). Therefore, the research question of this study, namely "how does uncertainty around Brexit impact cross-border trade between Ireland and the regions of the UK economy?", is of explanatory nature according to the author, and intends to explain the outcomes of increased uncertainty and decreased trade volumes in the regions, rather than intending to simply identify or quantify them (Yin, 2003). Secondly, establishing the proposition of the case study determines what will be examined in the research (Yin, 2003). The proposition, or the purpose, of this study is to attempt to explain the influence of trade negotiations and associated uncertainty on trade. Furthermore, the unit of analysis for the case is determined in order to guide the research design and the collection of data (Yin, 2003, p. 23). The "case" of this research paper is Brexit and the key events surrounding it, and the unit of analysis of the study will be the trade flows within the UK regions between the UK and the ROI, specifically trade between the ROI and GB and trade between the ROI and NI, although trade between NI and GB will also be considered for the purpose of discussion. This is done in order to separate trade on the island of Ireland, between ROI and NI, and trade between ROI and the rest of the UK regions. Although Brexit is the case being explored, the chosen time frame for the collection of trade volume data is between 2010-2022 in order to differentiate between trade prior to, during and after key events associated with Brexit, which took place over a longer period of time, starting officially with the referendum in 2016.

Hence, the theoretical framework will be used in order to explore under which conditions trade agreements can impact import and export volumes and how this impact can differ between regions. This is done by incorporating the concept of economic policy uncertainty into the case to be able to determine to what extent the impact of disruptions in trade agreements can affect trade through heightened uncertainty or related shocks. A timeline of key Brexit events will be created and interpreted in the context of uncertainty in order to identify uncertainty-generating events in relation to Brexit and associated trade agreements. Data on import and export volumes between ROI and GB, and ROI and NI, will be presented using graphs in order to compare the impact on trade volumes in the studied regions. Since this paper assumes that increased economic policy uncertainty has a larger effect on trade than other economic factors, as established in the formulation of the theoretical framework, this will be the sole economic factor being explored. Therefore measuring and interpreting the impact on trade will be used to consider the impact of uncertainty-related events and negotiations on trade volumes.

5.2 Data

The quantitative data used in this study has been collected from secondary sources. The data on levels of uncertainty was retrieved from the Economic Policy Uncertainty index created by Baker, Bloom and Davis (n.d.), providing datasets for monthly EPU numbers in the respective regions. Baker, Bloom and Davis' (2016c) journal article, in which they present their EPU index, is published in the Quarterly Journal of Economics and in their database, Baker, Bloom and Davis (n.d.) provide the EPU indices for several countries and regions in the world. All trade data was collected from the Central Statistics Office (CSO) (Central Statistics Office, n.d.). The CSO is the national statistics office of Ireland which works towards the objective of collecting, analysing and providing access to statistical data concerning the Irish population and its economic and social situation (Central Statistics Office, 2023). First, data on the value of merchandise trade was gathered for imports and exports between the ROI and GB, and between the ROI and NI, between the years 2010-2022. However, the monthly data for the trade between the chosen regions only existed between 2015-2022, and in order to see any trade patterns prior to the Brexit referendum, it was necessary to look at data prior to 2015. Therefore, yearly trade data was collected for the time period between 2010-2014, and indices were created such that benchmark points were used to demonstrate linear growth to display, or act as, monthly values.

In order to obtain the volumes of trade between the countries, which were not provided by the CSO directly, trade values had to be deflated using a trade price index. The data for trade price indices were similarly collected from the CSO and for the same time period.

Qualitative data used in this study has likewise been collected from secondary sources, including government reports and publications from economic institutes for country-specific data. In order to find important information and specific dates around Brexit, a report made by Walker (2023) in the House of Commons Library was used in order to create a timeline of what can be interpreted as key events surrounding the Brexit process. For this case, key events, mainly in the form of renegotiations, are largely interpreted as potential uncertainty-provoking events.

5.3 Limitations of Case Study Design and Data

There are several limitations associated with the methodology, namely the case study design, and with the choice and collection of data used for this research paper. Yin (2003, p. 10) provides several general concerns established regarding the method in his book, and one such concern which could affect the quality of this study is that case studies in general produce a very limited foundation for "scientific generalisation", which implies that it is difficult to generalise from one isolated case or event. This concerns the present case study such that the effect of trade agreements associated with Brexit and the related economic policy uncertainty on trade volumes cannot be generalised to all trade agreements, hence creating a lack of external validity. He explains however that case studies, in comparison to other designs, use a theoretical framework in order to generalise upon a conception, rather than for example a sample representing a population. Hence the aim is rather to develop or validate existing theories (Yin, 2003). This makes it easier to narrow down the findings and derive general conclusions from them.

The external validity of this study is enhanced by considering the effect not only on one region but on three different regions, namely the ROI, NI and Great Britain. This provides findings for the impact on additional regions affected by the agreements and also the difference on the impact between regions within the political union, the UK, and outside it, on the ROI. However, although this study is not intended to generalise upon trade agreements, it is important still to recognise that the theoretical framework used in this research and the data collected are not

representative of the impact of uncertainty on trade for other trade agreements or similar events. Another limitation of the methodology of this research paper is that it does not statistically test the macroeconomic effects of uncertainty on trade, but rather presents the data in light of what previous literature presented in the literature review suggests. This means that the findings of this paper relies on data and findings collected by other authors and from pre-existing sources, adding to the lack of reliability of the findings.

5.4 Validity and reliability

The sources used for the collection of data are collected from reliable sources. The CSO is the national statistics office in Ireland, which collects statistical data under the 'Statistics Act, 1993', meaning that the data published will be in compliance with statistical standards (Central Statistics Office, 2023). This creates validity to the trade data collected and hence increases the reliability of the findings. As mentioned, Baker, Bloom and Davis' (2016c) article on their EPU index is published in the Quarterly Journal of Economics, which is the oldest journal of economics and at the top in its field, also making it a valid and reliable source.

As previously indicated, the trade data taken from the CSO is only available in monthly values from 2015 onwards for the regions studied. This means that the yearly trade volumes between 2010-2014 had to be estimated using linear interpolation in order to create monthly values. This can create a lack of validity of the specific volumes presented in the trade data, although only up until 2015, which is still prior to the start of Brexit and therefore does not affect the findings of the research to a large extent. There is also no data available for the volume of trade between the different regions in the UK, such as trade between NI and GB, which means that the reliability of the findings regarding trade across the Irish Sea border is weakened as this will rely on the validity of other sources' findings, although sources are selected carefully. Nevertheless, this is taken into account in the methodology of the paper, as the intention is merely to measure the trade volumes between the ROI and GB, and the ROI with NI.

6. Findings and Analysis

The Brexit process has not been a straightforward one due to complexities in terms of agreements and regulations as well as delays and political division. In order to explore whether possible uncertainty-generating events or renegotiations related to Brexit have contributed to the trade reduction in the UK and the ROI, a timeline has been created displaying the key events of the Brexit process, from the referendum in 2016 up until the end of the transition period in 2021. This is created in order to consider which were the probable uncertainty-generating events, and hence to analyse what impact they might have had on trade volumes by comparing the timeline to a graph of import and export volumes between 2010-2022 in the regions.

The timeline, displayed in Figure 4, starts with the Brexit referendum in June 2016, which has already been shown to act as an event generating high uncertainty levels in both the UK and in the ROI, and which supports the heightened EPU levels in both countries during the same time period, as shown in Figures 2 and 3 created in Section 4.1. The timeline thereafter presents several of the renegotiations experienced between the UK and EU throughout the time period, in which numerous extensions of the withdrawal were agreed upon, postponing the start of the transition period. Moreover, it presents two elections since the start of the referendum, both in which a new prime minister has been elected. A change in political leader during a policy shift of this magnitude can likely contribute to uncertainty about future policy conditions, perhaps also reducing trust and creating scepticism towards the process and implementation. The Brexit transition period started in January 2020, when the UK was to leave the EU but remain part of the European single market until the end of the period. During this period, Figures 2 and 3 have similarly shown us that the UK's and the ROI's EPU levels increased, although to a significantly larger extent in the ROI. This increase can likely be associated with border expectations, as previously mentioned, and supports the notion of heightened uncertainty on account of key events during Brexit.

The transition period ended in December 2020, which marks the date when the UK officially left the EU single market and customs union (Walker, 2021). Therefore, the end of this period marks the beginning of the future trade relationship between the UK and EU, which nevertheless seemed to be an indefinite one. Ultimately, the timeline portrays numerous events throughout the
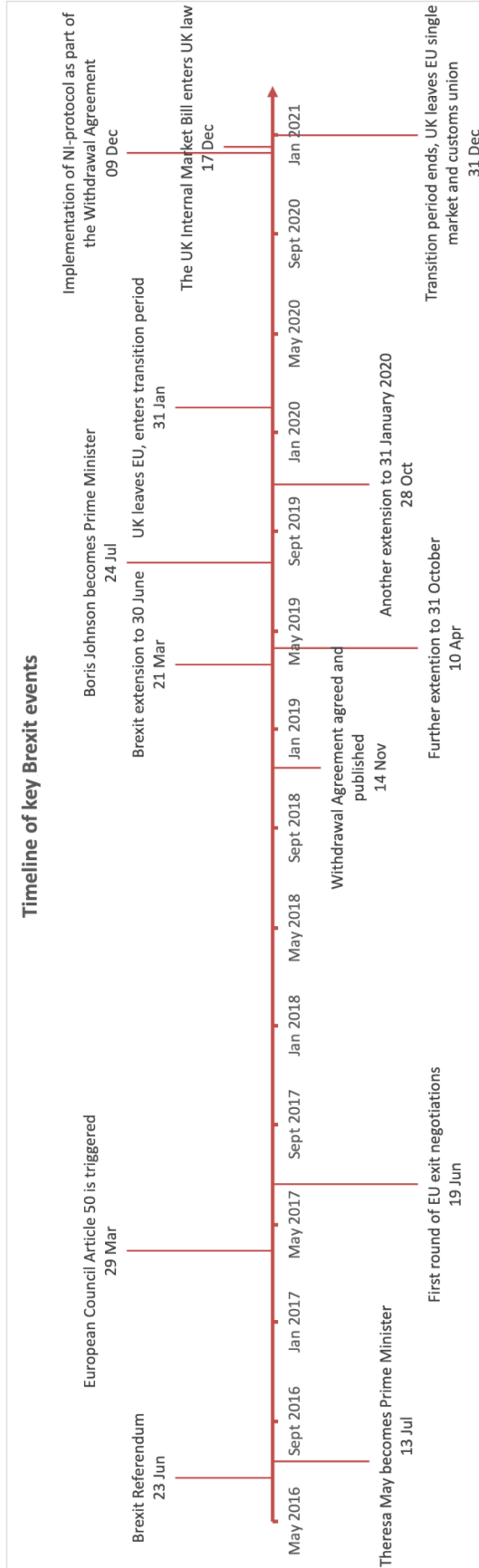
Timeline of key Brexit events

May 2016 · Sept 2016 · Jan 2017 · May 2017 · Sept 2017 · Jan 2018 · May 2018 · Sept 2018 · Jan 2019 · May 2019 · Sept 2019 · Jan 2020 · May 2020 · Sept 2020 · Jan 2021

Brexit Referendum
23 Jun

Theresa May becomes Prime Minister
13 Jul

First round of EU exit negotiations
19 Jun

European Council Article 50 is triggered
29 Mar

Withdrawal Agreement agreed and published
14 Nov

Further extention to 31 October
10 Apr

Brexit extension to 30 June
21 Mar

Another extension to 31 January 2020
28 Oct

Boris Johnson becomes Prime Minister
24 Jul

UK leaves EU, enters transition period
31 Jan

Transition period ends, UK leaves EU single market and customs union
31 Dec

Implementation of NI-protocol as part of the Withdrawal Agreement
09 Dec

The UK Internal Market Bill enters UK law
17 Dec

Figure 4: A timeline of key Brexit events

Note: The dates are taken from the Brexit timeline created by the House of Commons Library but the design is the author's own work

Source: Walker (2021)

process with the potential consequence of generating uncertainty shocks. Here it can be considered which were the positive and which were the negative shocks during Brexit. This can be interpreted from the perspective of expectations and policy anticipation, what can be expected from each new negotiation and agreement. In the case of the border expectations, the question to be asked is whether the border will be situated between the ROI and NI, or between NI and the rest of the UK in the Irish sea, where expectations along with a lack of knowledge about future policy contributes to policy uncertainty. Increasingly throughout the Brexit timeline, expectations seem to have been leaning toward the persistence of the Irish sea border within the UK, seen for instance through the implementation of the NI Protocol in December 2020 as part of the Withdrawal Agreement. This because the protocol primarily intends to maintain a soft border between the ROI and NI, meaning that NI would be required to have a trade policy different to that of the rest of the UK.
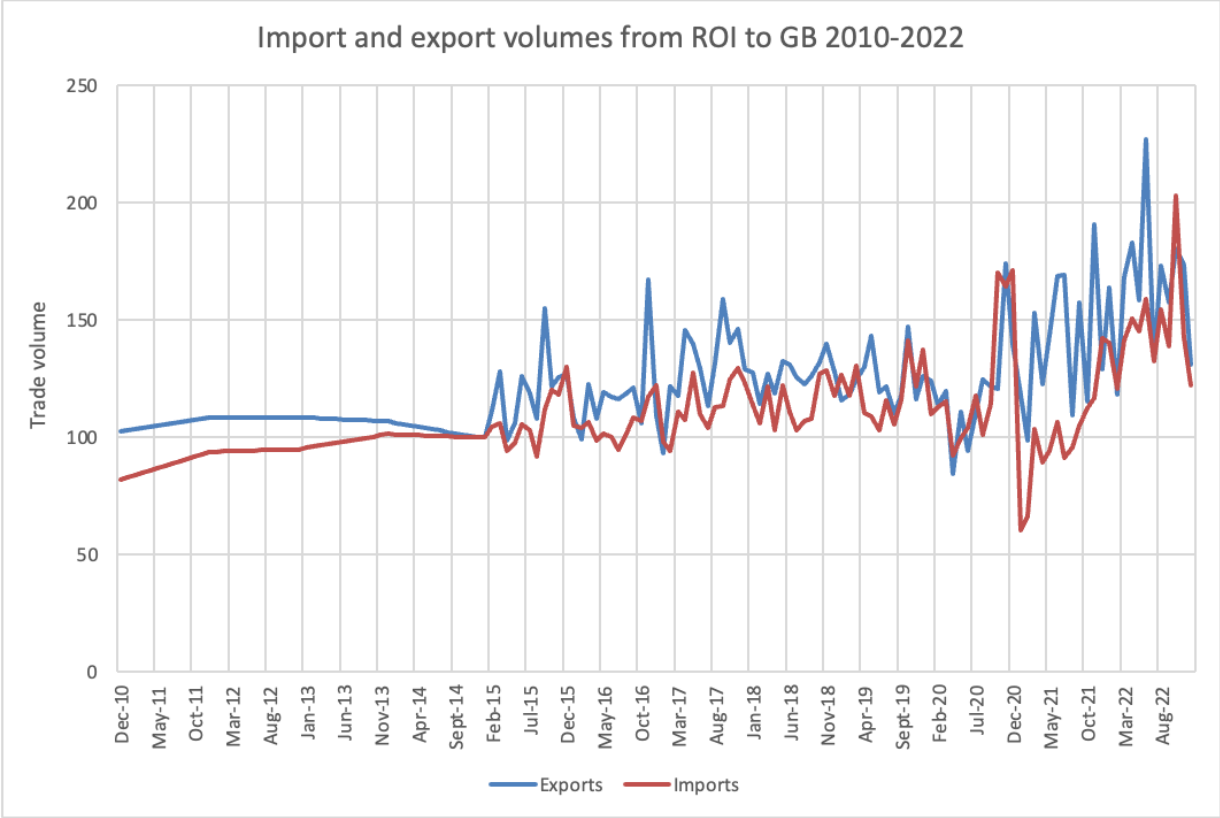

Figure 5: Import and export volumes from ROI to GB 2010-2022

Note: Trade volumes are defined as the quantity of trades which is based on the value of trades divided by a price index for trade during this period. The yearly trade volumes between 2010-2014 had to be estimated using linear interpolation in order to create monthly values

Figure 5 shows the changes in trade volumes between the ROI and GB from 2010 until 2022. Trade volumes between the ROI and GB have experienced fluctuations throughout the whole Brexit period, and even before the referendum in 2016. However the largest fluctuations in imports and exports seem to occur between the start of 2020 and onwards. Considering the Brexit timeline displayed in Figure 4, the Brexit transition period extends from January 2020 until December 2020, coinciding with this period of heavy fluctuations in trade volumes. The largest decline in imports from GB to ROI is encountered around January 2021, which is right after the end of the transition period, i.e. when GB left the EU single market and customs union (Walker, 2021). As seen earlier in Figure 2 and 3 on Irish and UK EPU, the ROI experienced a large spike in uncertainty during the transition period, while UK uncertainty did not see a spike but rather fluctuated and remained at high levels. As explained in Section 3, this spike in uncertainty in the ROI will be interpreted largely as a result of border expectations and Brexit negotiations, rather than uncertainty exclusively related to the COVID-19 pandemic. This therefore might have contributed to the large contractions in trade at the end of the transition period. Uncertainty levels were seemingly reduced after the transition period in both countries, which might also explain the simultaneous increase in trade following this period.
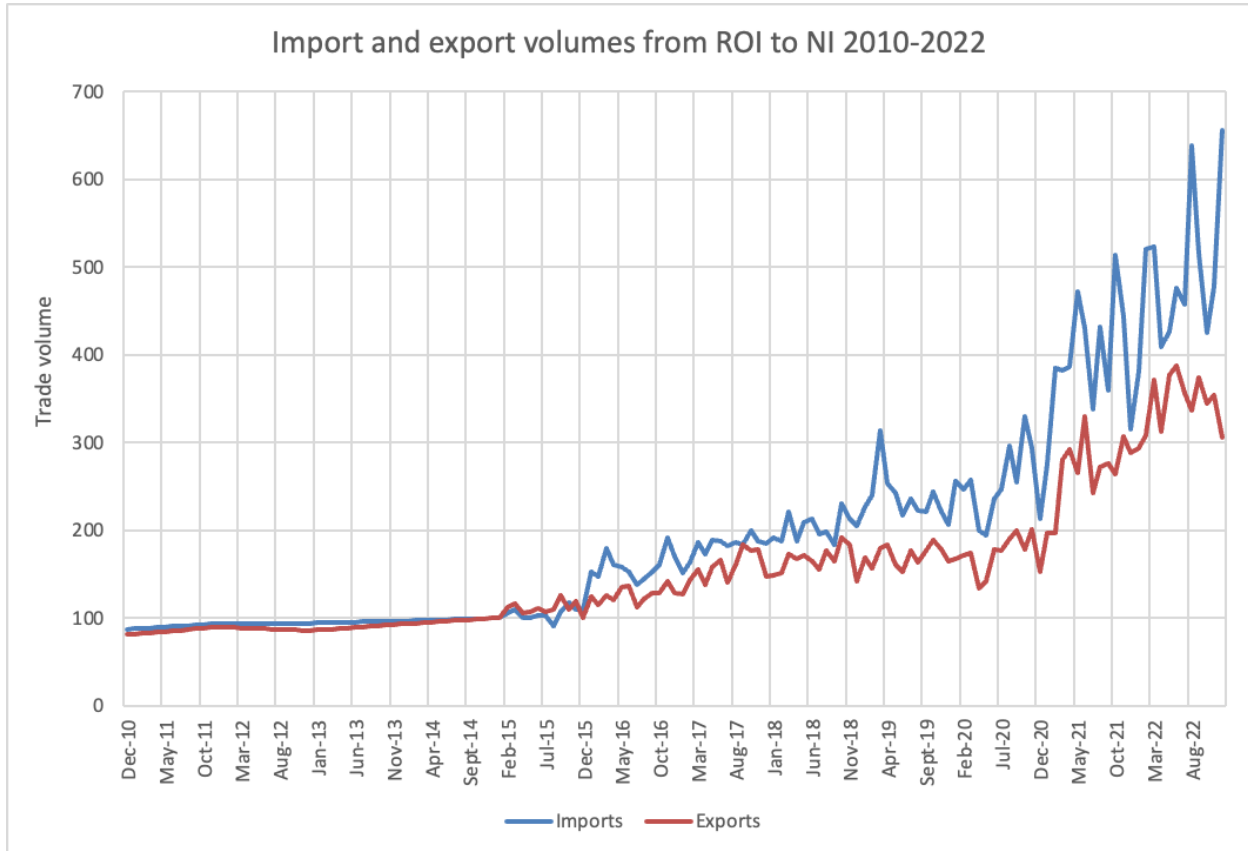
Figure 6: Import and export volumes from ROI to NI 2010-2022

Note: Trade volumes are defined as the quantity of trades which is based on the value of trades divided by a price index for trade during this period. The yearly trade volumes between 2010-2014 had to be estimated using linear interpolation in order to create monthly values

Figure 6 shows the changes in trade volumes between the ROI and NI between the same years. The changes in trade volumes observed since the start of Brexit are of major significance due to the magnitude of the changes. This can undeniably be contrasted to the trade volume changes between the ROI and GB seen in Figure 5, such that the trade volumes between the ROI and NI experience considerably higher trade volume increases. Prior to Brexit, import and export volumes were markedly lower and remained at a more consistent level. Thereafter we see a continuously upward trend in both, although import volumes are higher. There is a peak in imports in the month following the referendum in 2016. Subsequently, a larger peak in imports can be observed in March 2019, which from the timeline is shown to be around the first extension of the Brexit date requested by Theresa May and agreed and granted by EU27 leaders (Walker, 2021). After December 2020, both imports and exports start increasing, experiencing

larger fluctuations in volume. As mentioned, the end of 2020 marks the end of the transition period, meaning that trade volumes across the Irish border increase after Brexit, when GB has left the European single market, which NI remains part of to protect its relationship to the ROI.

In order to compare trade volume changes and the associated growth rates between periods as well as regions, the studied years are divided into two different time periods. In the period between December 2010 and May 2016, i.e. the period prior to the start of Brexit, import volumes between the ROI and GB increased by 24% and export volumes by 16% overall, which can be seen in Table 5, in complement to Figure 5. In the subsequent period between June 2016 and December 2022, marking the Brexit period and the years after it, imports increased by 22% and exports by 11% overall. This means that growth rates were higher prior to Brexit between the ROI and BG, although trade volumes have not changed significantly over the entire period. In contrast, import volumes increased by 81% and export volumes by 67% overall between the ROI and NI in the pre-Brexit time period, and in the following period imports increased by 331% and exports by 122% overall, showing massive increases and larger growth rates since the start of Brexit up until recently. This can be seen in Table 6 in addition to Figure 6. Therefore, in contrast to Figure 5 showing GB and Irish trade, Figure 6 suggests a rather long-term change regarding import and export volumes traded between the two regions, due to the magnitude of the change. Although the increase is relative in comparison to trade with GB, such that the traded volumes with the GB are larger, this change implies a more long-term transformation in the trade pattern and relationship between the ROI and NI, again suggesting a strengthened economic relationship between the two regions.

Table 5: The percentage increase in trade volumes between GB and the ROI 2010-2022

Time period:	Change in Imports (in %)	Change in Exports (in%)
Dec 2010 - May 2016	24.2	16.2
June 2016 - Dec 2022	21.7	11.4

Note: The time period between December 2010 and May 2016 marks the pre-Brexit period and between June 2016 and December 2022 marks the Brexit process

Table 6: The percentage increase in trade volumes between NI and the ROI 2010-2022

Time period:	Change in Imports (in %)	Change in Exports (in%)
Dec 2010 - May 2016	81.9	67.3
June 2016 - Dec 2022	330.9	122.2

Note: The time period between December 2010 and May 2016 marks the pre-Brexit period and between June 2016 and December 2022 marks the Brexit process

The considerably large increase in trade volumes between the ROI and NI since the start of Brexit is of great significance for the findings of this research. This increase, along with the observed trade volume changes between the ROI and GB can be related back to the border expectations mentioned throughout the paper. Increased uncertainty regarding the creation of a land border with the EU, which would become the Irish Sea border between NI and GB, seems to have reoriented Northern Irish trade away from Great Britain towards the Irish island. In figure 5 it is easier to see the effect of increased uncertainty levels on trade. It seems that the Brexit transition period acted as an uncertainty shock to the economies, perhaps due to the drastic change in border expectations resulting from the UK's withdrawal from the EU, creating a transition away from the single market, causing considerable drops in trade, especially in imports.

7. Discussion

The aim of this paper has been to investigate the impacts of renegotiations regarding trade agreements on trade volumes, and by conducting a case study design on Brexit, to explore the relationship between increased uncertainty as a result of trade negotiations and trade volumes between the ROI and regions of the UK. Since the start of the Brexit process with the referendum, numerous trade agreements have been established and renegotiations made which have been seen as necessary to the process. New trade policy and changing border expectations within the UK have resulted from the NI Protocol and several other trade renegotiations along the timeline of Brexit. This in turn has created significant increases in the economic policy uncertainty in the UK, which was shown in Section 4.1 in the formulation of the theoretical framework. This increase occurred in the form of uncertainty shocks, with the major one taking place in June 2016 as a direct consequence of the Brexit referendum. The border expectations and changing trade policy have additionally affected uncertainty in the ROI due to spillover effects, namely through the direct channel of the UK, being one of its key trading partners. The major uncertainty shocks in the ROI took place first during the referendum and thereafter at the start of the Brexit transition period. This resulting increase in Irish EPU can in large part be explained by the long history of conflict and resulting trade agreements between the ROI and NI, along with the rest of the UK.

The increases in EPU prior to the withdrawal of the UK from the EU do not seem to have had a direct negative effect on the trade volumes between ROI and GB or between ROI and NI. Despite this we see increased fluctuations in trade volumes leading up to Brexit, which can potentially be related to the changing expectations of the future trade relationships between the regions as a result of the several renegotiations along the timeline, generating uncertainty around future policy. One key expectation seems to be the placement of the hard trade border between the European single market and the UK, such that while the introduction of the NI Protocol might prevent a hard border on the Irish island between ROI and NI, it might instead be placed in the Irish Sea, between NI and GB. There is however a large decline in imports from GB to the ROI around January 2021, immediately after the end of the Brexit transition period, which therefore seems to happen right after the large spike in Irish EPU demonstrated in Figure 3 in

Section 4.1. Trade volumes between ROI and NI, on the other hand, seem to increase gradually from the referendum onwards. This is displayed by a large peak in imports from NI to ROI following the referendum, and subsequently increases in both imports and exports after December 2020 onwards, i.e. after the end of the transition period. This implies that trade volumes increased across the Irish border, between the ROI and NI, after the withdrawal of the UK from the EU, and the withdrawal of GB from the European single market.

The findings therefore show that trade between the ROI and NI has increased continuously since the start of Brexit and that the reason for this might be in view of the changed expectations due to uncertainty around border location. As a result of the revised NI Protocol, under which the Irish sea border was created in order to prevent a hard border on the Irish island, it seems that trade has been redirected towards the Irish border, which has been shown by the increase in trade between the ROI and NI, and the simultaneous reduction of trade between the ROI and GB. As previously mentioned, Duparc-Portier & Figus (2020) suggest that exports between GB and NI likely have decreased since the introduction of the NI Protocol due to trade frictions as a result of dissimilar trade policies and increased divergence, where several businesses in GB strongly reduced their exports to NI. This supports the findings of this research paper regarding the shift in trade away from the Irish Sea, between NI and GB, due to increased EPU and border expectations. Similarly, Graziano, Handley and Limão (2018) mention that Brexit can be considered a form of trade disagreement between the UK and the EU, such that it portrays a disruption in a longstanding trade agreement. They further mention the positive relationship between trade agreements and economic integration. The findings of this research paper supports this concept, suggesting that while NI is still politically integrated with the UK, it is becoming more economically integrated with ROI on the Irish island as a result of a trade agreement in the form of the NI Protocol.

The present case study of Brexit and related trade flows, based on a theoretical framework that assumes that uncertainty shocks affect trade to a greater extent than other economic factors, aimed to explain whether EPU can be assumed a reason behind the reduction in trade resulting from renegotiations and new trade agreements in a process such as that of Brexit. The findings suggest that this can to some extent be shown in trade volumes between GB and ROI, where

drops in trade volumes, particularly in import volumes, could be seen in the period after the Brexit transition period, during which EPU numbers were high in in both regions, particularly with a large peak in Irish EPU. However, the findings regarding trade between ROI and NI do not support the expected outcome, where trade between the two regions rather increased during periods of uncertainty. Although this increase might be explained by the redirection of trade from the Irish Sea to trade across the Irish border on the island of Ireland, it might be further explained by border expectations reducing uncertainty regarding this border, increasing trade integration between the two regions, while increasing trade disintegration between NI and the rest of the UK. Despite NI's increasing trade disintegration with GB, it can be discussed whether this new trade arrangement might in reality be of benefit to the NI economy, as discussed in the literature review in relation to the results presented by Duparc-Portier and Figus (2020). This would be due to NI's increasing trade integration not only with the ROI as a result of the NI Protocol but also with the rest of the EU, remaining in the European single market.

To summarise the findings of this case study, given the background and historical context of the trade relations and economic integration between ROI and UK regions, it could be concluded that the outcome of Brexit in terms of changing trade volumes is rather specific to the studied case of Brexit and the associated trade agreements. However, it is worth considering the future implications of the findings, where it might be applicable to future trade agreements, especially within the EU. It could perhaps be questioned whether the EU should in fact agree to a trade arrangement similar to this one, where part of a nation can remain part of the EU and its single market for goods. Additionally, it can be questioned whether the UK should have voted to leave and carry through with Brexit under the inevitable circumstance that one of its regions in reality was not able to leave the EU in order to protect its border from conflict. Yet another concern which is worth considering is the consequent dilemma which Brexit brings about, such that it seems difficult that NI can stay politically and economically integrated with the rest of the UK in the case that it stays within the European single market, unlike GB. On the other hand, if they leave the single market, they risk reintroducing a deep-rooted conflict with ROI on the Irish border, as well as further trade disintegration with the rest of the EU. For future research on this topic it would be of considerable interest to also study the change in trade volumes between NI and GB as a result of Brexit in order to further investigate the relocation of trade from the Irish

Sea towards the Irish border. Furthermore, it might be of interest to look at possible changes in trade volumes and economic integration between Scotland and GB, considering that the Scottish population similarly voted to stay in the EU. Potential disagreements regarding trade policy and consequent uncertainty around it could therefore be considered.

8. Conclusion

The aim of this research paper was to explore the effects of Brexit on cross-border trade between the ROI and regions in the UK economy. The case study approach was used with the intention to explain the relationship between trade agreements and EPU. This was further considered through the use of a theoretical framework, which was built on previous research findings showing a larger effect of uncertainty shocks on trade in relation to other economic factors. Therefore a timeline was created in order to consider whether key Brexit events increased EPU and consequently contributed to trade reductions in the chosen regions. During the Brexit referendum in 2016, the unexpected vote of the British population to leave the EU Single Market created concerns of possible disruptions in trade agreements. On the Irish island, the fear of a hard border, previously associated with the militarisation and control by the British Army of the border during The Troubles in NI, created large increases in EPU numbers as well as uncertainty regarding the border expectations. Therefore, with the withdrawal of the UK from the EU, there were growing concerns that this hard trade border between NI and the EU posed a threat regarding the reemergence of violence on the Irish island. The consequent establishment of the NI Protocol, created to maintain the rules of the GFA in order to avoid the reemergence of violence and political conflict on the island of Ireland, created new expectations of an emerging trade disintegration between NI and the rest of the UK. As a consequence of this new trade barrier within the UK, there were further worries associated with the trade union between NI and GB, yet again creating uncertainties regarding trade border expectations and disruptions of trade agreements. Therefore, as a consequence of Brexit, uncertainty has been created concerning whether a trade border would be located on the Irish island, threatening the political relations in the region which have been kept since the GFA in 1998, or in the Irish Sea, compromising trade within the union of the UK.

From the findings of this research, it is evident that expectations are leaning more and more towards a trade border in the Irish sea, and trade agreements seem to lean more towards the NI Protocol, protecting the GFA and political stability on the island of Ireland. The presented data regarding trade volume changes since before the start of Brexit suggest that trade between ROI and GB decreased in periods of heightened uncertainty, but has increased again since. In

contrast, it shows that trade between the ROI and NI has increased to remarkable levels, where imports have increased by 330% since the Brexit referendum. With regards to the theory of this study, it was expected that uncertainty would affect all regions similarly, namely by causing trade reductions in terms of negative uncertainty shocks to the economies. This effect can be seen to a limited extent in trade volumes between the ROI and GB, where large drops in import and export volumes are seen, responding to heightened EPU levels. The trade effects between the ROI and NI, on the other hand, show more unexpected results, which seem to support the idea of increased trade volumes in response to increased trade integration between the two regions since Brexit. It seems possible to suggest that NI might be taking advantage of its unique position, which has resulted in increased trade integration with the EU market while benefiting from the NI Protocol. This suggests that NI staying within the European single market, and under the agreements of the protocol, can experience increased trade integration within the EU and consequently gain boosts to the economy.

Hence, while trade between the ROI and GB responds to uncertainty caused by Brexit in a way that supports the theoretical framework of this paper, NI rather acts like an experiment in the process and to this theory, where the related trade agreements have shown that the public sentiment is not uncertain, but rather moving towards an EU alignment. Although trade volumes start to increase again also between the ROI and GB after the large uncertainty shocks, the percentage increase does not compare to that of trade between the ROI and NI. Hence, while being politically integrated with GB in the UK, NI is becoming increasingly economically integrated with the ROI, and the uncertainty shock of Brexit has reorientated trade from the UK internal market to the Irish border, between the North and the South. This has created the assumption that the NI Protocol will hold, changing the future UK trading relationship. Therefore, in order to answer the research question of this paper, "how does uncertainty around Brexit impact cross-border trade between Ireland and the regions of the UK economy?", it can be concluded that the cross-border trade relations have changed to a large extent as a result of Brexit, indicating long-term consequences, however that it might not be possible to conclude uncertainty to be the main driver behind this change, although it can be considered a large driver behind border expectations, impacting future trade policy and economic integration, thus impacting trade relations.

For future research on uncertainty shocks associated with trade agreements, an in-depth analysis of the Brexit referendum along with the Brexit process will be necessary to determine the positive and negative shocks during Brexit, and to what extent they have an impact on the trade relationships within the UK, in the short and long term. Finding trade data between the regions of the UK, specifically between GB and NI concerning this research, is of great importance to provide evidence suggesting a reorientation of the trade flows from the Irish Sea border to the border on the Irish island.

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