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How did the Brexit uncertainty impact services exports of UK firms?

Jun Du[1,2] · **Oleksandr Shepotylo**[1,2] · **Xiaocan Yuan**[1,3]

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Abstract
This paper examines the impact of Brexit-related uncertainty on the UK's trade in services, with a focus on how different types of international business policy uncertainty (IBPU) influence export participation and intensity. Leveraging a novel conceptual framework, we integrate multiple layers of uncertainty—including regulatory, legal, and market-based factors—into an analysis of UK firms' strategic decisions in an open economy. Drawing on firm-level data from Bureau van Dijk's Orbis database and a synthetic control method, we estimate that Brexit uncertainty led to a 9.2% annual reduction in UK services exports, equivalent to a cumulative loss of USD 146.8 billion between 2016 and 2019. Our findings show that Brexit-related uncertainty disproportionately affected small and medium-sized enterprises (SMEs), while multinational enterprises (MNEs) were more likely to relocate operations outside the UK, exacerbating trade declines. This research highlights the critical role of transparent and predictable regulatory frameworks, risk management policies, and transitional support measures to mitigate the adverse effects of prolonged uncertainty. By identifying the specific mechanisms through which uncertainty shapes export decisions, this study offers key insights for policymakers aiming to foster resilience in the UK's services trade post-Brexit.

Keywords Brexit · International business policy uncertainty · Synthetic control · Services trade · Internationalisation · Multinationals relocation · UK

Introduction

The Brexit referendum on 23 June 2016 marked the beginning of the United Kingdom's economic disengagement from the European Union (EU), ending a 44-year partnership that shaped a close economic relationship. This departure from the EU's integration agenda has the potential to reshape the UK's trade relationships, both with the EU and the global economy.

This paper investigates the impact of Brexit uncertainty on the UK's international business activities, particularly on services exports. While the economic consequences of Brexit on goods trade have been widely debated and studied, its influence on the services sector remains underexplored. This is concerning, given that services account for two-thirds of the UK economy, a third of the UK's exports, and play a critical role in job creation and value-added activities (Douch et al., 2020). The lack of research into the effects of Brexit on services is especially striking, as the UK is the world's second-largest exporter of services after the US (UKICE, 2024).

The debate around Brexit's effects on services trade remains unresolved. Some argue that the four-and-a-half years of Brexit-related uncertainty between 2016 and 2020 had a limited impact on services trade due to minimal policy changes during this period and opportunities for services growth, particularly in digital and financial

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✉ Jun Du
j.du@aston.ac.uk

Oleksandr Shepotylo
o.shepotylo@aston.ac.uk

Xiaocan Yuan
xiaocan.yuan@wbs.ac.uk

[1] Centre for Business Prosperity, Aston University, Aston Street, Birmingham B4 7ET, UK

[2] Economics, Finance and Entrepreneurship Department, Aston Business School, Birmingham, UK

[3] Warwick Business School, Scarman Road, Coventry CV4 7AL, UK

sectors (e.g., The Economist, 2023)[1]. The uncertainty was mainly linked to anticipated regulatory divergences, which varied across sectors. For instance, the financial services sector saw deregulation as a potential opportunity, while sectors like transport services feared reduced market access. As such, studies like those by Dhingra and Sampson (2022) found no evidence of trade diversion during this period.

On the other side of the debate, scholars contend that Brexit uncertainty had a more profound effect on services trade, particularly because of the UK's departure from the EU's Single Market and Customs Union. Services trade relies heavily on regulatory alignment, the free movement of people, and deep trade liberalisation within the EU. Consequently, Brexit's impact on services may have been underestimated[2], with some studies pointing to significant contraction risks in key sectors such as financial services, information technology, and transportation (e.g., Ahmad et al., 2023; Douch & Edwards, 2021; Du & Shepotylo, 2024; Kren & Lawless, 2024).

This debate is particularly important given the increasing integration of services with manufacturing, known as the "servitisation" of manufacturing, and the UK's role as a hub for multinational enterprises (MNEs) selling services into the EU. Foreign-owned businesses are responsible for over 56% of UK services exports (excluding financial, insurance, and transport services) (Lowe, 2021). Furthermore, the ability of MNEs to relocate services operations – often more easily than goods production – makes them particularly sensitive to Brexit-induced uncertainty. Evidence already shows that firms have shifted operations to Ireland and the Netherlands to maintain access to the EU market[3].

To fill the gap in the literature, this paper introduces a conceptual framework that examines how Brexit-related uncertainty has influenced UK services exports. Building on the recent editorial by Van Assche and De Marchi (2024), we conceptualise this uncertainty as "International Business Policy Uncertainty" (IBPU), a broader and more comprehensive framework than the narrower concepts of Trade Policy Uncertainty (TPU), Economic Policy Uncertainty (EPU), and market-induced uncertainty. IBPU captures the full spectrum of uncertainties affecting international business operations post-Brexit, including regulatory, legal, and market-driven uncertainties.

This study employs a multilevel empirical approach, combining firm-level data from Bureau van Dijk's Orbis database with cross-border investment data, to assess how Brexit uncertainty has impacted export participation, export intensity, and MNE relocation decisions. By linking firm-level export behaviour to MNE investment activities, we provide a detailed examination of the specific mechanisms through which Brexit uncertainty has affected UK services trade.

Our contribution to the international business literature lies in providing a nuanced understanding of how uncertainty affects trade and investment decisions, particularly in services – a sector that is crucial to the UK's economy. The findings have significant implications for policymakers and businesses alike, offering insights into how firms can navigate policy-driven uncertainties and how governments can design effective policies to mitigate the negative consequences of economic disintegration.

Brexit uncertainty: the context

EU single market membership and Brexit

The European Union's Single Market, established to facilitate the free movement of goods, services, capital, and people across member states, has long been hailed as a cornerstone of regional economic integration (In 't Veld, 2019). The UK's participation in the Single Market fostered deep integration across industries, including the services sector, which benefitted from common regulatory standards, market access, and a frictionless trade environment. These mechanisms allowed UK firms to operate within a harmonised regulatory framework, reducing the compliance burdens of adhering to individual national regulations across 28 EU member states (Tarrant & Tilford, 2018).

For the UK, participation in the Single Market was crucial, given that many sectors, including financial services, e-commerce, telecommunications, and transport, benefitted from seamless cross-border trade. The Single Market's regulatory framework went beyond traditional trade agreements, covering a broad range of service sectors and modes of supply, including cross-border trade, establishment, and movement of people. This facilitated a depth of economic

[1] See "Britain's services exports are booming despite Brexit. Why?", The Economist, 9 May 2023. https://www.economist.com/britain/2023/05/09/britains-services-exports-are-booming-despite-brexit-why?utm_medium=cpc.adword.pd&utm_source=google&ppccampaignID=18156330227&ppcadID=&utm_campaign=a.22brand_pmax&utm_content=conversion.direct-response.anonymous&gad_source=1&gclid=CjwKCAjw0aS3BhA3EiwAKaD2ZfR3oDLQP0aqRPKC2OvCjAob2VZg2fg_sxm_HRS2NULysEaVEgbF7RoCSaAQAvD_BwE&gclsrc=aw.ds.

[2] See among lots of discussions, Chris Giles interview of Jonathan Easton written in "Why Brexiters' confidence in services trade may be misplaced" in Financial Times, 24 September 2018. https://www.ft.com/content/195fa088-bd84-11e8-8274-55b72926558f.

[3] See among others, the Bloomberg report at https://www.bloomberg.com/news/articles/2021-03-02/dublin-is-top-brexit-relocation-spot-for-finance-firms-ey-says and many business services mushrooming since 2016 to help UK businesses to relocate, for example Company Bureau, Sherwin O'Riordan, at https://www.sor-solicitors.ie/corporate-commercial-law/brexit-business-relocation-advice.html.

integration rarely seen in other trade blocs (Emmerson et al., 2016). As a result, the UK's exit from the EU in 2020 not only severed its participation in the Single Market but also introduced uncertainties regarding future trade relations, regulatory alignment, and market access.

Key issues that emerged during Brexit negotiations were the future of financial services, recognition of professional qualifications, and the ability of service providers to operate freely across the EU. While the UK and EU reached an agreement on market access for goods, substantial ambiguity remained around services, which make up a significant portion of the UK's economy (Tarrant & Tilford, 2018). As the UK navigated its post-Brexit relationship with the EU, questions surrounding regulatory divergence, licensing, supply rights, and the recognition of standards became central concerns for UK service exporters.

Brexit uncertainty

The four-and-a-half-year period from the Brexit referendum in 2016 to the formal withdrawal in January 2021 was marked by prolonged uncertainty. This uncertainty affected various sectors, but it was particularly acute for services, which rely on regulatory clarity, cross-border mobility, and harmonisation of standards to thrive in international markets.

Brexit uncertainty originated from several key sources. First, the ambiguity around the timing and nature of the UK's exit from the EU created an unpredictable policy environment for businesses. Although Article 50 of the Treaty on EU was formally triggered in March 2017, the protracted political debates and repeated extensions to the Brexit deadline added to the sense of unpredictability. Businesses, especially those reliant on EU markets, faced ongoing questions about whether the UK would leave the EU with a deal or default to World Trade Organization (WTO) terms.

Second, the specific terms of the post-Brexit trade agreement were unclear for most of the transition period. Key elements such as customs arrangements, the future regulatory framework, and the possibility of tariff and non-tariff barriers to trade with the EU remained unresolved until the final days of the transition period. This lack of clarity made long-term business planning difficult, particularly for service firms that depend on regulatory compliance, freedom of movement for their personnel, and data-sharing agreements (Mulabdic et al., 2017). For example, industries such as financial services, information technology, and transportation, which were deeply integrated into the EU Single Market, faced significant operational risks.

Third, the domestic political environment in the UK further exacerbated uncertainty. Leadership changes, internal party divisions, and parliamentary debates contributed to a sense of instability. The political turmoil surrounding the Brexit process, including multiple general elections and shifting government strategies, left many businesses unsure about the future direction of the UK's trade and economic policies. This led to delays in investment decisions, with firms adopting a 'wait-and-see' approach as they assessed the evolving political landscape (Bank of England, 2019).

Finally, the broader global context of rising protectionism and economic disintegration further complicated the Brexit uncertainty. The period coincided with trade tensions between the US and China, as well as shifts in the global trading system, which added additional layers of complexity to the challenges faced by UK businesses. Firms had to weigh the risks of reduced access to EU markets against the opportunities that might arise from new trade agreements with non-EU countries, such as the US or emerging economies.

Throughout the Brexit transition, economic uncertainty was a persistent theme, reflected in various indicators. The UK's EPU index spiked sharply following the referendum, consistently exceeding global averages and correlating closely with the Brexit Policy Uncertainty Index. This heightened uncertainty mirrored wider concerns about the UK's future economic trajectory, particularly in services, where firms faced the prospect of losing frictionless access to their largest trading partner (Fig. 4 in the appendix).

In summary, the period of Brexit uncertainty was characterised by a confluence of factors: the unpredictability of the UK's withdrawal process, the unresolved terms of future trade relations, political instability, and the broader context of global economic shifts. These factors combined to create a challenging environment for UK firms, particularly those in the services sector, where regulatory and market access issues were paramount.

The distinct nature of trade in services

The impact of Brexit-related uncertainty on the UK's services trade has been a key focus of academic debate. Unlike trade in goods, services trade involves unique characteristics that create distinct challenges and opportunities. Services are often intangible, require real-time interactions, and frequently necessitate the physical presence of the provider and consumer. These complexities make services trade more sensitive to policy changes, regulatory barriers, and uncertainty. This section explores these unique aspects and why Brexit presents significant risks to services trade.

Defining services trade

Services can be broadly defined as economic activities that result in a change in the condition of a person or a good, provided by one economic unit to another (Hill, 1977). Unlike

goods, which are tangible and can be stored, services are typically consumed at the point of production. This immediacy adds layers of complexity to international trade, as services often rely on factors like proximity, the movement of people, and seamless communication to function efficiently across borders (Sahoo & Dash, 2016).

Trade in services encompasses a wide range of activities, from traditional sectors like travel and transport to more modern services such as financial services, IT, professional and technical services, management consultancy, and research and development (R&D). These sectors are increasingly interconnected with global value chains, where services are embedded in the production and delivery of goods. For instance, maintenance and repair services, research and development, and financial intermediation are all essential to the competitiveness of manufacturing sectors (Andrenelli et al., 2018).

Modes of services trade

The WTO's General Agreement on Trade in Services (GATS) identifies four modes of services trade, reflecting the variety of ways services are delivered internationally:

Mode 1: Cross-border supply, where services are supplied across borders (e.g., digital services)[4].
Mode 2: Consumption abroad, where consumers travel to another country to receive services (e.g., tourism)[5].
Mode 3: Commercial presence, where a company establishes a presence in a foreign country to provide services (e.g., a foreign bank setting up branches).
Mode 4: Presence of natural persons, where individuals temporarily travel to another country to provide services (e.g., consultancy or engineering)[6].

[4] Cross-border (mode 1) refer to services supplied from the territory of one Member into the territory of another. An example is an online training course offered by a UK firm sold to learners in France is UK' export, or UK legal or financial advice services being supplied by a UK business to Indian customers remotely via email or an online platform.

[5] Consumption abroad (mode 2) means services supplied in the territory of one Member to the consumers of another. Examples of exports are German visitors' expenses in booking flights and hotels in Wales, or Chinese students' fees for coming to the UK to study. Also covered are activities such as ship-repair abroad, where only the property of the consumer moves.

[6] Presence of the natural persons (mode 4) is services supplied by the national of one Member in the territory of another. This mode includes those independent service suppliers and employees of the services supplier of another Member. Examples are a UK heart surgeon performing an operation service in France, or a US engineer being hired to fix equipment belonging to a UK firm.

Additionally, disruptions in embodied services inputs, recognized as Mode 5 services trade, can exert a substantial influence, often constituting a high-value component within trade activities (Borchert, 2016). The liberalization of services trade generally presents a more intricate challenge compared to goods trade. The advent of ICT has further blurred the distinction between tradable and non-tradable services (Benz et al., 2022).

The impact of Brexit on services trade

Brexit introduces a wide range of uncertainties for the UK's services sectors. The deep integration of the UK into the EU's services markets, through regulatory harmonisation and mutual recognition of professional qualifications, has facilitated substantial growth in cross-border services trade over recent decades. The EU Single Market allowed UK firms to offer services across borders without the need for separate regulatory approval in each member state. However, Brexit complicates this dynamic, introducing barriers that did not previously exist for UK service providers. Projections indicate a minimum 16% reduction in the UK's bilateral trade in services with the EU under the most optimistic scenario (Mulabdic et al., 2017).

For instance, *financial services*, a key UK export, benefited significantly from EU "passporting" rights, allowing UK-based firms to operate freely across the EU without additional licenses. The end of passporting rights post-Brexit raises new compliance costs, regulatory divergence, and risks for firms needing to establish a presence within the EU to continue serving EU clients (Tarrant & Tilford, 2018). Similarly, *professional services* sectors, such as law and accounting, face challenges as mutual recognition of qualifications may no longer apply, requiring professionals to meet varying national standards across EU countries (Hall & Heneghan, 2021).

Beyond financial and professional services, the broader *digital services* sector, which includes IT, communications, and e-commerce, also faces significant disruptions. The free flow of data between the UK and the EU was largely unhindered before Brexit, but new data protection regulations, like the EU's General Data Protection Regulation (GDPR), introduce additional compliance challenges for UK firms operating in the EU.

Transport and logistics services, critical for the movement of goods and people, are similarly impacted. Restrictions on freedom of movement and uncertainty around market access agreements have complicated cross-border transport operations, increasing costs and regulatory hurdles for UK transport firms that rely heavily on EU markets.

In essence, the distinctiveness of trade in services means that it requires distinct scrutiny, both conceptually and

empirically. The insights derived from the realm of goods should not be directly transposed onto services.

Conceptual framework

The impact of uncertainty on services trade remains an underexplored area, largely due to the focus over the past three decades on the expansion and liberalisation of global trade in services. Scholars have highlighted the benefits of greater certainty in trade policies but have often overlooked the complexities introduced by heightened uncertainties, particularly those stemming from events such as Brexit. Much of the existing literature narrows its focus by addressing uncertainty within specific, isolated domains, missing the broader, interconnected effects that policy uncertainty can impose on firms operating internationally.

We conceptualise Brexit-related uncertainty as IBPU. This concept captures the multiple dimensions of uncertainty that emerged after the Brexit referendum, particularly in the UK services industries. IBPU is designed to provide a more comprehensive understanding of uncertainty's broader implications on international business operations, moving beyond narrower concepts like TPU, EPU, and market-based uncertainty. These more traditional concepts often focus on specific policy measures, such as tariffs or monetary policy, and fail to account for the full complexity of uncertainty in an international business context.

In defining IBPU, we build upon the framework proposed by Van Assche and De Marchi (2024), who describe international business policy as the set of public actions aimed at shaping cross-border business activities to address policy challenges. We expand this by defining international business policy uncertainty as the unpredictability or ambiguity in the regulatory, legal, and political environments affecting international business operations. This uncertainty arises when businesses face unstable or evolving government policies, including trade regulations, tariffs, investment rules, and diplomatic relations. Such instability complicates forecasting, planning, and decision-making, resulting in increased risk, reduced investment, and delayed business actions for firms engaged in global markets.

Our IBPU framework is particularly applicable to the complexities introduced by Brexit, where uncertainties ranged from regulatory divergence to geopolitical tensions between the UK and the EU. Brexit-related uncertainty affected numerous dimensions of business operations, including market access, movement of labour, compliance with evolving regulations, and the future of trade agreements. Given that services trade relies heavily on regulatory certainty – especially in sectors such as financial services, professional services, and information technology – the unpredictability surrounding the post-Brexit regulatory environment posed significant challenges for UK firms.

In contrast to existing frameworks such as TPU and EPU, IBPU provides a broader lens through which to analyse how uncertainty affects firm behaviour in international markets. For instance, TPU focuses narrowly on trade-related policies such as tariffs and quotas, typically within a single country's policy framework (Handley & Limão, 2022). EPU, on the other hand, captures the unpredictability of a country's fiscal and monetary policies, which predominantly affect macroeconomic conditions (Baker et al., 2016). These frameworks, while useful, are insufficient to capture the wide-ranging uncertainties that firms encountered post-Brexit. IBPU integrates these specific uncertainties and extends the scope to encompass broader international dimensions, such as shifting diplomatic relations, regulatory realignment, and the complex dynamics of cross-border service provision.

The UK services sector was particularly vulnerable to IBPU because of the profound role that regulations play in determining market access, cross-border mobility, and compliance with standards. The unique characteristics of services trade, including the need for proximity between provider and consumer, further exacerbate the impact of uncertainty. For example, sectors like financial services, where regulatory harmonisation with the EU was essential for seamless cross-border operations, faced substantial risks from Brexit-induced uncertainty.

To summarise, IBPU provides a conceptual foundation for understanding how firms navigate uncertainty in international markets, particularly in the context of services trade. The complexities introduced by Brexit serve as a case study for this broader phenomenon, where multiple layers of uncertainty – from trade policy to regulatory divergence – interacted to influence firm decisions about market entry, expansion, and investment.

Figure 1 illustrates the conceptual framework, outlining key components of IBPU and detailing the mechanisms through which these uncertainties impact firms' export decisions. It highlights how Brexit-related uncertainty translates into reduced export participation, delayed market entry, diminished export intensity, and business relocations. These components, in turn, contribute to broader outcomes, such as reduced trade flows and economic performance.

International business policy uncertainty and services trade

The predictability and stability of trade policies play a critical role in driving trade flows (Hoekman & Kostecki, 2009). This reliance is rooted in the significant initial investments required to initiate exporting activities, as emphasised by Roberts and Tybout (1997). Uncertainty arising from

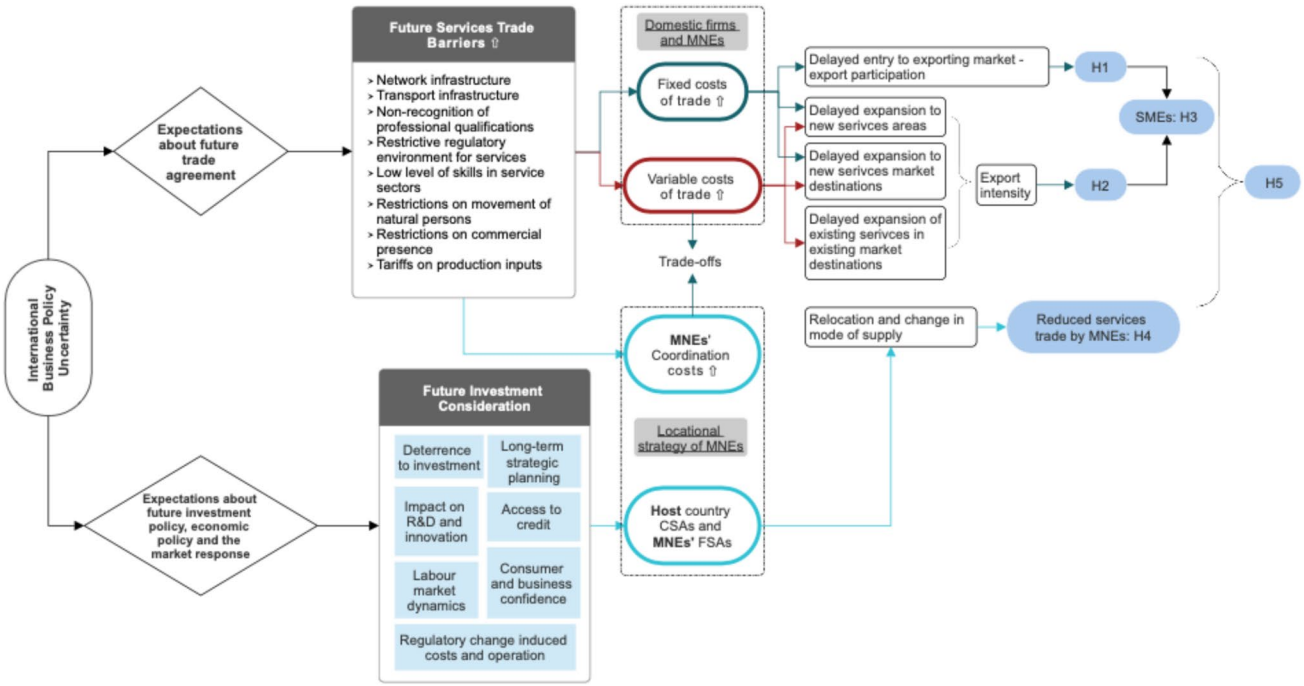


Fig. 1 Uncertainty and services trade: a conceptual framework

ambiguous or unpredictable policy environments hampers firms' ability to plan and make informed investment decisions.

Theoretical explorations of uncertainty in business and economics have focused on how potential changes in policies influence investment behaviour. The risk of future trade restrictions increases costs and limits market opportunities, hindering market entry, expansion, and operational efficiency. In response to this, firms may be reluctant to invest in new markets or adapt their supply chain strategies in uncertain policy environments.

Bloom (2009) demonstrated that economic uncertainty generally leads to investment delays by firms. In international markets, high levels of uncertainty are associated with firms delaying market entry and being less responsive to tariff reductions, as noted by Handley (2014) and Handley and Limão (2015). This environment discourages firms from expanding or further investing in their international operations. Research by Limão and Maggi (2015), Pierce and Schott (2016), and Handley and Limão (2017) further suggests that policy uncertainty can have effects comparable to a tariff increase, with trade agreements playing a critical role in reducing this uncertainty, as demonstrated by Handley and Limão (2015) and Carballo et al. (2022).

For services trade, uncertainty is shaped by ambiguities surrounding trade agreements and key factors that affect cross-border services. The OECD-WTO monitoring exercise ranks the most significant sources of trade costs for services, including network and transport infrastructure, recognition of professional qualifications, restrictive regulatory environments, and restrictions on the movement of persons and commercial presence (OECD/WTO, 2015). In the context of Brexit, expectations of more restrictive future trade agreements imply increased trade costs and limited market opportunities. For example, UK transport and higher-paid services sectors, such as financial services and ICT, heavily depend on the EU market and EU nationals (Hall & Heneghan, 2021). Brexit's end to free movement and market access could increase operational costs and diminish demand, particularly in logistics and travel services, reducing economies of scale.

Uncertainty surrounding Brexit significantly impacts both fixed and variable costs associated with exporting services from the UK to the EU. Fixed costs include initial expenditures to establish a presence in the EU and ongoing compliance with regulatory standards that may differ from those in place pre-Brexit. Variable costs include operational expenses like tariffs on inputs, and costs related to mobility and logistics, particularly pertinent given changes in UK–EU relations.

Brexit introduces substantial uncertainty due to ongoing negotiations and adjustments in trade relations between the UK and EU. This uncertainty deters UK-based service firms from investing in the EU market as they await a clearer regulatory framework. For instance, if the UK and EU cannot agree on the mutual recognition of professional qualifications, UK firms may face additional costs to qualify their staff under new EU regulations or may delay

establishing EU branches. These delays increase long-term fixed costs as market entry becomes more complex and competitive. Hence, we propose:

Hypothesis 1 Brexit-related international business policy uncertainty negatively impacts the participation of UK firms in service export markets.

Uncertainty not only affects non-exporters considering entry into export markets but also influences firms' product development and service expansion decisions. Research shows that high levels of uncertainty often lead to reduced investment in capacity expansion, marketing, and new product development for international markets (De Brentani et al., 2010; Gulen & Ion, 2016; Jung & Kwak, 2018). Firms are less likely to invest in research and development or build relationships with foreign distributors and customers if they are unsure about the stability of these markets or the continuity of favourable trading conditions.

In the context of Brexit, uncertainty affects both non-exporters and exporting firms considering entering new service sectors or markets. For instance, a firm specialising in consulting and IT services might delay extending operations to infrastructure management or security services due to regulatory ambiguities, as seen with firms like Accenture. Similarly, a company like WPP plc, which operates in communication services, may hesitate to diversify into advertising or public relations in the EU market.

Uncertainty can also deter firms from exploring new market destinations due to unclear regulatory frameworks and compliance requirements. Pursuing new markets requires risk tolerance, which decreases when faced with policy unpredictability (Wang et al., 2021). These unrealised opportunities – lost due to hesitation – represent missed export participation, despite being difficult to observe in firm-level data. The counterfactual effect would likely be seen in reduced export growth.

In addition to delaying business expansion decisions, firms often postpone critical decisions when faced with uncertainty, leading to missed export opportunities. A wait-and-see approach can result in firms reducing their foreign orders more than domestic ones due to higher transportation and ordering costs, contributing to greater volatility in international trade (Novy & Taylor, 2020).

Regarding variable costs, Brexit-related uncertainties, such as potential tariffs on digital products or restrictions on freedom of movement, directly increase operational costs. Service firms face higher expenses if new tariffs or regulatory barriers arise. Restrictions on the movement of service providers like consultants and engineers may compel firms to hire locally within the EU, raising operational costs. These concerns delay firms' investment decisions, particularly in expanding their service offerings to the EU market.

Moreover, Brexit may force firms to strategically diversify or establish additional operations within the EU to avoid potential service disruptions, leading to higher operational costs as firms build or expand their EU presence. Consequently, Brexit could heighten both fixed and variable costs for UK service exporters, challenging firms' ability to plan and invest effectively and impacting their competitiveness in the EU.

Thus, we propose:

Hypothesis 2 Brexit-related international business policy uncertainty negatively impacts the intensity of service exports by UK firms.

According to the resource-based view (RBV), firms possess unique resources and capabilities that shape their strategies and market success (Barney & Arikan, 2005). Uncertainty in trade policies complicates resource allocation and investment decisions, particularly for small and medium enterprises (SMEs).

SMEs are more vulnerable to the increased costs and risks stemming from uncertainty due to their lower resource bases and limited capacity to absorb financial shocks or quickly adapt to changing regulatory environments. Unlike large firms with diversified international operations, SMEs typically operate with tighter budgets and cannot spread risks across multiple markets. Uncertainty, such as that introduced by Brexit, can exacerbate these challenges, leading SMEs to delay or abandon expansion plans due to fears of future regulatory changes or tariffs that could undermine their business models.

Furthermore, SMEs often lack the expertise to navigate complex international trade laws, forcing them to either invest disproportionately in legal resources or risk non-compliance. Increased costs from tariffs or compliance with foreign standards can disproportionately affect SMEs, which have less negotiating power with suppliers and fewer options for adjusting supply chains.

Therefore, we propose:

Hypothesis 3 Brexit-related international business policy uncertainty disproportionately affects SMEs, leading to greater negative impacts on export participation and export intensity compared to larger firms.

Brexit uncertainty and MNE's locational strategy

For MNEs, uncertainty presents complex challenges due to their expansive operations across borders. While MNEs face similar challenges as domestic firms regarding increased costs and regulatory complexity, they also confront the significant coordination costs associated with managing operations in multiple locations. These coordination costs

include the integration of activities across varying regulatory regimes, maintaining consistent service or product quality across different jurisdictions, and ensuring compliance with diverse operational standards (Caves, 1996). Brexit-induced uncertainty exacerbates these costs, especially as the future relationship between the UK and the EU remains unclear.

Coordination costs for MNEs cover a wide range of logistical and operational expenses, including adapting to different legal frameworks, navigating regulatory changes, and managing cultural differences across regions. The complexity of these operations is heightened when facing potential fragmentation between the UK and the EU, as Brexit introduces new challenges for harmonising activities and maintaining efficiency. As Buckley and Carter (1996) have noted, fragmentation within regions can lead to higher coordination costs and operational disruptions.

In addition to dealing with uncertainties about trade relations, MNEs are also affected by broader economic and regulatory unpredictability. As discussed by Du and Shepotylo (2024), economic disintegration – such as Brexit – creates layers of uncertainty that go beyond trade costs. This includes concerns about the overall regulatory environment, labour mobility, and market access, all of which interact to complicate long-term decision-making. For MNEs, these uncertainties magnify the risk of investing in the UK, particularly as firms assess whether to maintain or relocate their operations to mitigate the impact of Brexit.

Uncertainty surrounding Brexit influences MNEs' investment decisions in multiple ways. First, it increases the risk premium attached to investments in the UK, particularly for firms reliant on cross-border supply chains and market access. Regulatory ambiguity regarding the movement of goods, services, and people between the UK and EU can result in higher operational costs, such as the need for duplicate regulatory approvals or adjustments to existing processes. As Bloom (2009) highlighted, uncertainty tends to lead firms to delay or scale down their long-term investments, which has been the case for many UK-based MNEs since the Brexit vote (Bloom et al., 2019).

Furthermore, policy uncertainty may influence MNEs' access to finance and their willingness to engage in R&D. Service industries, in particular, rely heavily on capital for growth and innovation. However, uncertainty surrounding Brexit has constrained investment flows into these sectors. Firms may be less willing to engage in R&D or innovation if they are unsure of the long-term regulatory environment, as illustrated by Piva and Vivarelli (2018). This inhibits the development of new services and technologies, limiting firms' competitive edge in international markets.

Another major issue for MNEs is the potential fragmentation of labour markets. Brexit-related uncertainty over immigration and labour laws could significantly impact MNEs' ability to access skilled workers. As Acemoglu and Restrepo (2019) argue, changes to immigration policies, such as those expected after Brexit, restrict the flow of skilled labour, particularly in knowledge-intensive services. This can result in higher labour costs and operational inefficiencies, as firms may need to relocate or hire locally in the EU to maintain access to a skilled workforce.

In addition to regulatory and labour challenges, MNEs face increased coordination costs as they manage operations across divergent regulatory systems. Regulatory fragmentation – such as differences in data protection laws, labour standards, or environmental regulations between the UK and the EU – forces MNEs to adjust their operations to comply with new or conflicting standards, raising both administrative and operational costs (Majeed & Moore, 2019). These complexities make long-term strategic planning more difficult and can deter further investment in the UK.

Moreover, international business policy uncertainty affects consumer and business confidence, which impacts demand for services. As uncertainty erodes confidence, both businesses and consumers may reduce their spending on discretionary services, such as leisure, travel, or consultancy services. This dampening of demand is well documented in the literature on consumer and corporate confidence (Casadei & Iammarino, 2021; Nowzohour & Stracca, 2020). The effect of this sentiment is particularly acute in industries where demand is sensitive to economic fluctuations, such as tourism, hospitality, and financial services.

Given these considerations, MNEs must balance the trade-offs between reducing trade costs and managing coordination costs when deciding whether to relocate investments. High trade costs, such as tariffs or restrictions on services, might suggest shifting operations to more favourable markets, but the elevated coordination costs of managing multiple locations may deter this. As Williamson (1985) and Hennart and Verbeke (2022) suggest, firms weigh these factors carefully, as reducing one type of cost often leads to an increase in another.

Thus, we propose:

Hypothesis 4 Brexit-related international business policy uncertainty has a disproportionately negative impact on the export participation and intensity of MNEs that relocate foreign direct investment from the UK compared to those that do not relocate.

Uncertainty and trade in services: An aggregate view

While examining how uncertainties impact businesses of various types, our understanding of their aggregate effects remains incomplete due to several empirical challenges. One of the primary difficulties lies in the lack of observable firm-level data, as well as the challenges in modelling

counterfactual scenarios – particularly, estimating what would have happened if Brexit had not occurred. This data gap is a significant obstacle for policymakers attempting to assess the broad effects of uncertainty on trade and inward investment.

At any point, a country's total exports consist of three key components: (i) exports from new entrants that did not export in the previous period; (ii) exports from continuing exporters that sustained their export activities; and (iii) the loss of exports from firms that ceased exporting. In the case of Brexit, the overall decline in UK exports can be attributed to several factors: diminished activity from existing exporters, fewer new entrants, and reduced export growth due to the relocation of MNEs. This breakdown clarifies the underlying dynamics affecting UK exports in response to Brexit-induced uncertainty.

The hypotheses developed thus far highlight different mechanisms by which international business policy uncertainty influences trade in services, particularly in the context of Brexit. Specifically, these hypotheses examine how firms respond to uncertainty in terms of market entry, export intensity, and the strategic location decisions of MNEs.

- **Hypothesis 1**: posits that Brexit-related uncertainty deters firms from entering new international markets, increasing the perceived risk of market entry due to potential changes in trade regulations and market conditions.
- **Hypothesis 2**: suggests that uncertainty surrounding Brexit leads firms to delay or reduce their investments in expanding their market presence. This occurs as the rising costs of operational adjustments, regulatory compliance, and potential tariffs force firms to adopt a more cautious approach.
- **Hypothesis 4**: contends that MNEs relocating their operations in response to Brexit face greater challenges in sustaining export intensity due to the increased costs associated with coordination and regulatory divergence.

These hypotheses reflect the complex interplay between uncertainty, firm behaviour, and international trade dynamics. Therefore, we propose:

Hypothesis 5 Brexit-related international business policy uncertainty negatively impacts UK services exports as a whole.

To rigorously test these hypotheses, we employ a multilevel empirical strategy that combines firm-level data with cross-country product-level analyses. Our approach involves longitudinal analysis of UK-based service firms and MNEs to examine how they have adapted to Brexit-induced uncertainty. By employing advanced econometric modelling, we quantify the impact of uncertainty on the key components of total exports: new entrants, continuing exporters, and firms that have ceased exporting.

Additionally, to capture the aggregate impact of Brexit, we apply a synthetic control method to estimate what UK exports might have been in the absence of Brexit. This method constructs a counterfactual scenario by comparing UK exports with those of a weighted combination of similar economies unaffected by Brexit. This counterfactual analysis enables us to isolate the Brexit effect and generate causal interpretations that would be more difficult to obtain through traditional difference-in-difference methodologies. The synthetic control method allows for a more robust comparison by eliminating the strong parallel trend assumptions typically required in such analyses.

The results of this counterfactual analysis will help to illuminate the overall impact of Brexit-induced international business policy uncertainty on the UK's service export performance. "Brexit uncertainty and UK services exports dynamics" section details the empirical model used to test Hypotheses 1–4, while "Aggregate impact of Brexit uncertainty" section outlines the methodology and findings of the counterfactual analysis, focusing on the aggregate effects of uncertainty on UK services trade.

Brexit uncertainty and UK services exports dynamics

Data and variables

Drawing on the firm-level data from Orbis database provided by Bureau van Dijk (BvD) for the UK in 2012–2019, also known as Fame, we construct a sample of firms that are located in the UK during the examined period in services sectors (excluding financial and insurance)[7]. This is the largest and most up-to-date firm-level dataset available for the purpose of our analysis. A range of company characteristics and financial information on an annual basis including firm age, employment, turnover, export revenue[8], foreign ownership, number of subsidiaries, location, and industry classification are obtained and taken into consideration, with all the monetary values deflated using sectoral price deflators extracted from the Office for National Statistics (ONS) data.

[7] This is related to the way information is collected by Orbis database owned by Bureau van Dijk. Financial data (which are extracted from balance sheets and profit & loss accounts) of banks and insurance companies are organised in a separate global standard format, which is different from the format of key financials for corporates.

[8] This variable is known as "overseas turnover" in the Fame database.

Taking a deep dive into MNEs in the UK, we further link the firm-level information with investment data from Orbis Cross Border Investment (CBI) data to identify MNEs in the UK, and their foreign investment activities. By daily tracking of news sources, this database offers unique insights into firms' globalisation strategy by tracking real-time greenfield foreign direct investment (FDI) and mergers & acquisitions (M&As) at the company level across the globe, starting from 2013. We take into account both forms of cross-border investment activities in this study. For each investment record, we are able to identify project (deal) overview, project (deal) number, investing company name(s), announced date, the destination (target) countries, etc. Only projects or deals with the status of "Announced", "Completed" and "Completed assumed" are taken into account. Compared with other sources of investment data, the advantage of this database is that each investment record can be matched to its investing company's corporate and financial information using a unique firm identifier. The investment records are then aggregated by the announcement year and organised in a panel setting using its investing (investor) firm identifier, before linking to the firm-level financial data.

We define an MNE as a UK-based firm which had at least one foreign subsidiary at the observation point in time or that the firm announced at least one cross-border project or M&A deal in a given year during our observed period. MNEs include UK MNEs that have UK companies as their ultimate owners, such as BP or Vodafone Group, and foreign MNEs which are ultimately owned by non-UK companies, such as Nissan or JLR in the UK. We also create another variable to capture foreign ownership, which is a dummy taking a value of 1 for a firm owned by a global ultimate owner located in any other foreign countries, otherwise 0. There are pure UK domestic firms, and foreign firms in the UK that are not MNEs. An example of the latter is Branston Pickle (Branston Pickle is a popular British food brand that produces a variety of chutneys and relishes. It is owned by the Japanese company Mizkan Group, but its products are primarily sold in the UK).

Pennings and Sleuwaegen (2000) define international relocation as either the decision to move part of the production to another country, or to replace part of the production by a combination of foreign investment and subcontracting. In a similar vein, by defining firm relocation as a simultaneous reduction in investment scale in the UK and expansion abroad (e.g., Dewit et al., 2019), we have the opportunity to examine if Brexit uncertainty had steeper negative effects on MNEs in the UK which appeared to have reduced investment or relocated at least some assets away from the UK. For each step below, we first explain our identification strategy, then describe the sample characteristics, before moving on to reporting the findings.

Summary statistics

We observe a sample of 436,723 services sector firms in 2012–2019 located in the UK, as shown in panel A of Table 1. Other business services (SJ) sector has the most observations, reporting 207,995 observations, followed by Personal, Cultural, and Recreational (SK) and Telecom, Computer and Information (SI) sectors. As expected, Manufacturing services have very few observations.

Sectors differ in terms of trade openness measured by export to turnover presented in panel B and share of exporting firms as shown in panel C of Table 1. Telecom, Computer and Information (SI) has the highest share of exports to sales, with 7.6% on average in 2012–2019. It also has the third-highest share of exporters, averaging at 28% of all the active firms. It is worth noting that the dynamic of trade openness has reached a peak of the maximum of 4.2% export share and 16% of exporters in 2015. Since the Brexit referendum, there have been steady reductions in both measures of trade openness. Maintenance and Repair (SB) sector experienced the steepest decline in the share of exporting firms from 37% in 2015 to 20% in 2019, followed by Telecom, Computer and Information (SI) sector from 35% in 2015 to 20% in 2019. SI sector also experienced the highest decline in the export share from 9.2% in 2015 to 5.5% in 2019. Notably, Other Business Services (SJ) have also considerably reduced trade openness in both exports to sales share and share of exporters.

Panel C of Table 1 shows that overall, 14% of firm-year observations have non-zero exporting values in our sample. On average, around 14% of firms are exporters in each year. When decomposing exporters based on export participation, we find that about 3% of the exporters become new exporters for the first time in the sample period. Continuing exporters, which exported before and started to export again in the following years, make up 10% of the sample. A small fraction of firms, 0.8% of those exporters, stopped exporting, which we regard as the case of export exit. If we compare the whole period before and after the Brexit referendum, the difference becomes even more clear, as presented in Table 2.

Table 3 provides the summary statistics for the firms included in the sample, presenting a comprehensive overview of their key characteristics. There are around 42% of small firms and 48% of medium firms, with the remaining 10% being large businesses. Considering export challenges are likely to be experienced by smaller firms, this is supposed to be an ideal sample to study our research question. Further, firms which are foreign-owned account for nearly 22% of the sample, which allows us to examine exporting decisions of foreign firms in the UK under uncertainty.

Table 1 UK firms in services sectors: Orbis data sectoral distribution

Service sector	Year								All
	2012	2013	2014	2015	2016	2017	2018	2019	
A: Number of firms									
SA: Manufacturing services	63	68	72	80	84	86	74	72	599
SB: Maintenance and repair	454	490	490	527	644	834	750	824	5013
SC: Transport	2907	3029	3028	3256	3560	3843	3847	4597	28,067
SD: Travel	3416	3551	3739	4202	4844	5437	5352	5733	36,274
SI: Telecom, computer and information	5405	5672	5831	6459	7713	9164	8520	10,347	59,111
SJ: Other business services	19,827	20,831	21,567	23,077	27,888	32,103	30,360	32,342	207,995
SK: Personal, cultural and recreational	9217	10,356	11,240	11,897	13,103	14,331	14,221	15,299	99,664
Total	**41,289**	**43,997**	**45,967**	**49,498**	**57,836**	**65,798**	**63,124**	**69,214**	**436,723**
B: Overseas sales to turnover share (%)									
SA: Manufacturing services	5.7	6.5	6.1	5.7	5.3	4.7	4.6	4.1	5.3
SB: Maintenance and repair	7.5	7.6	7.5	7.3	5.8	4.3	4.9	4	5.8
SC: Transport	3.8	3.9	4.1	4.5	4.2	3.5	3.6	2.7	3.7
SD: Travel	1	1	1.1	1.1	1	0.9	1	0.9	1
SI: Telecom, computer and information	8.4	8.8	9	9.2	8	6.6	7.1	5.5	7.6
SJ: Other business services	3.8	4	4.2	4.5	3.8	3.1	3.3	2.7	3.6
SK: Personal, cultural and recreational	1.6	1.7	1.7	1.8	1.7	1.5	1.5	1.3	1.6
Average	3.7	3.9	4	4.2	3.7	3.1	3.2	2.7	3.5
C: Proportion of exporting firms									
SA: Manufacturing services	0.38	0.47	0.4	0.39	0.36	0.36	0.38	0.38	0.39
SB: Maintenance and repair	0.36	0.37	0.39	0.37	0.29	0.21	0.24	0.2	0.29
SC: Transport	0.15	0.16	0.17	0.18	0.17	0.15	0.15	0.12	0.16
SD: Travel	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.05
SI: Telecom, computer and information	0.32	0.34	0.34	0.35	0.3	0.25	0.26	0.2	0.28
SJ: Other business services	0.15	0.16	0.16	0.17	0.14	0.12	0.13	0.11	0.14
SK: Personal, cultural and recreational	0.06	0.06	0.06	0.07	0.06	0.05	0.05	0.05	0.06
Average	**0.15**	**0.15**	**0.16**	**0.16**	**0.14**	**0.12**	**0.12**	**0.1**	**0.14**

Table 2 UK exporters and exports before and after Brexit

	Export: 1=Yes	Export share: %	New exporters (%)	Continuing exporters (%)	Export exits (%)
Before Brexit (2012–2015)	0.160	4.1	5.6	10.4	0.5
After Brexit (2017–2019)	0.129	3.3	1.7	11.2	1.1
Total	0.142	3.6	3.3	10.9	0.1

Model specification

Post-Brexit export adjustments can come through difference mechanisms, including adjustments at intensive margins when firms that continue exporting reduce their amount of exports. We look at export participation (probability of being an exporter) and intensity (share of exports to sales) by estimating the following regression model:

$$Y_{it} = \delta_1 Brexit_t + X_{it}\beta + \delta_2 Brexit_t \times X_{it} + D_s + \epsilon_{it}$$

where Y is one of the variables that measure firm's export participation and export. These include *Export Participation* and *Export Share* as defined above. *Export Participation* is a dummy variable taking a value of 1 if the export value is positive. *Export Share* is the ratio of export values over total sales revenue (i.e. sum of domestic and overseas sales) in percentage terms.

Brexit takes a value of 1 if the year is greater or equal to 2016 and 0 otherwise; X controls for firm-level heterogeneity such as labour productivity (turnover per employee in 2019 GBP), employment, and age. We distinguish between

Table 3 Variable definitions and summary statistics

Variable name	Definition	Mean	SD	Min	Max	*N*
Export participation: 1=Yes	A dummy takes a value of 1 if overseas turnover is greater than 0 in a given year, and 0 otherwise	0.150	0.357	0	1	344,866
Export share: %	The percentage of a firm's overseas turnover in relation to its total turnover	6.048	19.647	0	100	344,866
New exporter	Share of firms that started to export at time *t*	0.033	0.178	0	1	344,866
Continuing exporter	Share of firms that exported at times *t*–1 and *t*	0.109	0.311	0	1	344,866
Export exit	Share of firms that exported at *t*–1 and stopped exporting at *t*	0.008	0.090	0	1	344,866
Brexit dummy (Brexit: 1=Yes)	A dummy takes a value of 1 if the year is 2016 or later, and 0 otherwise.	0.607	0.488	0	1	344,866
Foreign ownership dummy (Foreign: 1=Yes)	It stands for foreign ownership. A dummy takes a value of 1 for a firm owned by a global ultimate owner located in any other foreign countries, and 0 otherwise.	0.216	0.412	0	1	341,887
Ln Labour productivity	Natural logarithm form of value added per employee, with value added calculated by subtracting material costs from turnover	4.51	1.45	− 1.430	9.28	341,887
Ln Employment	Natural logarithm of number of employees (report here the number)	3.05	2.00	0	8.40	341,887
Small	Up to 10 workers	0.42	0.49	0	1	377,353
Medium	Between 10 and 250 workers	0.48	0.50	0	1	377,353
Ln Firm age	Natural logarithm value since establishment (report here the number)	2.60	0.78	0	4.77	341,887
Foreign investments	Number of cross-border projects and mergers & acquisitions (M&A) deals announced by a given firm at time *t*	0.05	0.66	0	77	83,093
Foreign investments in the EU	Number of cross-border projects and mergers & acquisitions (M&A) deals announced by a given firm with destination countries within the EU-27 at time *t*	0.02	0.23	0	17	83,093
Decreasing rate of employment in the UK	Difference in natural logarithm form of number of employees between year *t*–1 and *t*	− 0.04	0.25	− 0.98	0.94	83093
Decreasing rate of total assets in the UK	Difference in natural logarithm form of total assets between year *t*–1 and *t*	− 0.04	0.26	− 0.81	0.64	83,085
Growth rate of national turnover	Difference in natural logarithm form of national turnover between year *t* and *t*−1	0.02	0.46	− 6.44	6.44	83,093

domestic and foreign firms, defined by the residence of the firm's global ultimate owner. D_s controls for time-invariant unobserved heterogeneity for each services sub-sector *s* defined at SIC07 5-digit level. Finally, in some of the model specifications, we interact the Brexit variable with the firm-level controls to examine the heterogeneity of Brexit' impacts across different firm characteristics including productivity, sizes, ages, and ownership. The identification comes from the differences in performance pre- and post-Brexit across firms in the same sub-industry *s*. The model is estimated by OLS with standard errors clustered at the industry level. We use the linear probability model when the dependent variable is export participation.

We further investigate the export participation by decomposing the exporting firms into those who started exporting (did not export at *t*–1 but exported at *t*), namely *New*, continued exporting (exported at *t*–1 and *t*), namely *Continue*, and *Exit*, as exited exporting (exported at *t*–1 but did not export at *t*):

$$S_{it} = \delta_1 Brexit_t + X_{it}\beta + \delta_2 Brexit_t \times X_{it} + D_s + \epsilon_{it}$$

where S_{it} is export *Participation* of firm *i* at time *t* – New, Continue, or Exit. Vector of controls X_{it} includes log of labour productivity, log of employment log of firm age, industry fixed effect (SIC07 5-digit). We estimate the linear probability model and report cluster-robust standard errors at the industry level.

In addition, we also provide alternative measures of firm size by introducing a binary variable named small, which takes the value of 1 if the firm has 10 or fewer workers and 0 otherwise, and a binary variable named medium, which

Table 4 Brexit and exporting firms: firm-level analysis

	(1) Export participation: 1=Yes	(2) Export share %	(3) New	(4) Continue	(5) Exit
A. Brexit and exporting					
Brexit	− .0145*** (0.003)	− .718*** (0.148)	− .0114*** (0.002)	− .00550* (0.003)	.00489*** (0.001)
Observations	377353	377353	344866	344866	344866
R-squared	0.317	0.186	0.045	0.284	0.017
B. Brexit, exporting and SMEs					
Brexit=1 # Small firm	− .0354*** (0.007)	− 2.111*** (0.392)	− .00868*** (0.003)	− .0243*** (0.006)	− .00648*** (0.001)
Brexit=1 # Medium firm	− .0186*** (0.007)	− .900*** (0.275)	− .00739*** (0.002)	− .0113** (0.005)	− 0.000601 (0.001)
Observations	377,353	377,353	344,866	344,866	344,866
R-squared	0.312	0.188	0.046	0.278	0.017

(1) Each model includes the following controls: log of labour productivity, log of firm age, industry fixed effect (SIC07 5-digit). (2) Models in panel A also have log of employment. Models in panel B also have full set of interaction of Brexit variable with the reported variables and with all controls. (3) Standard errors clustered at SIC7 5-digit industry are reported in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

takes the value of 1 if the firm has workers between 10 and 250. This helps to test whether small firms and foreign-owned firms reacted differently from larger and domestically owned ones.

Findings

Panel A of Table 4 displays the estimates with standard errors clustered at SIC07 5-digit level in parentheses. We find that the Brexit Referendum led to worsened firm export performance with the adjustments primarily going through the extensive margins. Post-Brexit, firms on average are 1.5 percentage points significantly less likely to export (Column 1) and they significantly export less in proportion to total sales revenue by 0.718 percentage points (Column 2). There are 1.14 percentage points significantly fewer new exporters (Column 3), which translates into only one out of six exporters being a new exporter (versus one out of three before Brexit). The share of exporters who exit from exporting significantly increases by 0.5 percentage points (Column 5), which constitutes an increase from 3% to 8% of the total number of exporters. There is also a marginally significant decline in the probability of continuing exporting (Column 4). These support H1 and H2.

Small and medium enterprises reduced their internationalization relative to large companies (panel B of Table 4). Both small and medium firms are less likely to export and tend to cut export share by 2.1 and 0.9 percentage points consequently (Column 2). Both small and medium-sized firms are less likely to start exporting and continue exporting. It is worth noting that all these findings are statistically significant at the 1% level. These support H3.

Brexit and MNEs

Using similar model specifications, we turn to examine how MNEs in the UK have been affected by the Brexit uncertainty since the 2016 Referendum. As noted above, we first examine the differences in export performance of both foreign and UK MNEs compared with that of non-MNEs which are foreign-owned and purely domestic UK firms before and after Brexit, with the descriptive statistics presented in Table 5.

Typically, on average both foreign and UK MNEs tend to perform better than domestic companies in terms of the two measures of export performance, including share of exporters and share of exports to sales, both before and after Brexit. Before Brexit, foreign-owned non-MNEs outperformed UK MNEs in the two export indicators, although not to the extent of foreign MNEs, but the share of exporters among foreign-owned non-MNEs has since been surpassed by UK MNEs.

Further, domestic UK firms and foreign-owned non-MNEs have shown poor export performance after Brexit compared with before 2016, experiencing a marked decline in exports. After Brexit, MNEs tend to have a slightly larger share of exports to sales. This implies that Brexit uncertainty might have been more adversely impactful on the export performance of domestic firms and foreign-owned non-MNEs than MNEs, with measures of both foreign and UK MNEs' services exports keeping the existing level or even enjoying a minor growth.

Next, we shift our focus to MNEs in the UK, and test if the contraction in services exports is particularly associated with those MNEs that are relocating. As described above, we draw on the linked firm-level financial data from Orbis along with Orbis CBI data to identify those MNEs that diversified investment or relocated away from the UK

Table 5 Exports of different types of firms before and after Brexit

Firm type	Export performance indicator	Before Brexit (year < 2016)		After Brexit (year > = 2016)		Total	
		Mean	SD	Mean	SD	Mean	SD
Foreign MNEs in the UK	Export participation: 1=Yes	0.4	0.49	0.4	0.49	0.4	0.49
	Export share, %	17.03	29.53	17.24	29.8	17.14	29.68
	Obs.	12,007		14,054		26,061	
UK MNEs	Export participation: 1=Yes	0.24	0.42	0.24	0.43	0.24	0.43
	Export share, %	7.9	20.77	8.23	21.35	8.08	21.09
	Obs.	33,681				75,494	
Non-MNEs which are foreign-owned	Export participation: 1=Yes	0.29	0.45	0.22	0.41	0.25	0.43
	Export share, %	13.72	29.23	10.67	26.5	11.87	27.64
	Obs.	18718		29167		47,885	
Purely domestic firms	Export participation: 1=Yes	0.07	0.26	0.05	0.22	0.06	0.23
	Export share, %	2.94	14.3	1.93	11.66	2.3	12.7
	Obs.	70,019		122,428		192,447	
Total	Export participation: 1=Yes	0.17	0.38	0.13	0.34	0.15	0.36
	Export share, %	6.94	20.87	5.47	18.79	6.05	19.65
	Obs.	134,425		207,462		341,887	

market. Following Pennings and Sleuwaegen (2000) and Dewit et al. (2019), this circumstance can be captured by (i) MNEs in the UK that have undertaken at least one cross-border investment in a given year[9], and (ii) the reduction in their employment scale or total assets in the UK in a given year. Accordingly, a three-way interaction between Brexit uncertainty, number of foreign investments, and decreasing rate of employment or total assets in the UK is generated and considered to capture MNEs' international relocation.

Tables 6 and 7 present the results from the regression analysis of export participation and export share models restricted to MNEs sample. Defined by the decreasing rate of employment and total asset, respectively, the role of MNEs' relocation aims to deliver the empirical test for H4.

Controlling for firm characteristics, our results show that firms with larger number of foreign investments are more likely to export and have larger export value share in revenue. We find that Brexit uncertainty tends to counteract such positive impacts of foreign investments on both the indicators of export performance in Table 6 and in the right-hand panel of Table 7, though the coefficients are not statistically significant across all the estimations. This suggests that the Brexit uncertainty exerted similar negative effects on all firms, including MNEs.

MNEs' responses to Brexit uncertainty vary significantly based on their specific firm characteristics, showing heterogeneity in their reactions. The results presented in both Tables 6 and 7 indicate that following Brexit Referendum, MNEs that are more productive, larger in scale, and older are more inclined to engage in exporting, with more productive and larger enterprises also demonstrating a greater share of export value. These results align with the existing findings that post-Brexit, exporting tends to become more complex, thus benefiting larger and more experienced firms (De Lyon & Dhingra, 2021; Douch et al., 2019). The improved export performance in services of highly productive MNEs following Brexit is in line with the findings of Di Stefano et al. (2022), indicating that such MNEs were less likely to close foreign plants during the COVID-19 shock from 2018 to 2020. Nevertheless, concerning the foreign ownership, foreign-owned MNEs do not encounter a disadvantage regarding their ability to export or their portion of export value after Brexit.

More importantly, the interaction terms in Table 6 reveal that Brexit had additional adverse impacts on MNEs characterised by a greater decline in UK employment rates and a larger volume of investments beyond the UK, concerning both the above indicators of exporting. This suggests that as MNEs increasingly diverted investments away from the UK while simultaneously downsizing their UK workforce post-Brexit – essentially engaging in international relocation – there was a statistically significant decrease in their likelihood to export and proportion of exports relative to total sales. This provides evidence for H4. In the right-hand panel of Table 6, when we substitute the variable for the total number of foreign investments with the number of foreign investments specifically within the EU, the results resemble those displayed in the left-hand panel. The persistence

[9] Foreign investments in our context include cross-border greenfield project investments and mergers & acquisitions.

Table 6 Brexit and MNEs' investment relocation, by employment

	(1)	(2)	(3)	(4)
	Export participation: 1=Yes	Export share: %	Export participation: 1=Yes	Export share: %
	Foreign investments across the globe		Foreign investments in the EU	
Brexit	− 0.104*** (0.020)	− 3.239*** (1.018)	− 0.101*** (0.019)	− 3.120*** (1.021)
Number of foreign investments	0.022*** (0.006)	0.789* (0.416)	0.052*** (0.018)	1.747** (0.847)
Foreign: 1=Yes	0.067*** (0.013)	5.207*** (0.612)	0.067*** (0.013)	5.212*** (0.616)
Ln Labour productivity	0.041*** (0.005)	1.496*** (0.187)	0.041*** (0.005)	1.510*** (0.188)
Ln Employment	0.037*** (0.003)	0.110 (0.147)	0.037*** (0.003)	0.134 (0.143)
Ln Firm age	0.000 (0.005)	− 0.075 (0.245)	0.000 (0.005)	− 0.088 (0.245)
Brexit=1 # number of foreign investments	− 0.005 (0.007)	− 0.236 (0.476)	− 0.000 (0.021)	− 0.188 (1.010)
Brexit=1 # Foreign: 1=Yes	− 0.007 (0.007)	− 0.307 (0.403)	− 0.007 (0.007)	− 0.322 (0.398)
Brexit=1 # Ln Labour productivity	0.007*** (0.002)	0.363** (0.142)	0.007*** (0.002)	0.345** (0.143)
Brexit=1 # Ln Employment	0.009*** (0.002)	0.345*** (0.095)	0.009*** (0.002)	0.325*** (0.091)
Brexit=1 # Ln firm age	0.012*** (0.004)	0.075 (0.213)	0.012*** (0.004)	0.085 (0.209)
Brexit=1 # increasing foreign investments # Decreasing rate of employment in the UK	− 0.039* (0.023)	− 4.049*** (1.546)	− 0.021 (0.030)	− 3.442* (1.805)
Decreasing rate of employment	− 0.030*** (0.011)	− 3.768*** (0.675)	− 0.034*** (0.011)	− 4.075*** (0.673)
Brexit=1 # decreasing rate of employment	− 0.003 (0.011)	0.636 (0.691)	0.000 (0.011)	0.827 (0.703)
Growth rate of domestic turnover	− 0.081*** (0.006)	− 7.411*** (0.588)	− 0.081*** (0.006)	− 7.407*** (0.587)
Announced year	9.987*** (1.216)	337.217*** (70.587)	9.904*** (1.211)	334.747*** (70.843)
c.year#c.year	− 0.002*** (0.000)	− 0.084*** (0.018)	− 0.002*** (0.000)	− 0.083*** (0.018)
Industry (SIC07 5-digit) trend	Yes	Yes	Yes	Yes
Observations	83,093	83,093	83,093	83,093
R-squared	0.201	0.142	0.201	0.142

(1) In these regressions, the sampled firms only consist of MNEs in the UK, aiming to test the channels of redirection and relocation. (2) Standard errors clustered at the SIC7 5-digit industry are reported in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

of a significant decrease in MNEs' share of exports, as a result of increased investments particularly in the EU and simultaneous reductions in UK employment post-Brexit, underscores the negative impact of relocation on MNEs' services exports, further lending support for H4.

The corresponding interaction terms in Table 7 indicate that Brexit has intensified negative impacts on MNEs experiencing a greater decline in total assets within the UK and a higher number of investments outside the UK. The results demonstrate that the previously noted negative effects on the two export indicators in Table 6 persist when investment redirection or relocation is executed through assets. This outcome also provides support for H4, further strengthening our contention regarding the detrimental influence of MNEs' international relocation driven by Brexit uncertainty on their UK services trade activities.

Remarkably, no comparable negative and statistically significant effects of the same interaction term can be detected in the case of MNEs' investments in the EU, as observed in the right-hand panel of Table 7. The significance and strength of these negative impacts observed in the left-hand panel (Table 7) imply that international relocation, regardless of whether it occurs within the EU, serves as a channel for reducing MNEs' UK service exports.

Aggregate impact of Brexit uncertainty

To assess the overall impact of Brexit uncertainty, as specified in Hypothesis 5, we employ a synthetic control method to estimate how UK exports might have performed in the absence of Brexit. We first detail the data and methodology employed in our analysis, and proceed to execute the synthetic control estimation to assess the causal impact of Brexit uncertainty on UK exports.

Data and description

We rely on the most comprehensive, consistent, and balanced data source available to date: the OECD-WTO

Table 7 Brexit and MNEs' investment relocation, by assets

	(1)	(2)	(3)	(4)
	Export participation: 1=Yes	Export share: %	Export participation: 1=Yes	Export share: %
	Foreign investments across the globe		Foreign investments in the EU	
Brexit	− 0.103*** (0.019)	− 3.180*** (0.995)	− 0.099*** (0.019)	− 3.049*** (0.992)
Number of foreign investments	0.021*** (0.006)	0.729* (0.385)	0.044** (0.017)	1.299* (0.667)
Foreign: 1=Yes	0.067*** (0.013)	5.188*** (0.606)	0.067*** (0.013)	5.175*** (0.611)
Ln Labour productivity	0.040*** (0.005)	1.430*** (0.181)	0.040*** (0.005)	1.442*** (0.182)
Ln Employment	0.037*** (0.003)	0.164 (0.146)	0.038*** (0.003)	0.191 (0.143)
Ln Firm age	− 0.001 (0.004)	− 0.170 (0.240)	− 0.001 (0.004)	− 0.180 (0.241)
Brexit=1 # Number of foreign investments	− 0.004 (0.006)	− 0.251 (0.407)	0.008 (0.020)	0.148 (0.759)
Brexit=1 # Foreign: 1=Yes	− 0.007 (0.007)	− 0.340 (0.398)	− 0.007 (0.007)	− 0.333 (0.398)
Brexit=1 # Ln Labour productivity	0.007*** (0.002)	0.339** (0.143)	0.006** (0.002)	0.325** (0.145)
Brexit=1 # Ln Employment	0.009*** (0.002)	0.341*** (0.094)	0.009***(0.002)	0.318*** (0.090)
Brexit=1 # Ln Firm age	0.012*** (0.004)	0.099 (0.195)	0.012*** (0.004)	0.107(0.195)
Brexit=1 # increasing foreign investments # decreasing rate of total assets in the UK	− 0.034* (0.018)	− 3.761*** (1.269)	− 0.005 (0.029)	− 2.380 (1.854)
Decreasing rate of total assets	− 0.012 (0.009)	− 2.480*** (0.631)	− 0.017* (0.009)	− 2.809*** (0.656)
Brexit=1 # Decreasing rate of total assets	− 0.007 (0.010)	− 0.225 (0.662)	− 0.004 (0.011)	− 0.043 (0.661)
Growth rate of national turnover	− 0.078*** (0.006)	− 7.258*** (0.578)	− 0.078*** (0.006)	− 7.265*** (0.581)
Announced year	9.945*** (1.191)	325.594*** (68.422)	9.824*** (1.187)	320.791*** (68.548)
c.year#c.year	− 0.002*** (0.000)	− 0.081*** (0.017)	− 0.002*** (0.000)	− 0.080*** 0.017)
Industry (SIC07 5-digit) trend	Yes	Yes	Yes	Yes
Observations	83,085	83,085	83,085	83,085
R-squared	0.201	0.142	0.201	0.141

(1) In these regressions, the sampled firms only consist of MNEs in the UK, aiming to test the channels of redirection and relocation. (2) Standard errors clustered at the SIC7 5-digit industry are reported in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Balanced Trade in Services dataset (BaTIS)[10]. The latest version of BaTIS encompasses data from over 202 reporters and partner countries. In this study, our analysis centres on the years 2009 to 2019, excluding the period encompassing the global financial crisis of 2007–2008, which witnessed profound structural changes in the global economy[11]. In addition, we use OECD quarterly trade in services data as a robustness check.

For our empirical modelling, we employ data on GDP, GDP per capita, and the share of services to GDP, which are sourced from the World Development Indicators provided by the World Bank.

An initial examination of global trade statistics sheds light on the overarching patterns and dynamics of the leading services exporters, as presented in Table 11 in the appendix. The United Kingdom stands as the second-largest global exporter of services, following the United States, and holds the top position in Europe. In 2019, the UK's services export amounted to $419 billion, closely trailed by Germany, and approximately double that of Ireland. Nevertheless, the UK has witnessed a relative decline, with its global share of exported services decreasing from 8.9% in 2005 to 7% in 2019. Germany and France have experienced a milder decline. In contrast, the Netherlands and Ireland have seen substantial increases. Notably, China and India have expanded their global shares, alongside other Asian nations such as Singapore and Hong Kong.

Aggregate impact assessment: A synthetic control approach

We adopt the synthetic control method due to Abadie and Gardeazabal (2003) and Abadie et al. (2010), which is relatively new and increasingly popular for studying the impact of policy shocks on trade. It is especially advantageous when

[10] For more information about OECD-WTO Balanced trade in services dataset (BaTIS), see also: https://www.oecd.org/sdd/its/balanced-trade-statistics.htm.

[11] We report results for the full period of observations in the data between 2005 and 2019 as a robustness check.

Table 8 Predictor balance

	UK	
	Actual	Synthetic
Export of services	12.8	12.8
GDP	28.6	28.9
GDP per capita	10.7	10.8
Share of services trade to GDP	0.202	0.201

Export of services, GDP, and GDP per capita are natural logarithms of values in current USD. Share of services trade is the ratio of services to GDP

Table 9 Synthetic control weights

Country	Weight
UK	
The Netherlands	0.47
Spain	0.039
US	0.491

The pool of donors includes all OECD countries

there are few, often only one, treated units. It evaluates the impact of a policy in a comparative case study, where the comparison unit is constructed as a weighted average of the appropriately chosen non-treated units, which are not affected by the policy. The comparison unit is used to model a counterfactual scenario, in which the treated unit has not been affected by the policy. The synthetic control methodology formalizes the data-driven selection of the comparison unit. Advantages of using the synthetic control method relative to linear regression models (i.e., difference-in-difference methods) include transparency of the fit and counterfactuals, safeguard against specification searches, and sparsity of the comparison units (Abadie, 2021). By appropriately choosing the pool of comparison countries, it allows for causal interpretation as it constructs the trajectory of the counterfactual UK trade without Brexit. The methodology of the synthetic control is further discussed in the Online Appendix.

We use annual and quarterly data for the causal impact analysis, as annual data contains less noise and seasonality, while the quarterly date allows to pinpoint the dynamics of Brexit better. We also provide evidence of the statistical significance of the analysis using the permutation test. The annual data ranges from 2009 to 2019. We limit the pool of potential synthetic control countries to the OECD countries to reduce the bias bound and to make it comparable to the quarterly analysis[12]. We build a synthetic pair based on the services export patterns, GDP, GDP per capita, and share of services to GDP in the period of 4 years before the referendum. Table 8 presents a summary of the balance of predictors, showing a good fit of the actual and synthetic UK in terms of economic size, structure of economy, and level of development.

Table 9 provides information about the set of countries and their weights used in the synthetic control analysis. The UK services trade prior to 2016 performed close to the mix of the Netherlands (47%), Spain (3.9%), and US (49.1%).

The results are reported in Fig. 2. Our estimates based on annual data presented in panel A suggest that the UK's services exports have been down by 9.2 % (36.7 billion USD) per year on average since 2016 as a result of Brexit. This is a slightly higher estimate compared to that based on quarterly data, which is displayed in panel B. This demonstrates that since 2016Q2, the UK has consistently underperformed against the hypothetical synthetic UK, by exporting considerably less in services in all quarters. Between the third quarter of 2016 and the second quarter of 2020, the average underperformance was estimated at 8.7% per quarter (approximately 8.5 billion USD per quarter) compared to the counterfactual scenario where the UK did not vote for Brexit. The use of quarterly data allows us to pinpoint the timing of Brexit more precisely. It also shows that the seemingly significant anticipation effect shown in the annual data in 2015, is the artifact of having too coarsely timed exports.

We follow Abadie et al. (2010) to infer a measure of statistical significance in our results using permutations presented in Fig. 3. This is done by iteratively re-assigning the treatment to each country in the data, constructing a synthetic control outcome and comparing its performance against the actual one. The null hypothesis is that the synthetic control outcome is not statistically significant, while the alternative is the significant impact of the treatment on the outcomes. The p value of the test is 0.045, which indicates that we can reject the null hypothesis of Brexit having no effect on the UK services export at 5% level of significance. Therefore, we conclude that the UK have experienced statistically significantly lower levels of services exports relative to the constructed synthetic control counterfactual services exports since 2016. Taken together, these results show that H5 is emphatically supported.

We perform further robustness checks estimating the impact using difference-in-difference method, including sectoral analysis and placebo tests, which are reported in the appendix. The analysis is performed using longer time frame and the results are presented in Table 12 in the appendix.

Discussion and policy implications

Discussion

This paper examines how Brexit-related uncertainty has impacted UK trade in services. Using a conceptual framework that integrates various forms of international business

[12] Analysis using the full sample as a pool of countries to construct a synthetic pair yields similar results.

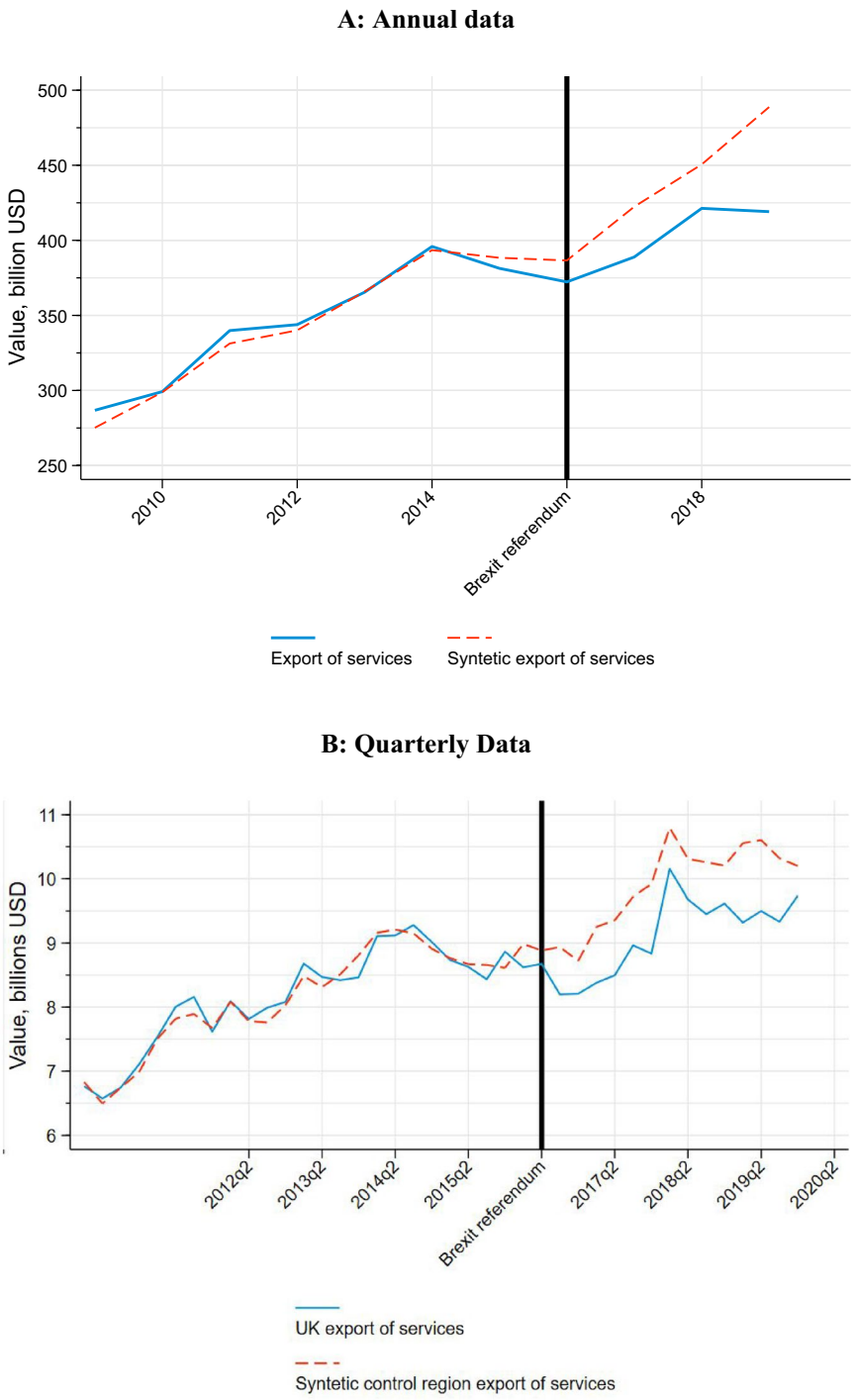


Fig. 2 Synthetic control on annual and quarterly data in 2010–2019. **A** Annual data. **B** Quarterly data

policy uncertainty, we find that both domestic and foreign-owned exporters were significantly affected by uncertainty, leading to delayed investments in export markets and hesitancy in expanding into new products or markets.

Our study extends beyond the traditional focus on trade-related uncertainties to include broader economic and regulatory factors, which further inhibit firms' ability to engage in international trade. Regulatory ambiguities,

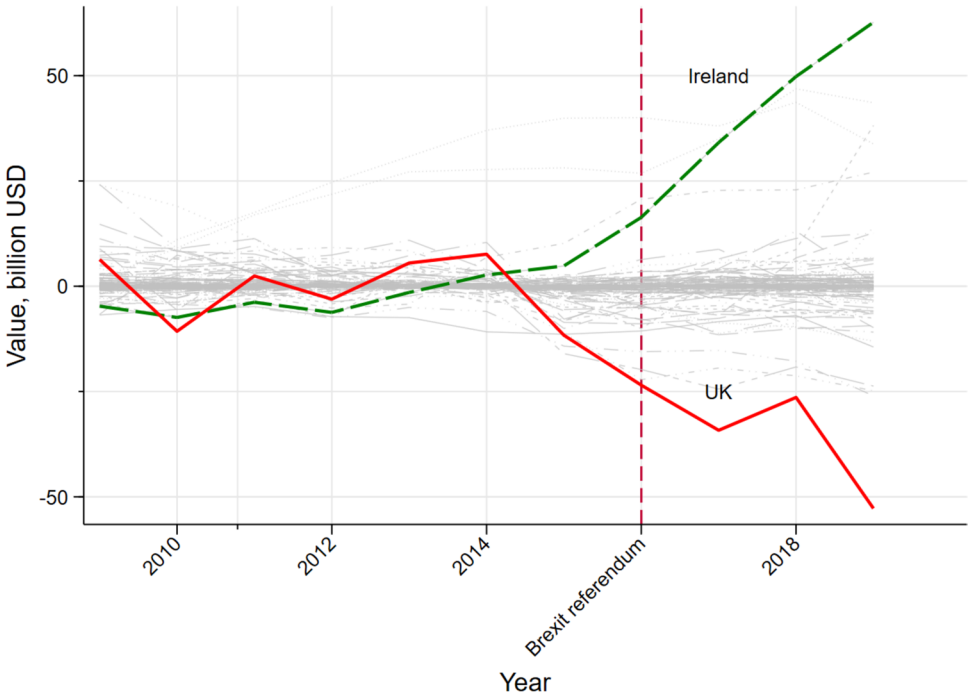


Fig. 3 *Permutation test.* We follow Abadie et al. (2010) to infer a measure of statistical significance in our results using permutations. Permutation test performs the statistical inference on the significance of the Brexit effect for the UK. This is done by iteratively re-assigning the treatment to each country in the data, constructing a synthetic control outcome and comparing its performance against the actual one. Each line in the figure represents the deviation of each country trajectory from its counterfactual synthetic control outcome. The null hypothesis is that the synthetic control outcome is not statistically significant, while the alternative is the significant impact of the treatment on outcomes. The p value for the UK is 0.045, and for Ireland, it is less than 0.01

legal concerns, and shifts in market conditions created significant barriers for firms, limiting their capacity to adjust swiftly to the changing environment.

The empirical analysis provides strong support for the tested hypotheses, offering evidence of the mechanisms through which uncertainty has reduced UK services exports. Brexit uncertainty operated through multiple channels, such as discouraging market entry, reducing export intensity, and prompting relocations of MNEs outside the UK. In many cases, these reductions in export capacity are likely to be permanent, given the disruptions caused by relocation and firms exiting export markets.

By estimating a counterfactual scenario using the synthetic control method, we identify a 9.2% annual reduction in services exports, equivalent to USD 36.7 billion per year, between 2016 and 2019, leading to a cumulative loss of USD 146.8 billion. The data indicate that the negative repercussions of Brexit on UK services exports began well before the formal departure from the EU in January 2021. These findings align with theoretical expectations and empirical studies in the field of international business policy uncertainty, demonstrating that regulatory and economic instability heavily constrains trade.

Policy implications

Mechanisms of how uncertainty impacts export

1. **Uncertainty as a Barrier to Market Entry and Expansion**: Brexit-related uncertainty caused significant delays in firms entering new export markets or expanding existing ones. The unpredictable regulatory landscape – particularly regarding trade agreements, market access, and compliance requirements – created a high-risk environment that stifled investment. To counter this, policymakers should prioritize the development of clear, transparent, and predictable regulatory frameworks. Reliable guidance on future trade relationships will help firms make more informed international decisions, reducing hesitation and encouraging growth.
2. **Impact of MNE Relocation**: The relocation of MNEs due to Brexit uncertainty has resulted in both immediate and long-term reductions in the UK's export capacity. Many firms relocated operations to mitigate risks, leading to permanent losses in trade relationships and market share. To address this, policymakers must focus on reducing the perceived risks of operating in the UK by simplifying customs procedures, maintaining regulatory alignment with key trading partners, and pursuing mutual recognition agreements. These steps would help to restore the UK's attractiveness as a business hub and reverse some of the lost capacity.
3. **Aggregate Economic Impact of Uncertainty**: The estimated 9.2% annual reduction in UK services exports (USD 146.8 billion over 4 years) underscores the severe economic costs of prolonged uncertainty. Proactive risk management policies are essential to mitigating such impacts. Governments should implement early-warning systems and risk assessment frameworks to help firms adapt to changing condi-

Table 10 Summary of research findings and policy implications

Hypothesis tested	Key findings	Policy implications
H1	The Brexit uncertainty negatively impacts the participation of UK firms in service export markets.	**Uncertainty as a Barrier to Market Entry**: Brexit-related uncertainty has delayed firms' entry into new export markets or expansion of existing ones. This aligns with the finding that uncertainty discourages market participation. Policymakers should develop clear, transparent, and predictable regulatory frameworks to help firms make more decisive international strategies, reducing hesitation and fostering greater participation in global markets.
H2	The Brexit uncertainty negatively impacts the intensity of service exports by UK firms.	**Uncertainty as a Barrier to Market Expansion**: The finding of a 9.2% annual reduction in UK services exports aligns with the impact of Brexit uncertainty on export intensity. Proactive risk management policies and contingency planning can help firms navigate uncertain periods while maintaining export activity. Policymakers should introduce early-warning systems, risk assessment frameworks, and transitional support programs (e.g., temporary financial assistance or tax relief) to mitigate these impacts.
H3	The negative effect of the Brexit uncertainty on export participation and export intensity is disproportionately large for small and medium-sized enterprises compared to their large counterparts.	**Business-Led and Government-Led Risk Mitigation**: SMEs are particularly vulnerable to uncertainty, as reflected in their disproportionate reduction in export participation and intensity. Government resources, guidance, and support are critical to help SMEs develop and implement risk management strategies. Additionally, fostering best-practice sharing among industries can enhance resilience. Policymakers should focus on tools like financial planning, scenario analysis, and supply chain management to support SMEs.
H4	MNE relocations driven by the Brexit uncertainty lead to a reduction in international trade activities in the host countries from which these MNEs relocate.	**Impact of MNE Relocation**: Brexit uncertainty prompted many MNEs to relocate, leading to reductions in the UK's export capacity. To counter this, policymakers should focus on simplifying customs procedures, maintaining regulatory alignment, and pursuing mutual recognition agreements. Reducing administrative and regulatory burdens will help retain MNEs and restore lost operations, mitigating the negative impact of relocations.
H5	The Brexit uncertainty adversely affects UK services exports as a whole.	**Aggregate Economic Impact of Uncertainty**: Brexit-related uncertainty has led to a significant reduction in UK services exports, as evidenced by the cumulative loss of USD 146.8 billion over 4 years. This supports the need for early-warning systems and risk assessment frameworks to pre-empt and mitigate the impacts of prolonged uncertainty. Policymakers should prioritize the development of well-structured policy frameworks and transparent regulatory environments to mitigate the adverse effects on overall UK services exports.
Cross-cutting across hypotheses	• **Importance of Regulatory Clarity**: Regulatory uncertainty, especially concerning UK–EU alignment, affects service exports across all firm sizes. Transparent and timely communication regarding regulatory changes and market access conditions is crucial for ensuring smoother market participation and export intensity. This applies across Hypotheses 1, 2, and 5. • **Transitional Support Measures**: To mitigate the effects of uncertainty, WTO-compliant support measures, such as temporary tax reliefs and financial assistance for regulatory compliance, can provide necessary aid to firms. This is relevant for reducing the impacts on SMEs (H3) and overall services exports (H5). • **Pre-Emptive Measures**: Governments should implement pre-emptive strategies to address sources of uncertainty, such as visa or logistics barriers, which affect market entry and export participation (H1 and H3).	

Source: The Authors' summary from this analysis

tions. Furthermore, contingency planning and transitional support programs – such as temporary financial assistance or tax relief – can help firms maintain export activity during uncertain periods.

Risk mitigation strategies

1. **Regulatory Clarity**: Regulatory uncertainty – particularly regarding UK–EU alignment – has profoundly impacted services trade. Policymakers must prioritize transparent and timely communication about regulatory changes, trade agreements, and market access conditions. While it is impossible to eliminate all uncertainty, well-structured and predictable policy frameworks can significantly mitigate avoidable costs. Clear communication is crucial for sectors like financial services and IT, which rely on seamless cross-border operations.
2. **Transitional Support Measures**: Governments should implement WTO-compliant transitional support measures to assist firms in adapting to new regulatory and trading realities. While direct export subsidies are restricted under WTO rules, alternative measures, such as temporary tax reliefs, financial assistance for regulatory compliance, or grants for workforce retraining, can offer critical support without violating international trade rules. Countries like Ireland and France have introduced successful programs focused on compliance, resilience, and adaptation, serving as potential models for the UK.
3. **Business-Led and Government-Led Risk Mitigation**: Businesses should continue to develop risk management tools, such as financial instruments and insurance products, to safeguard against trade disruptions. However, these efforts remain uneven across sectors. Best-practice sharing among industries and collaboration on risk mitigation strategies can enhance overall resilience. Governments should also provide resources and guidance to help businesses develop and implement effective risk management strategies, such as tools for financial planning and supply chain management.
4. **Pre-Emptive Measures**: Governments should implement pre-emptive strategies to address potential sources of uncertainty, such as visa or logistics barriers. Additionally, investing in domestic workforce skills and capabilities will improve adaptability to changing international trade conditions. By building capacity for rapid responses to regulatory changes, businesses will be better positioned to seize new market opportunities despite uncertainty.

Manufacturing and services: a mutually beneficial relationship

The relationship between services and manufacturing is mutually reinforcing. A robust manufacturing sector stimulates demand for advanced services, while a competitive services sector supports manufacturing growth through innovation in knowledge-based services. Given the intertwined nature of goods and services trade, it is critical that both sectors receive equal consideration in trade agreements. However, service liberalisation presents greater challenges than trade in goods due to the complex and politically sensitive nature of service industries.

The uncertain future

While the EU–UK Trade and Cooperation Agreement (TCA) introduced in January 2021 aimed to alleviate some of the uncertainty, UK services sectors continue to face challenges due to the altered trade dynamics with the EU. With frictionless trade no longer guaranteed, the full extent of Brexit's consequences for UK services trade remains uncertain. Continuous monitoring and adaptive policy responses will be essential to address emerging challenges and mitigate the negative effects of the UK's disintegration from the EU.

We summarise our key research findings and their policy implications in Table 10.

Limitations and future research

Our primary objective in this study is to understand how UK firms responded to the uncertainty following the Brexit referendum. While modelling uncertainty is highly relevant and interesting, we have not tackled it in any nuanced way. With this focus, we have employed an empirical approach using difference-in-difference and synthetic control methods, treating Brexit as a shift or shock rather than operationalising the specific differences in uncertainties from various sources. In future research, the need to delving into the nature of uncertainty in international business policy context will only grow. This is likely to be highly relevant as globalisation continues to evolve in unpredictable ways. This includes the need for both conceptual development of specific mechanisms and novel data and methods for measuring and modelling different types of uncertainty.

Conclusion

This study provides a comprehensive assessment, underpinned by extensive empirical evidence, illustrating the profound impact of uncertainty on trade participation and performance. It shows that the UK's services trade experienced a significant decline

due to the uncertainty triggered by the 2016 Brexit referendum. The adverse effects were amplified by heightened levels of policy uncertainty. Using the synthetic control method, the study estimates an annual 9.2% decrease in services trade, equivalent to USD 36.7 billion, during the 2016–2019 period, culminating in a cumulative loss of USD 146.8 billion.

The analysis highlights that the consequences of Brexit on UK trade extended beyond goods to services, with substantial and consistent findings across various robustness checks. The core message is clear: policy uncertainty detrimentally affects exporting.

Furthermore, our research aligns with previous studies on how economic uncertainty impacts trade flows, confirming that uncertainty can significantly reduce both trade participation and performance, which in turn depresses international trade engagements. The study not only confirms the negative effects of Brexit uncertainty but also delves into the mechanisms behind the decline in the UK's services trade. It identifies three key channels through which Brexit uncertainty has led to these declines: reduced export participation, diminished export intensity, and business relocation.

The findings highlight the need for transparent, predictable regulatory frameworks, proactive risk management policies, and WTO-compliant transitional support to mitigate uncertainty's economic toll. Simplifying customs procedures, maintaining regulatory alignment, and fostering clear communication will be crucial to sustaining the UK's competitiveness in international trade. Moving forward, continuous monitoring and adaptive policy responses are essential to navigating ongoing and future challenges in the post-Brexit environment.

Appendix

See Fig. 4 and Tables 11, 12.

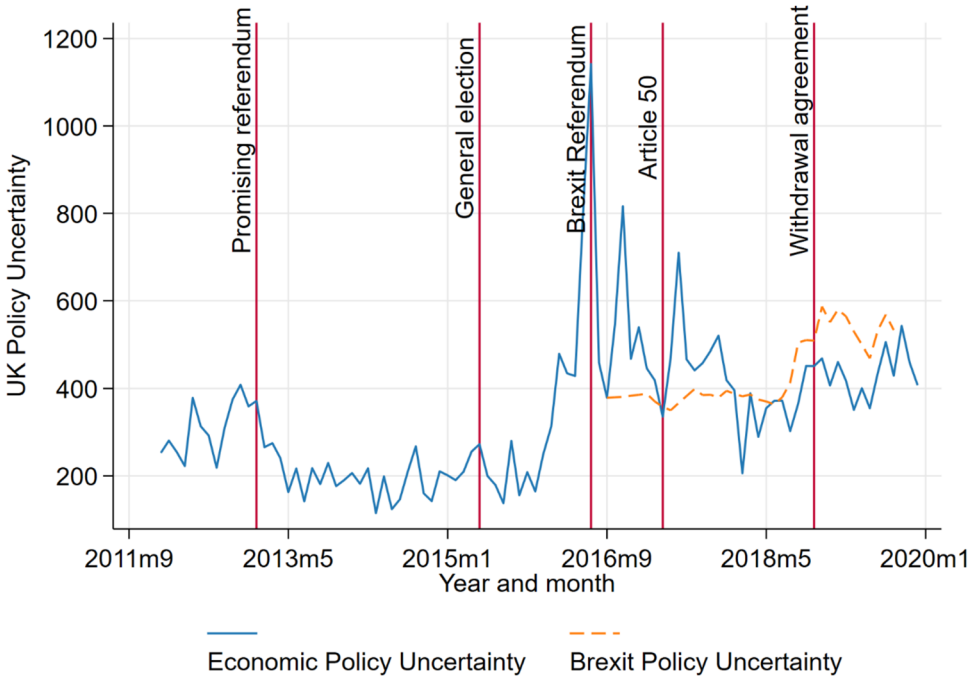


Fig. 4 Economic policy uncertainty and Brexit policy uncertainty indices. Source: EPU is extracted from: https://www.policyuncertainty.com/. BPU is based on Decision Maker Panel (DMP) Survey and Bank of England calculations

Table 11 Top 20 services exporters

Country name	Services export in 2019, billion USD	Share of global export of services (%)		
		2005	2010	2019
USA	895.6	14.89	15.25	14.95
United Kingdom	419.1	8.86	7.61	6.99
Germany	350.5	6.45	6.19	5.85
The Netherlands	286.2	3.98	3.99	4.78
France	266.4	5.39	4.78	4.44
China	251.3	3.32	3.99	4.19
Ireland	208.6	2.16	2.20	3.48
Japan	191.6	3.52	3.17	3.20
Singapore	171.5	1.91	2.34	2.86
Hong Kong	153.4	1.97	2.29	2.56
Spain	150.7	3.29	2.74	2.51
India	147.1	1.38	2.07	2.45
Switzerland	145.9	2.75	2.77	2.43
Italy	129.9	3.20	2.57	2.17
Belgium	104.5	1.92	2.06	1.74
Canada	91.9	2.06	1.82	1.53
Bermuda	91.7	1.10	1.57	1.53
Republic of Korea	90.4	1.53	1.73	1.51
Luxembourg	87.8	1.28	1.37	1.46
Australia	74.6	1.25	1.37	1.25

Data source is BaTIS

Table 12 Difference-in-difference exports in 2005–2019

	(1) Overall	(2) Transport	(3) Travel	(4) Insurance and pension	(5) Financial	(6) Intellectual Property rights	(7) IT	(8) Business	(9) Culture
	S	SC	SD	SF	SG	SH	SI	SJ	SK
A. Brexit and UK services export									
UK=1 # After=1	− .111*** (.0286)	− .133** (.0484)	− .0816 (.0700)	− .164 (.0992)	− .236*** (.0559)	− .0532 (.0975)	− .170*** (.0508)	− .119* (.0527)	− .00341 (.116)
Observations	595379 .986	594930 .974	591849 .976	510275 .969	491520 .981	470360 .980	580777 .969	587082 .981	484368 .946
B. Brexit and services trade. Placebo test									
UK=1 # After=1	− .111*** (.0286)	− .133** (.0484)	− .0812 (.0700)	− .164 (.0992)	− .235*** (.0559)	− .0534 (.0975)	− .170*** (.0508)	− .119* (.0527)	− .00508 (.116)
Placebo=1 # After=1	− .00828 (.0732)	− .00781 (.0409)	.0446 (.112)	.536 (.356)	.275 (.151)	− .348 (.217)	− .245*** (.0490)	− .0354 (.100)	− .338*** (.0975)
Observations	595379	594930	591849	510275	491520	470360	580777	587082	484368
Pseudo	.986	.974	.976	.969	.981	.980	.969	.981	.946

(1) Standard errors clustered by country pair in parentheses. (2) All models have reporter, partner and pair fixed effects. (3) ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1057/s42214-024-00202-6.

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Jun Du is Professor of Economics at Aston Business School, specialising in international trade, innovation, and industrial organisation. Her research explores the intersection of economic policy, firm behaviour, and innovation dynamics, with a particular focus on how economic uncertainty and regulatory changes impact international business strategies. Professor Du has published extensively in leading academic journals, contributing valuable insights into the drivers of competitiveness and growth in the global economy. As the Founding Director of Centre for Business Prosperity, she is also actively involved in policy advisory work, helping to shape strategies that foster innovation and economic resilience in the face of global challenges.

Oleksandr Shepotylo is Associate Professor of Economics at Aston Business School, UK. He earned his PhD from the University of Maryland in the USA. He has worked at the World Bank and consulted governments on trade policy and WTO accession. Before coming to the UK, he taught at top universities in the US and Ukraine. His research focuses on how firms, industries, and countries grow by integrating into global markets. Oleksandr has published in top economics journals, and his research has been supported by the UK government and international agencies.

Xiaocan Yuan is a post-doctoral research fellow at Warwick Business School. Her work focuses on foreign direct investment and UK productivity, funded by the ESRC Productivity Institute. She earned her PhD in Management from Aston Business School, UK. Her main research interests include understanding the driving forces behind firm innovation and growth, the location choices of foreign direct investment, and firm internationalisation strategies. She is also Research Associate at the Centre for Business Prosperity, Aston University, UK.