Creative Industries Policy and Evidence Centre

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Discussion paper

International Trade Challenges and the Effectiveness of Support Measures for the UK's Creative Industries

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Centre for Business Prosperity (CBP) at Aston University is an independent research centre for global strategy for firms, industries, and regions. This project is funded by the Creative Industries Policy and Evidence Centre (Creative PEC) We are grateful for the financial support and other assistance provided by the Creative PEC. Special thanks to Hasan Bakhshi, Director of the Creative PEC for commissioning this the research on which this paper is based. We are thankful for the comments and suggestions by Bernard Hay, Giorgio Fazio and Bruce Tether during the course of the research. The views expressed in this report are those of the authors and do not necessarily represent those of the funders. *Corresponding author: Jun Du j.du@aston.ac.uk.

About the Creative Industries Policy and Evidence Centre

The Creative Industries Policy and Evidence Centre (PEC) works to support the inclusive and sustainable growth of the UK's Creative Industries through the production of independent and authoritative evidence and policy advice. Led by Newcastle University with the Royal Society of Arts and funded by the Arts and Humanities Research Council, the Centre comprises a core consortium of; Newcastle University, Work Advance, Sussex University and the University of Sheffield. The PEC works with a diverse range of industry partners. For more details visit http://www.pec.ac.uk and @CreativePEC

Disclaimer

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Executive Summary

The formidable challenges confronting the UK's creative industries in the realm of exports, stemming from the convergence of COVID-19 and the conclusion of the EU transition period, reached their apex in the early months of 2021. Our comprehensive analysis of export disruptions and the heterogeneity of firms in 2021 employs the ONS's Business Insights and Conditions (BICS) Surveys data and offers seven pivotal insights into the turbulence faced by the UK's creative industries:

- **Prevalence of Disruption**: A substantial portion of firms within the UK's creative industries encountered export disruptions in 2021, with some even suspending their exports entirely.
- **Uncertainty**: A profound sense of uncertainty permeated these firms concerning the root causes of export disruptions, surpassing the levels witnessed in the broader economy.
- **Impact of Brexit**: Firms exclusively exporting to the EU endured most of the disruption, underscoring the imperative of tailored support.
- **Leading Export Challenges**: Predominant export challenges encompassed diminished demand, customs duties, work permit/visa restrictions, and logistical issues.
- **Sectoral Disparities**: Diverse creative sub-sectors were affected to varying degrees, accentuating the need for precisely targeted interventions.
- **Firm Resilience**: Larger, more established, and highly productive creative enterprises exhibited greater resilience against Brexit-related challenges, albeit not against the disruptions spawned by COVID-19.
- **Policy Support**: Government support measures proved beneficial to creative industry firms, particularly the smaller entities, yielding remarkable increases in the probability of successful exports.

These findings underscore the urgency of instituting comprehensive trade policies and measures to dismantle the barriers obstructing the UK's creative industries. Collaborative efforts between the UK and the EU are indispensable, with the sharing of invaluable lessons and best practices. Our policy recommendations include:

1. **Tailored EU Export Support**: Customised support for firms exporting to the EU, with a special focus on small businesses grappling with new requirements and administrative complexities.
2. **Export Decision Facilitation**: Providing tailor-made advice to assist creative firms in their export decisions, proffering market intelligence and strategic guidance.

3. **Reviving Export Activities**: The creation of digital resources and advisory programs to inspire and assist former exporters in resuming their international trade.
4. **Igniting Innovation**: Showcasing success stories of creative enterprises exploring new export avenues and fostering knowledge-sharing within the industry.
5. **Regulatory Conformity**: Sustaining alignment with the EU on matters such as intellectual property, product standards, sustainability, and data protection.

In addition, broadening the scope of trade support organisations with aligned objectives, and fostering collaboration with diverse entities will be crucial to maximise the effectiveness in aiding firms grappling with multifaceted challenges that extend beyond mere technical export difficulties. By addressing these issues collectively, the economy can fortify the resilience and global competitiveness of the UK's creative industries.

To pave the way for more efficient and meticulously targeted export support strategies for the UK's creative sectors, further research is imperative. This research should delve deeper into how export support mechanisms can effectively cater to firms of different size, age, sector, and product/service line. Furthermore, innovative approaches to outreach are urgently required to tackle the longstanding issue of limited accessibility to export support, ensuring that it reaches and engages those in dire need of assistance.

1. Introduction

The UK's creative industries span an extensive and diverse spectrum within the economy, encompassing traditional artistic pursuits such as music, publishing, and the performing arts, as well as more knowledge-based endeavours such as software and computer services, and services-oriented sectors like film, television, and design. The 2001 Creative Industries Mapping document by the UK Department of Culture Media and Sports (DCMS) defines the creative industries as those rooted in individual creativity, skill, and talent, with the potential for wealth and job creation through the generation and exploitation of intellectual property (DCMS, 2001).

The growth of the UK's creative industries has been nothing short of remarkable. From 2011 to 2019, these industries burgeoned at nearly twice the pace of the broader economy, contributing an impressive £115.9 billion to the UK economy in gross value added and accounting for 5.9% of the UK's GDP in 2019 (DCMS, 2020).

Notably, the UK's creative sectors are not only ambitious but also pivotal contributors to the country's trade surplus. In 2019, the UK's creative industries exported services worth approximately £38 billion, representing nearly 12% of the UK's total service exports. Additionally, the creative sector exported goods valued at £13.8 billion, constituting 3.8% of the UK's goods exports in 2019 (DCMS, 2022). This underscores the sector's sustained global competitiveness, underpinned by the significance of international trade, which extends beyond the export value, also fuelling job creation and value addition, primarily driven by micro businesses (Du et al., 2023b).

The confluence of unparalleled challenges posed by the Covid-19 pandemic and the UK's departure from the EU necessitates a focused analysis of the performance of the creative industries in the years 2020-2021. It offers a unique opportunity to study how firms within the creative industries weathered economic shocks, their ability to maintain active export operations, and in particular the role of government support. During the crisis period, sub-sectors like live music and performance were on the brink of devastation, while others, including TV, video games, and global music streaming, thrived. Further heterogeneity was observed within sub-sectors, with some businesses ceasing to trade while others not only survived but also thrived by adapting to digital technologies and evolving consumer preferences (Green, 2021).

Beneath these high-level observations, a profound gap in the granular analysis of creative industry firms' experiences during this crucial period is evident. To address this gap, we require data at the firm level. As the UK economy emerges from the Covid-19 crisis and navigates the post-Brexit landscape, the imperative to glean lessons from the crisis for the formulation of new policies and fresh strategies is paramount. As articulated by DCMS (2021), 'There is now a practical urgency about gathering research and intelligence, not only to support re-opening but to secure the pathway to longer-term growth.'

Our previous research for the Creative PEC partly responded to this call, assessing the international trade

experiences of UK creative industry businesses during the period of UK trade policy uncertainty following the Brexit Referendum (Du et al., 2023b). This present study marks a second phase of our endeavour to comprehend creative industry firms' international trade experiences during the more recent post-Brexit era. We seek insights into firms' export challenges and disruptions and assess the extent to which government support mitigated these challenges. The lessons from this study are expected to guide the recovery and growth of the creative industries as they progress beyond the post-Covid-19 and post-Brexit landscape.

Specifically, we address two vital questions. First, we delve into how firms responded to export disruptions during the crisis, shedding light on the nature and extent of export challenges and disruptions in the UK's creative industries. We utilise data from the ONS's Business Insights and Conditions (BICS) Surveys, focusing on the period from 7 January to 2 December 2021 (waves 20-44 in BICS). Drawing on individual firm-level data linked to BICS from the ONS's Business Structural Database (BSD), we offer insights into the determinants of disruptions and their relative significance, comparing creative industry firms with their counterparts in non-creative service sectors. This analysis allows us to account for firm-specific characteristics, such as size, age, and productivity, and scrutinise the heterogeneity in their responses to shocks and their resilience.

The second question we address is of paramount importance to policy formulation. To what extent did creative industry firms access the policy supports introduced by the UK government, and how effective were these supports in helping them overcome export challenges? Given that export supports were specifically targeted at firms in need, we first explore the factors influencing firms' access to these supports. Conditional on these factors, we evaluate the effectiveness of export supports in assisting firms in overcoming difficulties and maintaining their export activities.

The remainder of this report is organised as follows. Section 2 offers context on international trade in the UK's creative industries. Section 3 provides a comprehensive description of the data. Section 4 delves into our first question, exploring the factors behind export disruptions in creative industry firms. Section 5 addresses the second question regarding the access to and efficacy of export support. Our findings are discussed in Section 6, within the context of existing research literature, and we offer policy recommendations. Finally, Section 7 concludes this report.

2. The Context for UK Creative Industries' Trade in 2021

2.1 The landscape

In a global context, international trade within the creative industries has exhibited remarkable growth. As of 2020, the exports of creative goods had surged more than 2.5 times in the preceding two decades, and creative services had doubled in the previous ten years (UNCTAD, 2022). While the proportion of creative goods in global trade remained relatively stable or even decreased over time, creative services have gained prominence among service sectors. The percentage of creative service exports in relation to total service exports soared from 12% in 2010 to 21% in 2020 (UNCTAD, 2022).

As the world's second-largest trader in services, the UK holds a robust competitive position within the global economy. Key players in the global creative industries include the United States, European Union Member States, the UK, and major Asian economies such as China, Japan, and Korea. Di Novo, Fazio, and Vermeulen (2020) have provided insightful observations on international trade trends within the UK's creative industries. In 2019, the UK's creative industries contributed £38 billion to service exports, accounting for nearly 12% of the UK's total service exports (Di Novo et al., 2020). Remarkably, even amid the Covid-19 crisis, the UK's creative industries managed to expand their service exports to £41.4 billion in 2020, constituting 14.2% of the UK's service exports (DCMS, 2022). For the UK's creative industries, international trade is not only about export value but also about job creation and value addition, with a significant contribution from micro-businesses (Bazalgette, 2017).

Du et al. (2023b) conducted an extensive review of the global landscape of service exports by the UK's creative industries, with a focus on five sub-sectors. Notably, IT, software & computer services dominate the world's trade in creative services, followed closely by advertising and marketing services, in which the UK holds a prominent position. Furthermore, the United Kingdom has the largest market share among major economies in the distribution and licensing of audio-visual products. The study also revealed that the services trade within five sub-sectors of the UK's creative industries—specifically, audio-visual distribution and licensing, computer services, advertising and market research services, architecture services, and audio-visual-related services—experienced challenges due to the policy uncertainties stemming from the Brexit Referendum between 2016 and 2019.

Against this backdrop, the UK's creative industries faced the dual challenges of the Covid-19 pandemic and the conclusion of the EU transition period. These challenges reached a critical point in the first quarter of 2021 when the UK adjusted its trading relationships with the EU.

2.2 The Impact of Covid-19

The Covid-19 pandemic marked an unprecedented socio-economic crisis, particularly impacting the service industries and triggering an accelerated adoption of digitalisation practices (WIPO, 2022). This crisis disrupted established business models, organisational structures, work methodologies, technologies, consumer preferences, and policy frameworks. It introduced a multifaceted and enduring crisis, poised to exert a lasting influence for years to come.

The intensity and dynamics of this impact exhibited notable variations across creative sub-sectors and countries (OECD, 2020). Venue-based sub-sectors, such as museums, libraries, and performing arts, faced severe challenges, teetering on the brink of survival. In contrast, IT-related and audio-visual sectors experienced significant growth (Kim et al., 2020). In sum, the UK's creative sector displayed relative resilience, with exports contributing £41.4 billion in 2020, constituting 14.2% of the UK's service exports (DCMS, 2022). Nevertheless, these figures obscure the numerous hurdles that creative businesses encountered.

Initially, the pandemic brought forth cancellations and closures. Many live events, including concerts, festivals, and theatrical productions, succumbed to postponements and cancellations due to Covid-19 restrictions, resulting in substantial revenue losses. Furthermore, sectors like film and television production, music concerts, and art exhibitions were significantly impacted by pandemic-related restrictions on travel and gatherings. Cinemas closed, and the cancellation of film festivals and similar events led to reduced international sales of films and TV shows. The music industry suffered from cancelled concerts, festivals, and tours, resulting in reduced revenues from music exports (Billboard, 2023). Similarly, art exhibitions and galleries were adversely affected by pandemic-related restrictions, leading to diminished international sales of artworks (Artsy, 2023).

Concurrently, there were production delays linked to these cancellations and closures. Film and television production schedules experienced severe disruptions, leading to delays in the release of new content. In response to these challenges, several creative industries shifted to online delivery models, such as virtual concerts and streaming services for films and television, as a means to reach audiences during lockdowns. The pandemic thus had a significant economic impact on the creative industries, with many artists, performers, and businesses grappling with reduced revenues and, despite public financial measures, a lack of sufficient financial support.

Furthermore, consumer behaviour underwent significant changes during the pandemic, with a growing inclination toward online platforms for entertainment and shopping. This shift necessitated adjustments in how the creative industries market and sell their products. In sum, the Covid -19 pandemic has profoundly affected the creative industries, and it will likely take several years for the full extent of these impacts to become apparent.

2.3 The impact of Brexit on creative sector goods

The United Kingdom formally concluded its withdrawal from the European Union (EU) in 2020, fully departing from the EU on January 1, 2021, following the transition period. While the formal withdrawal signalled the conclusion of EU membership, the UK adhered to EU rules and regulations during negotiations regarding the future UK-EU relationship.

During the transition period, freedom of movement between the UK and EU member states continued. In 2021, the initiation of the new UK-EU relationship was defined by the EU-UK Trade and Cooperation Agreement (TCA), negotiated, and agreed upon during the transition period. Consequently, the UK regained full sovereignty over its laws, borders, and trade policies, liberating itself from EU regulations and institutions. This transformation introduced new regulations and customs procedures, significantly impacting trade between the UK and the EU, including import/export requirements and tariffs. It is within this trade context that this paper focuses its analysis.

Under the TCA, UK creative industries no longer enjoy unrestricted access to EU markets. While the TCA does not impose tariffs and quotas on goods exported to the EU, it introduces rules of origin (RoO) requirements. Firms must adhere to these requirements, which can result in additional administrative burdens. Failure to claim preferential treatment or prove a product's eligibility for preferential rates may lead to tariffs on the import and export of creative goods between the UK and the EU. Certain UK creative goods may not meet these requirements, making them subject to tariff charges. Even for goods theoretically eligible for tariff-free status, firms unable to provide proof of eligibility may still face tariffs. Examples of such goods include artworks, paintings, antiques, film, and audio-visual works.

The introduction of customs procedures for creative goods adds to the time and cost of trade. These procedures necessitate customs declarations and, potentially, additional paperwork to comply with new regulations. Additionally, the UK and the EU may introduce non-tariff barriers, such as licensing requirements and technical standards, which can affect the trade of creative goods. Du and Shepotylo (2022) estimate that increased frictions due to non-tariff measures significantly contributed to the negative impact of post-Brexit trade with the EU. Changes in intellectual property (IP) laws can also affect the rights of artists, writers, musicians, and other cultural producers to protect and monetise their works across borders, although these IP regime changes have been limited and are expected to remain so in the near term. It is worth noting that the UK's departure from the EU does not significantly affect European Patents, as firms can continue to apply for European Patents through the European Patent Office (EPO), covering multiple European countries, including the UK. However, this differs for trademarks and design rights, where businesses may need to consider separate registrations for the UK and the EU, incurring additional costs.

Transport and logistics present a major challenge, as new regulations impact the distribution of cultural goods across borders. The 'cabotage' rules in the Trade and Cooperation Agreement (TCA) have affected the

movement of creative goods in 2021. Specifically, UK-owned companies can no longer use vehicles over 3.5 tonnes for more than three internal movements within the EU before returning to the UK. This restriction hampers the movement of goods and affects sectors like events haulage, already grappling with the impact of the Covid-19 pandemic.

Moreover, the TCA requires an *Admission Temporaire* (Temporary Admission or ATA) Carnet for moving work equipment, including recording equipment and musical instruments, across borders. A carnet acts as a temporary passport for goods and entails substantial costs, including a security deposit. These expenses and added bureaucratic processes can limit the ability of small businesses to develop acts in the EU. Additionally, provisions in the TCA for the movement of 'cultural goods' introduce additional barriers for UK companies and organisations when organising trade fairs and exhibitions, subjecting them to customs, logistical considerations, tariffs, carnets, and export licensing charges.

Finally, changes in VAT and other taxes may impact the pricing of creative sector goods, potentially making them more expensive for consumers in both the UK and the EU.

2.4 The impact of Brexit on creative sector services

Barriers to trading in services have escalated in the aftermath of the Brexit transition and the implementation of the TCA. The UK, no longer part of the world's largest trading bloc, has encountered new trade impediments when dealing with the EU. These hurdles encompass constraints on the mobility of creative industry professionals, the lack of mutual recognition of professional qualifications, disparities in intellectual property and copyright protection, and the withdrawal of EU funding. Each of these challenges is discussed in detail.

One of the most contentious post-Brexit issues for serviceability revolves around the mobility of creative professionals and mutual recognition of professional qualifications. This was a contentious point in the Brexit negotiations. With the UK's exit from the EU, creative service providers face new constraints on the movement of people, including visa requirements and work permits. These requirements can increase the complexity and cost of individuals working in creative services across borders. While the TCA guarantees short stays of up to 90 days every six months for business travellers in creative industries such as advertising, market research, and computer services, it excludes paid work or activities that generate income. These restrictions limit the mobility of creative professionals, affecting practices common in sub-sectors like music, performing arts, and architecture, where professionals frequently move between projects within a country. However, the time limit on visa-free stays complicates this practice.

When a visa or work permit is required, each European member state has its unique work rules and visa regimes, adding complexity and bureaucracy for sub-sectors where professionals often tour and work within the EU. For instance, companies like Globetrotter Live Limited have highlighted the complexities arising from different work

requirements for people working on the same project during tours. The intricate nature of these requirements can lead to permits expiring mid-project, prompting larger companies to favour EU-based contractors.

The ability for regulated professionals to offer cross-border services is pivotal for the creative sector. Post-Brexit, the lack of recognition of professional qualifications hinders the ability of creative service providers to trade, even if this is a temporary situation as EU-UK cooperation evolves. The process of recognising professional qualifications has become more burdensome in terms of paperwork, time, and capital. SMEs, in particular, face challenges due to limited resources and the inability to outsource administrative tasks.

Market access constraints have emerged as another set of new trade barriers since the UK's departure from the EU. Notably, the audio-visual services sector faces market access restrictions, including quotas and nationality requirements for streaming platforms and broadcasters operating in both the UK and the EU. These regulations increase operational complexity for streaming platforms and create barriers for new businesses. Additionally, in co-production and accessing EU funding, the requirement for physical presence has implications for UK companies. EU co-production rules necessitate significant contributions from EU-based production companies, compelling UK companies to establish EU subsidiaries. This is essential to maintain eligibility for certain EU funding programs that support creative projects. Collaborative projects with EU counterparts may become more intricate without an EU presence, potentially limiting access to EU talent and markets.

The complexities of national regulatory frameworks govern the global business operations of creative industry firms. Post-Brexit, operations within the EU involve compliance with local regulations, including tax and labour laws, introducing administrative complexities. Additionally, regulatory divergence between the UK and the EU could create additional costs and challenges for creative service providers. This divergence might include variations in intellectual property regimes and standards for health and safety.

The UK's exit from the EU also signifies a significant loss in EU funding and investment. Major funding sources that are no longer accessible include European Structural and Investment Funds, Creative Europe funding, and finance provided by the European Investment Bank. This loss of eligibility for structural funding leaves a substantial funding gap of approximately £8.4 billion. The absence of Creative Europe funding affects collaborative cultural projects, particularly in sub-sectors like the performing and visual arts. Similarly, the loss of the Creative Europe MEDIA sub-program impacts the audio-visual sector. The absence of Horizon 2020 funding also marks a significant loss for research investment in the UK. This not only affects financial funding but also the potential loss of talent.

On the positive side, the UK and the EU currently maintain high alignment on intellectual property and data protection regulation, a benefit for the creative industries. The UK GDPR, retained in UK law until June 27, 2025, ensures the free flow of data between the EU and the UK in most cases.

In summary, international trade in the creative industries has experienced both growth and disruption. While the

creative services sector has expanded significantly, it has faced substantial challenges due to the Covid-19 pandemic, shifts in consumer behaviour, and Brexit-related trade barriers. Some sectors faced tariffs and customs procedures, while others encountered non-tariff barriers, mobility restrictions, and regulatory changes. The loss of EU funding and financial support further complicated matters. To address these challenges, rigorous research at the firm level is crucial. Studying how individual creative businesses navigate complex trade dynamics, adapt to evolving regulations, and seize opportunities is vital. This research can provide valuable insights into strategies that promote resilience, innovation, and sustainable growth within the creative industries, shaping the future of this critical sector in a rapidly evolving global context.

3. Data and Description

This study leverages data from the Office of National Statistics (ONS) Business Insights and Conditions Surveys (BICS) to investigate international trade in the UK's creative industries. The BICS survey, consisting of approximately 40,000 business responses per wave, has been conducted bi-weekly since 2020. It covers various business situations, including export-related challenges, leading to an unbalanced panel due to differing response rates in each wave. To ensure that the BICS accurately represents the UK business population, the ONS employs established weighting methods, aligning the results with the total number of UK businesses.

As of June 2020, BICS results have been weighted, allowing for the estimation of the collective impact on all businesses from the pandemic's onset to the present, facilitating time-based comparisons. The BICS adopts an agile approach, continuously collecting real-time information on matters affecting UK businesses and the economy. The survey regularly undergoes updates, with questions added, modified, or removed to adapt to evolving circumstances.

Our study begins by analysing firms' accounts of their trade experiences and performance during the period under examination, yielding preliminary descriptive insights. Subsequent regression analysis builds on these initial observations, investigating the relationships between key variables of interest. The BICS survey offers valuable information at the firm level regarding export disruption, highlighting the diverse responses of firms to challenges posed by Covid-19 and/or Brexit. This depth of detail is typically unattainable in survey-based studies reliant on smaller, non-representative samples.

Key variables of interest encompass the firm's perceived primary cause of export disruption (Covid-19, Brexit, or a combination of both) and the specific export challenges faced by the firm, such as reduced demand, transport and distribution issues, legal complications, customs and tariffs, and export licensing. We link the BICS survey data to the Business Structural Database (BSD) at the firm level, controlling for additional firm characteristics commonly addressed in empirical studies, including firm age, size, labour productivity, industry, and location.

This is followed by a policy evaluation, allowing us to assess whether the export support received by a firm aided in overcoming export challenges.

Table 2 presents a breakdown of the creative industries sample in the BICS dataset, organised by time period, based on the raw data observations. We classify creative industries based on the broad DCMS categories, referencing the Standard Industrial Classification (SIC) codes. The dataset comprises more than 39,000 observations from the creative industries over the years 2020 to 2022, inclusive.

Table 2: BICS creative industries sample size, number of firm-wave observations

Sector description	Sector definition, SIC codes	2020: waves 7-19	2021: waves 20-44	2022: waves 45-64
IT, software & computer services	5821,5829,6201,6202	2,873	8,409	6,714
Advertising & marketing	7021, 7311, 7312	786	2,161	1,636
Film, TV, video, radio & photography	5920, 8552, 9001, 9002, 9003, 9004	722	1,837	1,544
Music, performing & visual arts	5911,5912, 5913,5914,6010,6020,7420	683	1,908	1,553
Architecture	7111	617	1,567	1,258
Publishing	5811,5812, 5813, 5814, 5819, 7430	483	1,070	938
Design & designer fashion	7410	212	816	570
Museums, galleries & libraries	9101, 9102	127	367	315
Crafts	3212	54	86	65
Total		6,557	18,221	14,593
			39,371	

Note: Figures in the table are the numbers of observations in the BICS data for the creative industries.

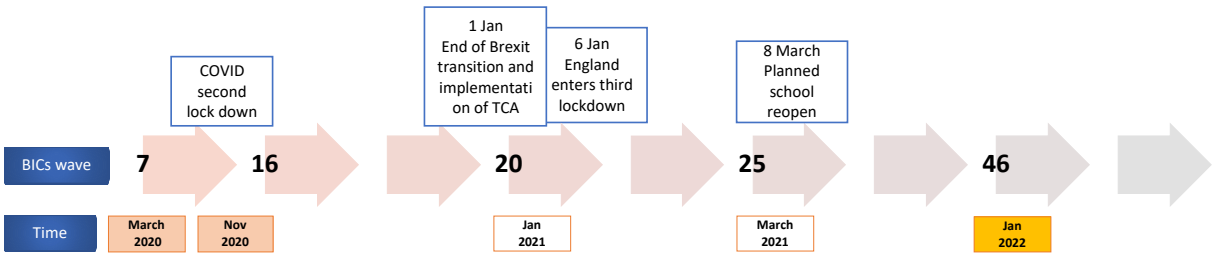
The BICS survey was initiated by the ONS as a response to the rapidly evolving business landscape in the wake of the Covid-19 pandemic. Over time, the survey questionnaire underwent modifications to align with the shifting priorities, as depicted in Figure 1 below. The initial phase, spanning from March 9, 2020, to December 17, 2020 (waves 7-19), was experimental in nature, with questions being introduced and dropped without consistent continuity from one wave to the next.

The second phase, from January 7 to December 2, 2021 (waves 20-44), is particularly pertinent for our study. During this period, the questions pertaining to trade conditions, encompassing aspects like exports, export disruptions, export challenges, and export support, remained consistent from one wave to another, providing a robust dataset for analysis.

In contrast, the third phase, commencing from December 16, 2021 (waves forty-five onwards), exhibited

noticeable shifts in the questions related to business conditions compared to the previous phases. International trade-related questions became more selective and appeared less frequently in many cases, which hindered direct comparisons with the responses obtained during the second phase (Stage 2).

Figure 1: The stages of the BICS waves



Source: BICS survey data wave seven to wave 46.[1]

Table 3 provides an overview of the 18,221 firm-wave observations derived from creative industries firms in the 2021 waves. Among these, 7,096 firm-wave observations pertain to exporters or potential exporters, constituting nearly 40% of the entire sample. The most prominently represented sub-sector, accounting for 46% of the sample, is IT and Software & Computer Services. Other sub-sectors, such as Advertising & Marketing, Music, Performing & Visual Arts, Film, TV, Video, Radio & Photography, and Architecture, each contribute roughly 10% of the observations. The Publishing and Design & Designer Fashion sub-sectors collectively make up approximately 5.9% of the entire sample, while Museums, Galleries & Libraries and Crafts are the least represented in the survey. Notably, the composition of sub-sectors in the BICs data aligns closely with the IBDR's BSD data, reflecting a similar distribution.

Furthermore, sub-sectors exhibit variations in terms of their trade openness. Crafts, Publishing, and IT, Software & Computer Services are the most active exporters, with the share of exporters in firm-wave observations ranging from 35% to 60%. Conversely, Museums, Galleries & Libraries have the lowest export intensity, with only 5% of firm-wave observations representing exporting firms. This variance likely reflects both the comparative advantages of certain sub-sectors and their degree of tradability. Tradability ranges from highly tradable software products, easily accessible to customers worldwide with a simple click, to non-tradable experiences in the case of museums, where physical presence at the museum is essential, even though digital collections are available. Importantly, the tradability of services is continuously evolving, driven by advancements in IT and evolving consumer preferences. Consequently, virtual museum visits may potentially become as tradable as software purchases in the future. It is important to note that the survey's definition of exports encompasses both

[1] BICS questionnaires are available from: https://www.ons.gov.uk/economy/economicoutputandproductivity/output/datasets/businessinsightsandimpactontheukeconomy.

goods and services.

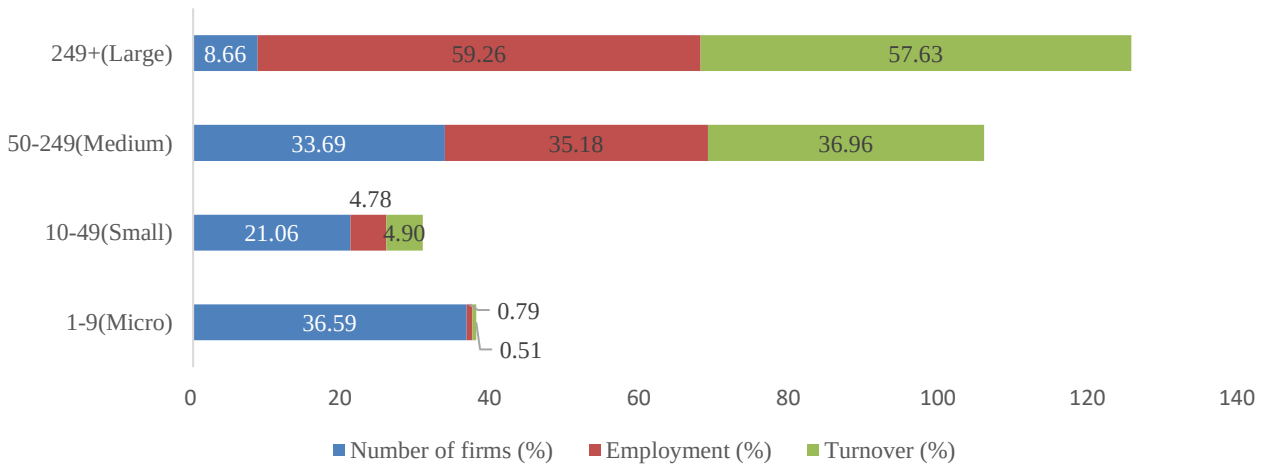
Table 3: Sample structure, 2021, BICS waves 20-44

Sector description	BICs, wave 20-44				Business population	
	No. firms	Share in total, %	No. exporters	Share in total, %	No. firms	Share in total, %
IT, Software & Computer	8,40	46.2	2,964	35.2	149000	50
Advertising & Marketing	2,161	11.9	618	28.6	25375	8.5
Music, Performing & Visual arts	1,837	10.1	276	15	34370	11.5
Film, TV, Video, Radio &	1,908	10.5	359	18.8	35610	12
Architecture	1,567	8.6	396	25.3	16745	5.6
Publishing	1,070	5.9	416	38.9	10800	3.6
Design & Designer Fashion	816	4.5	249	30.5	23695	8
Museums, Galleries & Libraries	367	2	21	5.7	1025	0.3
Crafts	86	0.5	54	62.8	1315	0.4
Total	18,22	100	7,096	38.9	297935	100

Note: The "Business population" data comes from ONS UK BUSINESS: ACTIVITY, SIZE AND LOCATION, based on the IBDR's Business Structural Database, showing the composition of creative sub-sectors in the economy. Available here: https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/adhocs/15046creativeculturalanddigitalindustries.

Figure 2 shows the share of turnover, employment, and number of firms in the sample by firm size. While micro and small firms make up most of the sample in terms of the number of firms (57.7%), they nevertheless contribute much less to employment and turnover compared with their larger counterparts.

Figure 2: BICS data structure of creative industry firms 2021 (waves 20-44)



4. What Caused Firms' Export Disruptions?

Our first key interest is to understand firms' export challenges and disruptions over the examined period. **Export challenges** refer to the factors that affect firms' abilities to export compared with the previous wave, while **export disruption** refers to the extent to which the actual exporting activity is affected compared with the last wave. We explore the data and make some initial observations. This is followed by an analysis of the extent to which the export challenges reported by firms have impacted on the degree of export disruptions they experienced. We compare the BICS survey responses for creative industries firms with those in other sectors. The final part of our analysis considers firm heterogeneity, which will help to understand the distributional nature of export challenges.

4.1 Descriptive statistics

We first look at firms' reported export disruptions. Figure 3 plots firms' reported export status over time. Overall, there are around 2,000 creative industries firms in each wave of the survey. For the firms that reported as exporters, at least half of them exported as normal. The number of exporting firms varied by wave, ranging from 50% in waves 21-25, January to March 2021 to 70% in waves 30 June 2021 onwards. Around one-third of firms reported they were still exporting, but less than normal. A small but sizeable proportion of firms reported that they could not export at all. This proportion ranged from 9% in waves 22 and 23 (Spring 2021) to 3% later in the year.

Figure 4 shows the mean value of the different levels of export disruption experienced by firms in the creative sector. In the Music, Performing & Visual arts sub-sector, 1% of firm-wave observations recorded exporting more than normal in the previous two weeks, 33% exporting as normal, 61% exporting but less than normal, and 6% were not able to export at all. Overall, most firms that responded to this question had undertaken their normal exporting activities, while 16-27% of firms reported as exporting "less than normal" or "unable to export".

In the period studied, firms were asked to state their trade status and then identify the main causes of their exporting challenges: the firm's perceived cause for export challenges. Note that these responses were self-reported and reflected a firm's perception of the factors that had presented it with export challenges. More specifically, firms were asked to select just one option from a list of specific perceived causes of the export challenges they had experienced: (1) Coronavirus (Covid-19) pandemic, (2) End of the EU transition period, (3) Coronavirus (Covid-19) pandemic plus the end of the EU transition period, and (4) Other.

Figure 3: Creative industry firms export status, 2021.

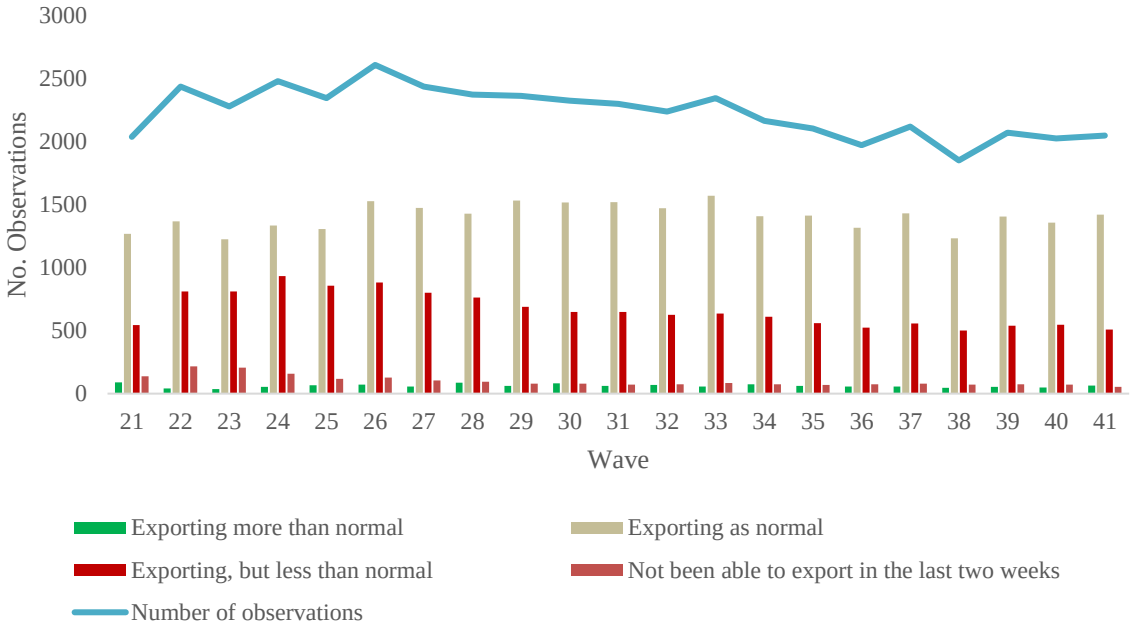


Figure 4. Export disruptions across Creative Industry sectors

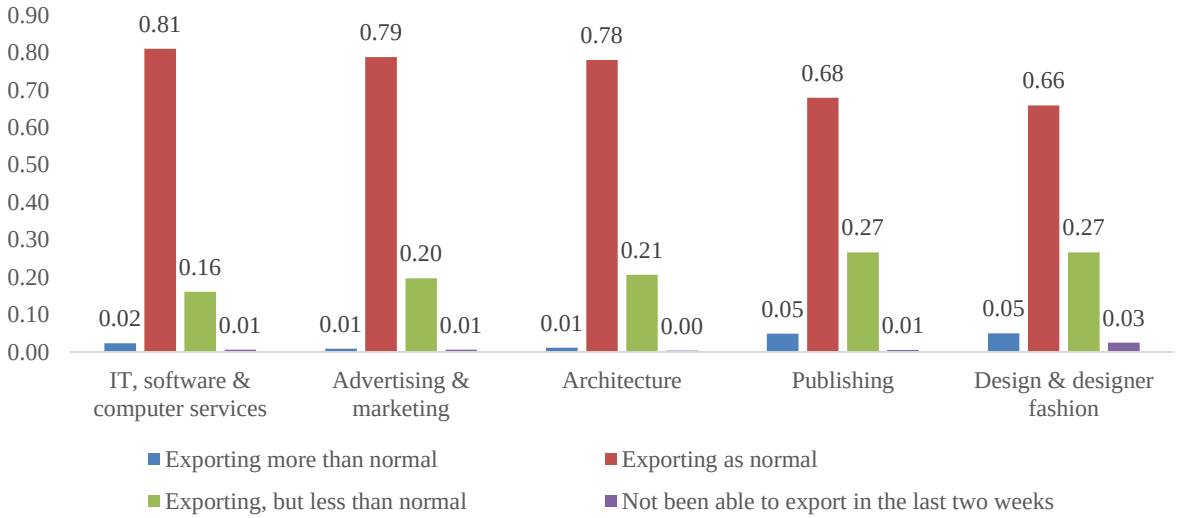


Table 4 shows firms' responses to this question, contrasting the creative industries with other services sectors. The vast majority (71%) of creative industries firms chose not to give an answer to this question, or they were unsure about the main cause of their export challenges. For other service firms, about 40% answered this question. Only 15% of creative industry firms stated that Brexit was for them the *main* cause of export disruption, which interestingly compares with 37% in the case of non-creative industries service firms. That percentage is

even higher for the whole economy counting in manufacturing firms (Du et al., 2023).[2] The difference been creative and non-creative services industries firms was even greater when Brexit and Covid-19 were together as the main challenge. Overall, very few services firms declared that Covid-19 was the main cause of their export challenges.

Table 4. Firms' perceived causes for export challenges

Causes of export challenges	Creative industries		Non-creative industries	
	Freq.	Percent	Freq.	Percent
Coronavirus (Covid-19) pandemic	155	4.1	680	4.1
End of the EU transition period	584	15.4	6,072	36.6
Coronavirus (Covid-19) pandemic and the end of the transition period	343	9.1	3,435	20.7
Other	22	0.6	147	0.9
Didn't answer or unsure	2,685	70.9	6,273	37.8
Total	3,789	100	16,607	100

4.2 Modelling

To analyse the export performance of creative industries firms in a multivariate context, we specify the following empirical model:

$$Export\ disruption_{it} = \beta_0 + \beta_2 Export\ challenge_{it} + \beta_3 Export\ challenge_{it} \times X_i + \beta_4 Export\ destination_{it} + \beta_5 X_i + \beta_6 Sector_s + \beta_7 Regional_r + \beta_8 Wave_t + u_{it} \quad (1)$$

where $\boldsymbol{Export\ disruption_{it}}$ is firm *i's* exporting status for firm *i* in the last two weeks (or month) compared with normal expectations for that time of year. This ordered variable takes value 1 if firm *i* is exporting more than normal, 2 if exporting as normal, 3 if exporting but less than normal, and 4 if unable to export in the last two weeks (or month). Thus, a higher variable value indicates an increasing degree of export disruption experienced by firm *i*.[3]

[2] In a recent work by Du et al. (2023) entitled "Midlands International Trade: State and Challenges" which reports similar statistics for both manufacturing and services industries for regions in the UK (page 40), nearly 60% of Midlands firms consider Brexit to be the sole or joint main cause of their export challenges, compared with 53% of firms in the North, 52% from East of England, 49% from South, and 32% from London. See details are https://midlandsengine.org/wp-content/uploads/2023/06/Midlands-Engine-Export-Challenges-1.pdf.

[3] The original question in the BICs survey is the following: "How does your business's exporting in the last two weeks compare to normal expectations for this time of year?" and the options include "Exporting more than normal", "Exporting as normal", "Exporting, but less than normal", "Not been able to export in the last two weeks" and "Not sure".

On the explanatory variable side, $\boldsymbol{Cause_{it}}$ is a set of variables for the firm's perceived main cause of the export challenges. $Cause_{it}$ is based on the question, "What was the main cause of these exporting challenges?" The response is one of a broad range of mutually exclusive options: Brexit, Covid-19, Brexit and Covid-19, and other challenges. $\boldsymbol{Export\ challenges_{it}}$ captures the responses to the question, "Has your business experienced any of the following challenges with exporting over the last two weeks?" The answers are not mutually exclusive and firms can choose any or all of the following challenges: (1) transportation costs, (2) customs duties or levies, (3) disruption at UK borders, (4) reduced demand for products and services, (5) additional paperwork, (6) basing some staff in an EU member state to be allowed to work, (7) lack of hauliers to transport goods or lack of logistics equipment, (8) work permit or visa restrictions, or lack of mutual recognition of professional qualifications. The last four options (5-8) are only available in wave twenty-four onwards, and therefore, including them in the model entails a loss of observations in the estimation.

We include several control variables in the model. $\boldsymbol{Export\ destination_{it}}$ captures the firm's export destinations and is based on the question, "Which of the following best describes your business's exporting status?" It consists of two dummy variables, "To EU only" and "To both EU and non-EU," with a base group of "To non-EU only". Further, X_i is a vector of firm characteristics, including size (log number of employees), age (number of years since firm establishment), and labour productivity (measured by log turnover per employee).

We control for sector, location, and time-specific effects through the inclusion of dummy variables: sector dummies at Standard Industrial Classification (SIC2) level, regional (r) dummies at NUTS1 sub-regional level for each of the five regions, and wave (t) dummies. These variables are drawn from the linked BSD 2020 data. As the dependent variable is ordered, the model is estimated by using an Ordered Probit estimator with cluster-adjusted standard errors.

4.3 Findings

Export disruptions of creative industries firms: Baseline model

Table 5 presents the baseline model estimation as described in model (1) for the creative and non-creative services sectors. We present the estimates for three models with varying specifications. The specifications presented in Columns 1 and 2 include alternative sets of variables to mitigate their potential multicollinearity, while Column 3 includes additional export challenges variables that are available for the shorter sample period.

We find that exporting to EU-only is associated with the highest degree of export disruptions among creative industries firms over this period, followed by exporting to both EU and non-EU markets. Exporting to the non-EU market-only appears to be the least disruptive. This is in contrast with the non-creative services firms, which experience less disruption when firms diversify their export markets to both the EU and outside the EU. Perceiving the main cause of export challenges to be "Covid-19" seems associated with a higher degree of

export disruption, more so than "Covid-19 and Brexit" or "Brexit", for both creative and non-creative services firms. The significance of unspecified other factors- at least for non-creative services firms- suggests that the picture painted by the BICS data of export disruptions in the period 2020-2022 is incomplete.

Table 5 also shows that the reported export challenges are statistically significant factors that impact on export disruptions, but that not all types of export challenges are born equal. Specifically, firms that reported a reduced demand for products and services were more likely to experience export disruptions. For creative industries firms this was followed by "Work permit or visa restrictions." "Customs duties and levies" and "Lack of hauliers to transport goods or lack of logistics" were also key challenges identified by the model. "Additional paperwork" was also a challenge for both creative and non-creative services firms but only a marginally significant one.

Notably we found little evidence that "Change in transportation costs" (in contrast with Du et al., 2023) and "Disruptions at borders" were a statistically significant challenge for exporters.

Table 5: Export disruptions of creative industries firms, the baseline model

	Creative industries			Non-Creative industries		
	(1)	(2)	(3)	(4)	(5)	(6)
Export destination (base group: only non-EU)						
To EU only	0.407**	0.406**	0.352*	-0.029	0.006	-0.017
	(0.152)	(0.155)	(0.160)	(0.081)	(0.084)	(0.088)
To both EU and non-EU	0.288*	0.291*	0.240+	-0.1929**	-0.186*	-0.218**
	(0.118)	(0.123)	(0.128)	(0.072)	(0.075)	(0.079)
Main cause of export challenge (base group: 0 "exporters that did not answer")						
Covid-19	1.364***			1.089***		
	(0.145)			(0.087)		
Brexit	0.697***			0.549***		
	(0.129)			(0.050)		
Covid-19 & Brexit	1.127***			0.691***		
	(0.168)			(0.060)		
Others	0.821			1.053***		
	(0.557)			(0.173)		
Experienced exporting challenges in						
Change in transportation costs		0.152	0.083		0.135**	0.087+
		(0.167)	(0.182)		(0.043)	(0.046)
Customs duties or levies		0.419**	0.311*		0.210***	0.163***
		(0.144)	(0.144)		(0.044)	(0.047)
Disruption at UK borders		0.035	-0.212		0.129*	0.072
		(0.200)	(0.213)		(0.051)	(0.056)
Reduced demand for products and services		1.489***	1.388***		1.203***	1.197***
		(0.145)	(0.151)		(0.045)	(0.048)
Additional paperwork			0.239+			0.158**
			(0.136)			(0.049)
Basing some staff in an EU member state to be allowed to			-0.085			-0.106
			(0.403)			(0.212)
Lack of hauliers to transport goods or lack of logistics equipment			0.503*			0.128*
			(0.226)			(0.056)
Work permit or visa restrictions			0.750*			0.104
			(0.315)			(0.183)
Firm characteristics						
Productivity	-0.024	0.028	0.020	-0.0532**	-0.048*	-0.050*
	(0.059)	(0.056)	(0.058)	(0.021)	(0.021)	(0.022)
Firm size	-0.034	-0.052	-0.046	-0.024	-0.014	-0.012
	(0.042)	(0.041)	(0.043)	(0.017)	(0.017)	(0.018)
Firm age	0.008	0.008+	0.008+	0.005**	0.005*	0.005*
	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)
Observations	3,834	3,723	3,677	16,620	15,543	14,406

Note: The table reports the Ordered Probit model estimation of the factors hypothesised to impact on the degree of export disruption (dependent variable), which takes value 1-4, indicating the increasing degree of export disruption firms experienced. Specifically, *Export disruption* takes value 1 for firms reporting to have exported more than normal in the last two weeks compared to normal circumstances, 2 if they exported as normal, 3 if they exported less than normal, 4 if there were not able to export in the last two weeks. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10.

Exploring firm heterogeneity

We further explore whether the effects reported in Table 5 differ across firms according to size, labour productivity, and age. The interaction terms between firm characteristics and export challenges help to test if firm characteristics (which might be interpreted as proxies for firm resources and capability) help mitigate the negative impacts of the different export challenges on exporting disruption.

Table 6 shows that among firms that perceive Brexit to be the main cause of export challenges, larger creative industries firms were less likely to have experienced export disruption. Similarly, there is some evidence that more productive creative industries firms were also less prone to disruption, as the interaction between Brexit and labour productivity in column 3 is significantly negative, at least at the 10% level. The contrasting findings for non-creative services firms are reported in columns 4-6 of the table. The interaction between Brexit/ Covid-19 and firm size is in this case significantly negative in column 4, indicating that the larger non-creative services firms were able to mitigate some of the negative exporting impacts of Brexit and Covid-19 considered together. The implication is that while larger and more productive firms in the creative industries may have been better equipped at overcoming Brexit-related export difficulties than their non-creative services counterparts, they were less equipped to overcome Covid-19-related export difficulties.

Table 6: Export disruptions: perceived cause of export challenge and firm heterogeneity

	Creative industries			Non-Creative industries		
Export destination (base group: only non-EU)	(1)	(2)	(3)	(4)	(5)	(6)
To EU only	0.388*	0.400**	0.410**	-0.064	-0.043	-0.037
	(0.156)	(0.153)	(0.153)	(0.080)	(0.081)	(0.081)
To both EU and non-EU	0.275*	0.283*	0.298*	-0.226**	-0.210**	-0.193**
	(0.119)	(0.118)	(0.119)	(0.071)	(0.071)	(0.072)
Main cause of export challenge (base group: 0 "exporters that did not answer")						
Covid-19	1.197*	1.490***	0.967	0.924***	0.930***	1.663***
	(0.488)	(0.313)	(1.100)	(0.266)	(0.209)	(0.342)
Brexit	1.808***	0.838**	1.873**	0.798***	0.675***	0.371+
	(0.464)	(0.263)	(0.652)	(0.154)	(0.109)	(0.211)
Covid-19 & Brexit	1.194**	1.356***	2.372**	1.142***	0.807***	0.847***
	(0.436)	(0.335)	(0.770)	(0.159)	(0.123)	(0.250)
Others	-0.802	-0.166	-2.217	1.469*	1.344**	0.570
	(1.429)	(1.241)	(3.190)	(0.601)	(0.430)	(0.885)
Interaction terms						
Covid-19 * Firm size	0.047			0.042		
	(0.107)			(0.059)		
Covid-19 * Firm age		-0.005			0.006	
		(0.011)			(0.006)	
Covid-19 * productivity			0.083			-0.111+
			(0.220)			(0.061)
Brexit * Firm size	-0.270**			-0.055+		
	(0.100)			(0.033)		
Brexit * Firm age		-0.006			-0.004	
		(0.009)			(0.003)	
Brexit * Productivity			-0.248+			0.033
			(0.136)			(0.039)
Covid-19 & Brexit * Firm size	-0.012			-0.102**		
	(0.107)			(0.035)		
Covid-19 & Brexit * Firm age		-0.010			-0.004	
		(0.011)			(0.004)	
Covid-19 & Brexit * Productivity			-0.254			-0.029
			(0.168)			(0.045)
Others * Firm size	0.559			-0.0995		
	(0.379)			(0.1335)		
Others * Firm age		0.061			-0.010	
		(0.050)			(0.012)	
Others * Productivity			0.671			0.090
			(0.652)			(0.165)
Firm characteristics						
Productivity	-0.016	-0.027	0.020	-0.053*	-0.055**	-0.052*
	(0.059)	(0.059)	(0.059)	(0.021)	(0.021)	(0.024)
Firm size	-0.006	-0.035	-0.034	0.016	-0.024	-0.026
	(0.045)	(0.042)	(0.042)	(0.024)	(0.017)	(0.017)
Firm age	0.007	0.010+	0.008+	0.005**	0.008**	0.005**
	(0.005)	(0.006)	(0.005)	(0.002)	(0.002)	(0.002)
Observations	3,834	3,834	3,834	16,620	16,620	16,620

Note: The table reports the Ordered Probit model estimation of the factors hypothesised to impact on the

degree of export disruption (dependent variable), which takes value 1-4, indicating the increasing degree of export disruption firms experienced. Specifically, *Export disruption* takes value 1 for firms reporting to have exported more than normal in the last two weeks compared to normal circumstances, 2 if they exported as normal, 3 if they exported less than normal, 4 if they were not able to export in the last two weeks. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10.

Turning to firm heterogeneity and export challenges, we find little evidence to suggest that export challenges were unevenly distributed among firms of different sizes, ages, and productivity levels. Firms from all the groups reported export challenges that were similar to those described in the results drawn from Table 5.

There are just a few exceptions. First, more productive creative industries firms seem to have been more able to mitigate the challenges thrown up by "customs and levies." Similarly, columns 2 and 3 show that older firms in general tend to have fared better in the face of reduced demand for their products and services.

We also find that the interaction between disruption at UK borders and firm size is positive and statistically significant. This means that larger firms are more likely to have experienced disrupted exports because of border issues, and the pattern is consistent for both creative industries and non-creative industries services firms. Further, while there is evidence that more productive non-creative services firms were less likely to experience export challenges at borders; this is not the case for creative industries firms.

Table 7: Export disruptions and firm heterogeneity

	Creative industries			Non-Creative industries		
Export destination (base group: only non-EU)	(1)	(2)	(3)	(4)	(5)	(6)
To EU only	0.406**	0.397*	0.414**	-0.000	0.005	0.004
	(0.157)	(0.156)	(0.155)	(0.084)	(0.084)	(0.084)
To both EU and non-EU	0.284*	0.284*	0.312*	-0.192*	-0.182*	-0.186*
	(0.124)	(0.124)	(0.123)	(0.075)	(0.075)	(0.075)
Experienced exporting challenges in						
Change in transportation costs	0.701	-0.020	0.165	0.387**	0.249*	0.149
	(0.606)	(0.380)	(1.031)	(0.133)	(0.104)	(0.193)
Customs duties or levies	1.033*	0.485	2.385**	0.199	0.138	-0.136
	(0.506)	(0.302)	(0.859)	(0.136)	(0.106)	(0.212)
Disruption at UK borders	-0.984	-0.341	-0.893	-0.294*	-0.071	0.819***
	(0.648)	(0.426)	(1.201)	(0.150)	(0.117)	(0.238)
Reduced demand for products and	1.782***	1.950***	1.128	1.413***	1.45***	1.215***
	(0.405)	(0.265)	(0.695)	(0.133)	(0.108)	(0.217)
Interaction terms						
Change in transportation costs *	-0.146			-0.058*		
	(0.139)			(0.030)		
Change in transportation costs *		0.007			-0.004	
		(0.012)			(0.003)	
Change in transportation costs * Productivity			0.003			-0.002
			(0.223)			(0.035)
Customs duties or levies * Firm size	-0.148			0.003		
	(0.115)			(0.029)		
Customs duties or levies * Firm age		-0.002			0.002	
		(0.011)			(0.003)	
Customs duties or levies *			-0.409*			0.064+
			(0.183)			(0.038)
Disruption at UK borders * Firm age		0.015			0.006+	
		(0.013)			(0.003)	
Disruption at UK borders * Firm size	0.264+			0.098**		
	(0.145)			(0.034)		
Disruption at UK borders *			0.193			-0.127**
			(0.251)			(0.043)
Reduced demand for	-0.073			-0.051+		
	(0.099)			(0.030)		
Reduced demand for products and services * Firm age		-0.021+			-0.008*	
		(0.011)			(0.003)	
Reduced demand for			0.076			-0.003
			(0.154)			(0.039)
Firm characteristics						
Labour productivity	0.031	0.028	0.054	-0.047*	-0.047*	-0.046+
	(0.056)	(0.056)	(0.056)	(0.021)	(0.021)	(0.025)
Firm size	-0.030	-0.050	-0.055	-0.006	-0.013	-0.015
	(0.044)	(0.041)	(0.042)	(0.022)	(0.017)	(0.017)
Firm age	0.008	0.008	0.009+	0.005*	0.005*	0.005*
	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)
Observations	3,723	3,723	3,723	15,543	15,543	15,543

Note: The table reports the Ordered Probit model estimation of the factors hypothesised to impact on the degree of export disruption (dependent variable), which takes value 1-4, indicating the increasing degree of export disruption firms experienced. Specifically, *Export disruption* takes value 1 for firms reporting to have exported more than normal in the last two weeks compared to normal circumstances, 2 if they exported as normal, 3 if they exported less than normal, 4 if they were not able to export in the last two weeks. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10.

Table 8 looks at the interaction between firms' characteristics and the four additional exporting challenges that were not available in waves 21-23. As noted, this reduces the sample size compared with Table 3. We find that the interactions between work permit or visa restrictions and firm size and age are significantly negative, suggesting that larger and older firms can reduce the degree of export disruption related to work permit or visa restriction challenges. Interestingly, this pattern does not hold true for non-creative services firms. In essence, the adverse effects resulting from heightened work permit or visa restrictions affect firms of all sizes across various service sectors. However, within the creative industries, larger entities exhibit a higher degree of resilience in the face of these challenges compared to their smaller counterparts. Thus, this finding underscores a particular area of providing support grounded in the differential impact of work permit and visa restrictions on firms within the creative industries, particularly in relation to their size and age.

Table 8: Export disruptions and firm heterogeneity: an extended list

	Creative industries			**Non-Creative industries**		
Export destination (base group: only non-EU)	(1)	(2)	(3)	(4)	(5)	(6)
To EU only	0.357*	0.338*	0.371*	-0.033	-0.021	-0.019
	(0.164)	(0.162)	(0.161)	(0.088)	(0.088)	(0.088)
To both EU and non-EU	0.241+	0.241+	0.274*	-0.231**	-0.217**	-0.219**
	(0.129)	(0.128)	(0.128)	(0.080)	(0.079)	(0.079)
Experienced exporting challenges and interaction						
Change in transportation costs	0.881	0.167	0.527	0.304*	0.236*	0.117
	(0.671)	(0.396)	(1.183)	(0.144)	(0.114)	(0.224)
Change in transportation costs * [illegible]	-0.209			-0.050		
	(0.149)			(0.031)		
Change in transportation costs * [illegible]		-0.004			-0.005	
		(0.013)			(0.003)	
Change in transportation costs * Productivity			-0.085			-0.005
			(0.251)			(0.040)
Customs duties or levies	1.084*	0.419	2.517**	0.078	0.058	-0.250
	(0.515)	(0.286)	(0.817)	(0.147)	(0.116)	(0.234)
Customs duties or levies * Firm [illegible]	-0.192			0.021		
	(0.123)			(0.032)		
Customs duties or levies * Firm		-0.004			0.003	
		(0.010)			(0.004)	
Customs duties or levies * Productivity			-0.462**			0.076+
			(0.176)			(0.0426)
Disruption at UK borders	-1.249+	-0.680	-0.664	-0.424**	-0.111	0.872***
	(0.755)	(0.445)	(1.413)	(0.158)	(0.129)	(0.259)
Disruption at UK borders * Firm [illegible]	0.286+			0.114**		
	(0.171)			(0.036)		
Disruption at UK borders * Firm		0.024			0.006	
		(0.015)			(0.004)	

Disruption at UK borders * Productivity			0.098			-0.147**
			(0.291)			(0.047)
Reduced demand for products and services	1.607***	1.764***	1.194	1.405***	1.413***	1.11***
	(0.464)	(0.294)	(0.729)	(0.140)	(0.114)	(0.224)
Reduced demand for products and services * Firm size	-0.054			-0.052+		
	(0.117)			(0.031)		
Reduced demand for products and services * Firm age		-0.016			-0.007*	
		(0.012)			(0.003)	
Reduced demand for products and services * Productivity			0.041			0.015
			(0.162)			(0.040)
Additional paperwork	-0.156	-0.064	-0.771	0.333*	0.185	0.222
	(0.497)	(0.296)	(0.989)	(0.150)	(0.113)	(0.228)
Additional paperwork * Firm size	0.104			-0.041		
	(0.120)			(0.032)		
Additional paperwork * Firm age		0.013			-0.001	
		(0.010)			(0.004)	
Additional paperwork * [illegible]			0.212			-0.012
			(0.201)			(0.042)
Basing some staff in an EU member state to be allowed to	-1.017	-1.155	0.677	0.414	-0.036	-1.149+
	(1.269)	(0.970)	(0.716)	(0.691)	(0.408)	(0.668)
Basing some staff in an EU member state to be allowed to	0.231			-0.111		
	(0.262)			(0.149)		
Basing some staff in an EU member state to be allowed to		0.033			-0.003	
		(0.031)			(0.013)	
Basing some staff in an EU member state to be allowed to			-0.166			0.203+
Work permit or visa restrictions	2.130**	2.292***	3.537+	0.780	0.752*	0.582
	(0.656)	(0.451)	(1.898)	(0.506)	(0.374)	(0.699)
Work permit or visa restrictions * Firm size	-0.42**			-0.146		
	(0.159)			(0.111)		
Work permit or visa restrictions * Firm age		-0.07***			-0.024+	
		(0.017)			(0.013)	
Work permit or visa restrictions * Productivity			-0.612			-0.093
			(0.404)			(0.132)
Lack of hauliers to transport goods or lack of logistics	1.445	0.641	0.925	0.127	0.039	-0.055
	(0.917)	(0.452)	(1.425)	(0.185)	(0.147)	(0.284)
Lack of hauliers to transport goods or lack of logistics	-0.255			0.001		
	(0.230)			(0.041)		
Lack of hauliers to transport goods or lack of logistics		-0.012			0.003	
		(0.014)			(0.004)	
Lack of hauliers to transport goods or lack of logistics			-0.081			0.033
			(0.285)			(0.050)
			(0.155)			(0.117)

Firm characteristics						
Labour productivity	0.023	0.010	0.057	-0.049*	-0.051*	-0.051+
	(0.059)	(0.058)	(0.059)	(0.022)	(0.022)	(0.027)
Firm size	-0.018	-0.039	-0.052	0.009	-0.012	-0.012
	(0.046)	(0.043)	(0.043)	(0.024)	(0.018)	(0.018)
Firm age	0.008	0.009	0.009+	0.006*	0.005*	0.005*
	(0.005)	(0.006)	(0.005)	(0.002)	(0.003)	(0.002)
Observations	3,677	3,677	3,677	14,406	14,406	14,406

Note: The table reports the Ordered Probit model estimation of the factors hypothesised to impact on the degree of export disruption (dependent variable), which takes value 1-4, indicating the increasing degree of export disruption firms experienced. Specifically, *Export disruption* takes value 1 for firms reporting to have exported more than normal in the last two weeks compared to normal circumstances, 2 if they exported as normal, 3 if they exported less than normal, 4 if they were not able to export in the last two weeks. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10.

5. Does export support help to export?

The analysis in the previous section focused on how export challenges affected firms' export performance. In this section, we shift our focus to examine whether and how government policies and measures have assisted creative industries firms in mitigating these disruptions. This assessment involves investigating the causal impact of policy interventions on the outcomes of interest for these firms. It is important to acknowledge that this endeavour is confronted with common challenges encountered in policy evaluation, including sample selection issues, confounding variables, and potential sources of endogeneity. To address these challenges, we employ a structured approach involving several key steps.

First, we establish a foundation by assessing the extent of export support received by firms during the crisis period. Subsequently, we utilize causal inference tools for program evaluation. Given the limitations of available data, we opt for matching methods, which provide a robust means of addressing the complexities inherent in this analysis.

5.1 Export Supports: Who Received Them?

In 2021, many creative industries firms, like other firms, were experiencing the continuing fallout from the Covid-19 pandemic. In November 2020, the UK government had imposed a second national lockdown, which was followed by a system of tiers of restrictions in which social and household gatherings were generally prohibited. On 4 January 2021, the UK government announced a new lockdown for England, followed by similar actions by the devolved administrations. This was the third time since March 2020 that restrictions had been introduced that covered most of the UK.

Coincidentally, 2021 was also the year that the UK reached the end of Brexit transition, starting with the new EU-UK Trade and Cooperation Agreement (TCA) coming into force in January 2021. There were myriad changes and disruptions to the UK's trade with the EU, some of which were temporary and others which proved longer

lasting, and these had a considerable impact on firms in the creative industries. The TCA challenges remained significant for most of 2021 (and beyond) but all Covid-19 restrictions were lifted in July 2021.

To address the challenges firms had been facing since 2020, the UK government offered a wide range of business support measures to UK businesses affected by pandemic disruption. Other business supports were offered by the Bank of England.4 In 2021, the government continued to provide assistance by offering low-interest loans through schemes developed in 2020. The central and devolved governments also provided businesses with cash grants, tax cuts, and tax deferrals.

The BICS surveys collected responses from businesses regarding which support options had helped them deal with their exporting challenges. The survey listed a number of options:

- Customs and tariffs
- Export licences
- Financial support
- Finding new markets
- Finding new overseas contacts or customers
- Legal issues
- Transport and distribution
- Understanding markets and demand issues

To understand the patterns of firms that managed to obtain export support, we estimate the following logit model, where the dependent variable is whether firm i had received export support (from the list above) at time t:

$$Prob(Export\ support_{it} = 1) = \frac{\exp(\beta_0 + \beta_1 * export\ challenge_{it} + X_{it}\gamma + D_s + D_t + e_{it})}{1 + \exp(\beta_0 + \beta_1 * export\ challenge_{it} + X_{it}\gamma + D_s + D_t + e_{it})}$$

As before, in this equation, X includes a set of controls, such as firm's labour productivity, age, and employment. We also control for firm size, based on whether firms were small (fewer than one hundred employees), medium (100–250), and large (more than 250). D_s denotes the creative industries sub-sector and D_t is the BICS waves fixed effects, which were included to control for macroeconomic shocks, changes in sampling methodology across surveys, and to account for different degree of openness across industries, so our results are identified on the variation of responses within industry, rather than across industries.

[4] See reviews by the Institute of Government about business and individual support during COVID: https://www.instituteforgovernment.org.uk/article/explainer/coronavirus-what-economic-support-government-currently-providing-businesses.

Findings

In Table 9, we show how each potential export challenge relates to the receipt of export support. The table reports marginal effects and robust standard errors. It also indicates the statistical significance of the estimated coefficients and the overall goodness of fit of the model. For Column 1, any type of support is the dependent variable.

The results suggest that firms were 4.8% more likely to have received support when dealing with reduced demand, 3.4% more likely when facing increased customs duties or levies, 2.8% more likely when facing additional paperwork, 2.5% if they experienced new border restrictions in the destination countries, and 1.9% more likely when encountering disruption at the UK border. At the same time, the lack of hauliers and logistics equipment made receiving export support less likely by 2%. This last result indicates that in cases where a firm lacked the means of transporting its goods and services, it might have opted for not exporting rather than seeking support to overcome the difficulty. Medium and small firms were more likely (1% and 1.3%, respectively) to receive export support than large firms. This likely reflects the fact that large firms have the internal capacity and expertise to deal with export challenges on their own, whereas smaller firms are more likely to need help. Older firms were also more likely to get support. This may have been related to their more experienced management, wider networks, and more established business.

In columns 2-9, we focus on each type of export support separately. In general, foremost types of support, firms appear to have sought support when they were faced with new border restrictions and reduced demand. Several results stand out as worth mentioning. Firms are more likely to have sought financial support when they encountered reduced demand or work permit/visa restrictions. When creative sector firms were faced with work permit requirements or visa restrictions, they sought new overseas contacts and legal support. Faced with new customs duties or levies, firms asked for clarification about tariffs and customs. Small creative industry firms received financial, overseas, and license support more often, while medium-sized firms needed transport support.

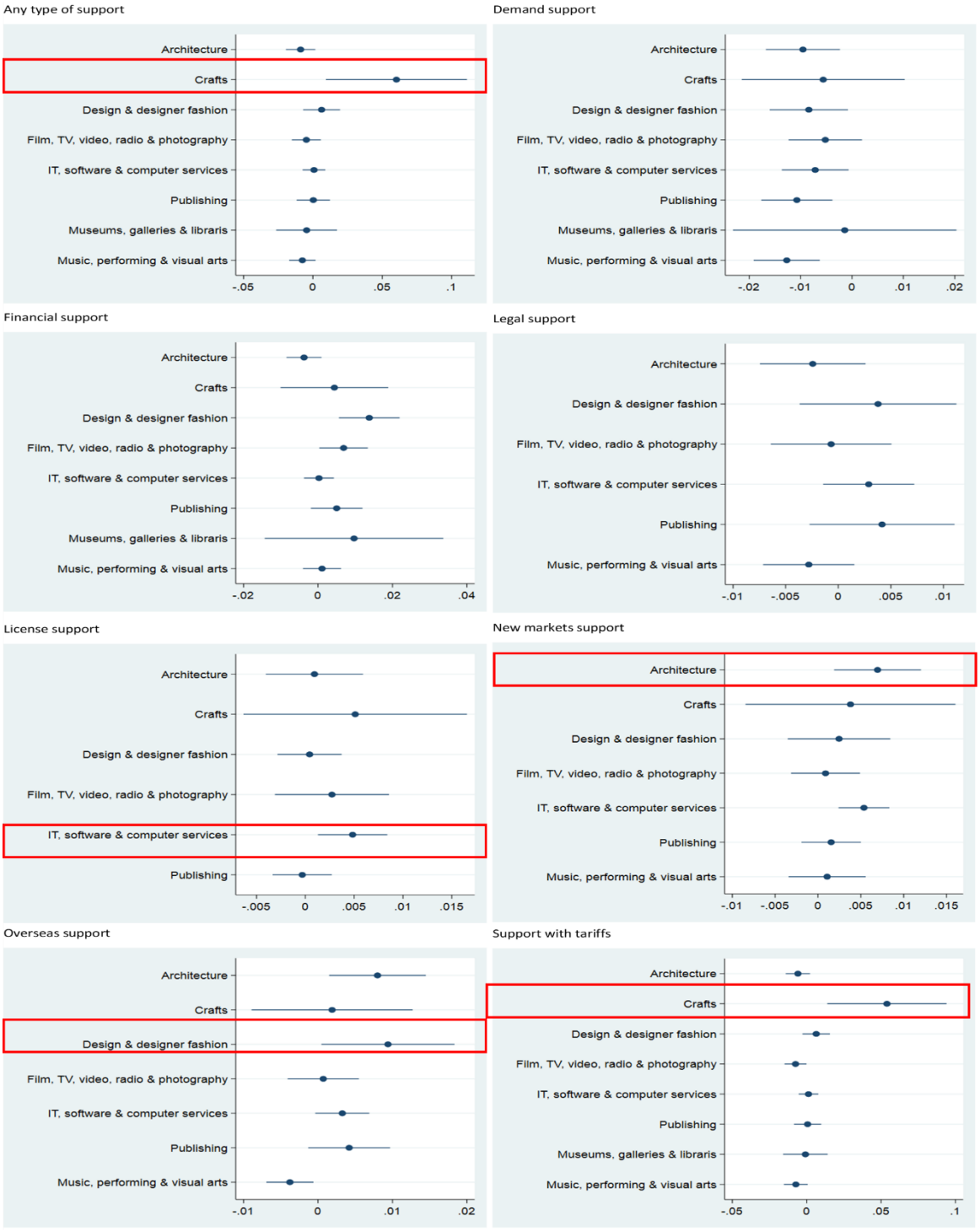
Table 9 Export challenges and export support for creative sector firms

	Type of export support								
	Any	**Financial**	**Demand**	**New Market**	**Overseas**	**Transport**	**Legal**	**Tariffs**	**Licence**
Log Labour productivity	1.001	0.001	0.0004	0.001	0.002**	0.002	.0002	0.001	0.0001
	(0.00)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm's age	0.0003**	-0.0001	0.0001**	-0.0001	0.000	0.0001	0.000	0.0002*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log employment	0.0002	0.001	-0.0003	0.001	0.001	-0.002**	-0.0001	-0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Closure of infrastructure	-0.006	-0.004	0.003	-0.0001	-0.006	0.003	0.004	0.004	0.006*
	(0.010)	(0.010)	(0.000)	(0.010)	(0.010)	(0.000)	(0.000)	(0.010)	(0.000)
New border restrictions abroad	0.025***	0.009***	0.005*	0.006*	0.009***	0.003	0.005	0.011***	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Change in transportation costs	0.011	-0.007**	-0.0005	-0.001	-0.004	0.025***	-0.001	0.006	0.003
	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Customs duties or levies	0.034***	0.006	0.002	0.004	0.006	-0.0001	0.005	0.031***	0.006
	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.00)	(0.000)	(0.000)
Disruption at UK borders	0.019***	0.008**	0.005	-0.005	-0.003	0.005*	-0.003	0.003	0.002
	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Reduced demand	0.048***	0.021***	0.011***	0.015***	0.016***	-0.001	0.008***	0.006	0.003*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional paperwork	0.028***	0.013***	0.007*	0.003	0.001	-0.001	0.007*	0.024***	0.008
	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Staff relocation to EU	0.017	-0.0002	-0.002	0.008	-0.009	-0.002	0.001	-0.0002	0.000
	(0.020)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(.)
Lack of hauliers or logistics equipment	-0.020*	-0.015*	-0.012**	0.008	0.011*	-0.003	0.000	-0.008	0.000
	(0.010)	(0.010)	(0.000)	(0.010)	(0.000)	(0.000)	(.)	(0.010)	(.)
Work permit or visa restrictions	0.021	0.012*	0.010*	0.006	0.016***	0.000	0.014***	0.009	0.006
	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)	(.)	(0.000)	(.01)	(0.000)
Small	0.013**	0.010***	-0.001	.000	0.006***	.0019	.0025	0.004	.004**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(.0.000)	(0.000)	(0.000)
Medium	0.010*	0.003	-0.003	-0.003	0.002	.0078*	0.003	0.006	.0017
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sub-industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BICS wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14079	14079	12627	12420	12489	11473	10459	14079	10432
Pseudo R squared	0.470	0.484	0.361	0.377	0.391	0.511	0.335	0.543	0.408
Chi squared	940	600	561	421	413	531	489	859	581

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001

In Figure 5, we report the propensity of different creative sub-sectors to receive export support. Each "dot" represents the size of the marginal effect, while the bar represents a 95% confidence interval. Crafts businesses were more likely to have received export support than the other sub-sectors. Architecture and Music, Performance and Visual arts firms were less likely than others to have received export support. Design and Designer Fashion were significantly more likely to have received financial support. IT companies were more likely than firms in other sub-sectors to have received export support related to licensing more. Architecture and IT firms were more likely to have received export support related to new markets. Crafts firms received by far the most support related to customs and tariffs, which is likely related to the fact that Crafts firms send physical goods across the border more often than firms from the other sub-sectors. Furthermore, Crafts firms were more likely to have received help and information about the changes to the tariff regime.

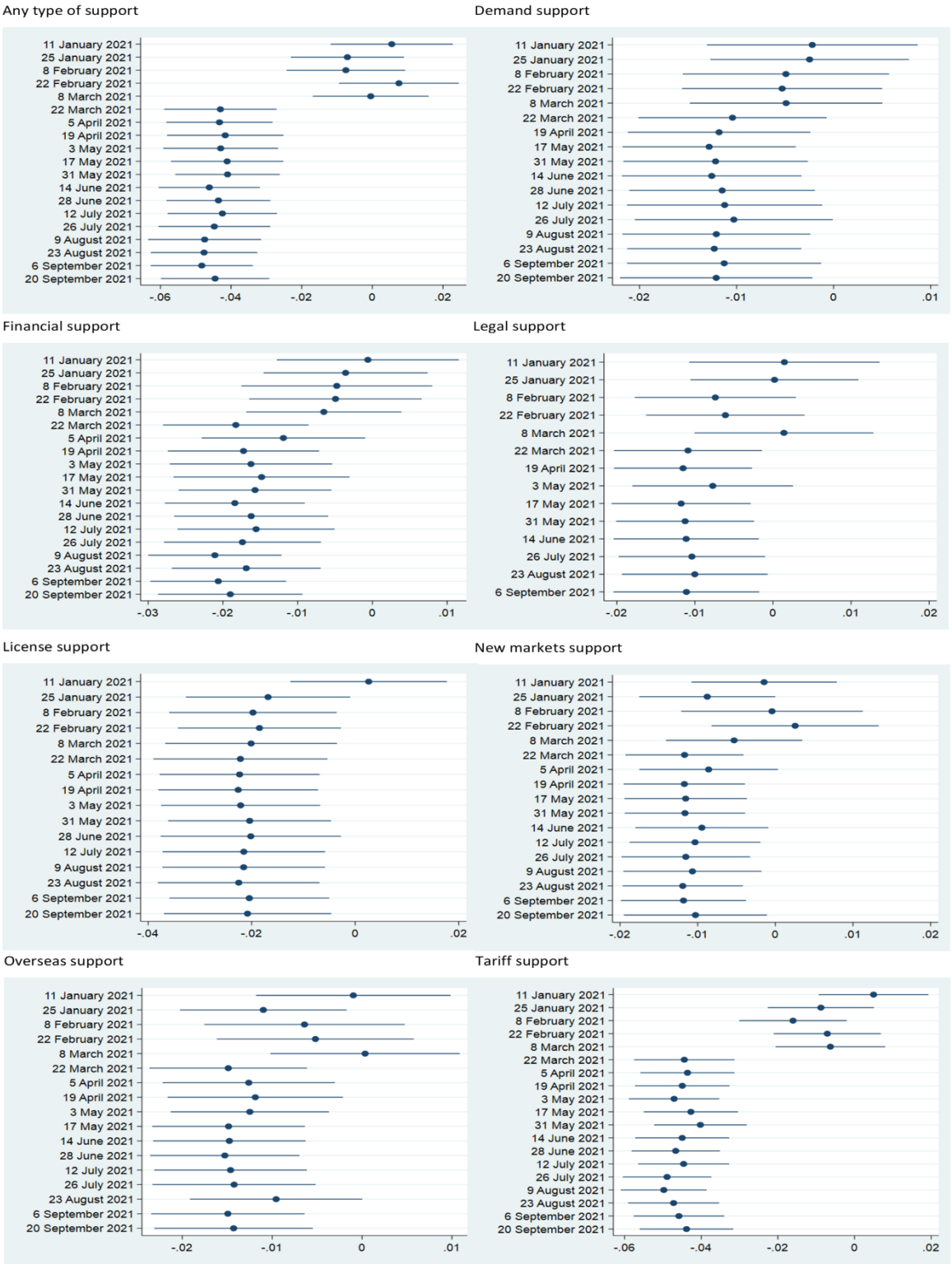
Figure 5 Export support by creative sector sub-sectors



Note: Red boxes highlight creative sub-sectors and types of support wherein a positive and statistically significant correlation exists between export challenges and export support.

Figure 6 below reports the time coefficients. The peak of export support occurred in January-March 2021, when firms were first experiencing the new trade regime with EU countries. It was also, as documented by Du and Shepotylo (2022), the period associated with the greatest trade disruptions. It was arguably, therefore, the period when firms most needed support with the new tariffs and customs arrangements. The beginning of January also shows a spike in license-related support. Support related to lack of demand, search for new markets, and legal support was more equally spread over the period under investigation.

Figure 6 Timing of export support



Note: This figure presents the values of the estimated coefficients for time fixed effects in a regression where export support is regressed on export challenges and time fixed effects. Each "dot" represents the size of the coefficient, while the bar represents a 95% confidence interval. More positive coefficients indicate a higher probability of receiving support.

5.2 Did export supports help?

Moving on to the question of whether the assisted firms were in fact more successful at exporting, we evaluate the effectiveness of the export support in helping such firms to export during January-September 2021.[5] Specifically, the available data allow us to test whether having received export support made the firm more likely to export.

Methodological approach

Estimating the causal impact of receiving export support on exporting requires certain selection and treatment biases to be addressed. Exporting firms may have characteristics that are fundamentally different (e.g., size, productivity, managerial experience) from those of non-exporters, and the firms that received export support may have been very different from those that did not. If we do not control for selection, therefore, the estimated impact might not be well identified: a firm's export performance and whether it had received support may be positively (negatively) correlated purely because firms that were more likely to export were more (less) likely to claim and receive support.

"Matching" allows us to estimate the average treatment effect on the treated and the average treatment effect on a cross-section under the following assumptions: a) the treatment is applied at random but conditional on the observed selection factors; b) there is a pool of untreated firms that have similar characteristics to the treated firms; and c) a single dimensional propensity score matching (PSM) is sufficient to deal with the rich and multidimensional space of factors that affect selection (Rubin, 1977; Rosenbaum and Rubin, 1983). We use PSM as our preferred matching method. The propensity score is defined as the conditional probability of receiving the treatment, given the observed covariates. The matching process involves selecting individuals from the treatment group who have a similar propensity score to individuals from the control group. The matched pairs can then be compared to estimate the treatment effect. We seek to estimate how outcome Y_i (say, exporting in the last 2 weeks) depends on export support (D_i). The selection problem arises in that the firms that are asking for export support are those that are likely to be facing export challenges. Therefore, regressing the outcome on export support is likely to be biased downward, resulting in an insignificant and potentially negative estimate of the coefficient of interest. However, if we condition the selection on the fact that the firm has an export challenge and compare those who received the support against those who did not, we will obtain a more reliable result. More formal discussion of the matching methodology is presented in the appendix.

Results

We estimate the impact of receiving support on the probability of exporting for **exporting** firms (average treatment effect on treated, ATET) as well as for **all** firms (average treatment effect, ATE). The former measures how the support keep already exporting firms to continue, while the latter measures how the support helps firms to export, regardless their previous experience with exporting. Table 10 presents the estimates of ATET and ATE for the impact of receiving export support on the probability of a firm having exported (columns 1 and 2), having exported to the EU (columns 3 and 4), having exported to the rest of the world (columns 5 and 6) and having exported to both the EU and the rest of the world (columns 7 and 8) over the previous 2 weeks. Matching controls Z include labour productivity, firm's age and employment, and firm's sub-industry. Robust Abadie-Imbens standard errors (Abadie et al., 2004) with 10 matches are reported in parentheses.

Panel A of the table reports the results for all creative industries firms. Overall, the results demonstrate that

[5] We estimate the average effect for any type of support, addressing any type of export challenge. To explore variation in the effectiveness of supports of different types would require a large sample.

receiving export support has a strong and positive effect on exporting in the short run. For those who received support, doing so increases the probability of exporting by 6.6%, exporting to the EU increases by 7.9%, exporting to the rest of the world increases by 9.2%, and exporting to both increases by 10.5%.[6] While the coefficient weakly increases from exporting to EU to exporting to both, the differences are not statistically significant.

For the sample of all firms in the economy, receiving support has an even larger effect on the probability of exporting: it increases the probability by 52.4%, mostly due to increasing the probability of exporting to the rest of the world by 56%. Interestingly, it does not significantly increase the probability of exporting to the EU, which is probably because it is rare for firms who had not already been exporting to the EU to start doing so after the TCA was implemented. However, we find that during the examined period, it was more common for a firm to decide to start exporting to non-EU countries in 2021.

Table 10 Impact of export support on exporting: Propensity score matching

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exports, any		**Export to EU**		**Export to non-EU**		**Export to both EU and non-EU**	
	ATET	**ATE**	**ATET**	**ATE**	**ATET**	**ATE**	**ATET**	**ATE**
				A: Creative sector, All				
Received export support=1	0.066*	0.524***	.008*	0.161	0.092*	0.562***	0.105*	0.199
	(0.032)	(0.123)	(0.038)	(0.152)	(0.038)	(0.123)	(0.042)	(0.152)
Observations: 12800; # Non-treated: 12370; # Treated: 430								
				B: Creative sector, Small				
Received export support=1	0.123**	0.483***	0.151**	0.293**	0.110*	0.496***	0.138**	0.306**
	(0.041)	(0.081)	(0.048)	(0.113)	(0.048)	(0.086)	(0.053)	(0.116)
Observations: 8806; # Non-treated: 8485; # Treated: 321								
				C: Creative sector, exporters only				
Received export support=1	0.112***	0.024	0.123***	0.049	0.091*	0.109	0.102*	0.134
	(0.033)	(0.109)	(0.037)	(0.131)	(0.040)	(0.110)	(0.042)	(0.131)
Observations: 5217; # Non-treated: 4787; # Treated: 430								

Note: table reports ATE and ATET coefficients estimated by the propensity score method using Stata command "defects" "psmatch." Matching controls *Z* include labour productivity, firm's age and employment, firm sub-industry. Robust Abadie-Imbens standard errors with 10 matches are reported in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

There are good reasons for expecting the impact of export support to have varied with firm size. For example, smaller firms may have had less in-house capacity to deal with the new TCA requirements and Covid-19 challenges and thus have been more likely to seek external support. They may therefore have benefited more from third-party expertise and government financial support. To test this reasoning, Panel B reports the PSM causal effects for small firms with employment below 50 workers. Compared with the overall effect for firms of all sizes, we indeed observe a stronger effect for the smaller firms that received support, where receiving export support increases the probability of exporting in the last two weeks by 12.3%, exporting to the EU by 15.1%, exporting to the rest of the world by 11.0%, and exporting to both by 13.8%.

Among all small firms, the effect is stronger and statistically significant for all export destinations: it increases the probability of exporting in the last two weeks by 48.3%, exporting to the EU by 29.3%, exporting to the rest of the world by 49.6%, and exporting to both by 30.6%. Again, we observe that among all firms, receiving support has a stronger positive effect on exporting to the rest of the world rather than on exporting to the EU. This may have been because UK businesses were better informed about exporting to the EU before the TCA was introduced. In

[6] Since each model is estimated separately, the average effect of export support on exporting is not directly comparable to the weighted probabilities of exporting to EU, ROW, or both.

fact, prior to Brexit exporting to the EU was in principle not much different from doing business in the UK. After the TCA was introduced, those who were not already exporting were perhaps unlikely to start exporting to the EU, even if they were considering exporting to some new markets. Since knowledge of exporting to new markets requires the support and expertise of specialists, it seems reasonable to assume that the benefits of support on exporting to ROW were larger.

The BICS questionnaire asks only firms who had exported within the last 12 months if they had received export support. This creates another potential selection bias in the estimation, as we do not know about firms that received support but did not start exporting, meaning that we cannot establish whether the export support may have helped some firms to export for the first time. The results indicate that among the exporters, those who received the support are 11.2% more likely to have exported in the previous two weeks, 12.3% more likely to have exported to the EU, 9.1% more likely to have exported to the rest of the world, and 10.2% more likely to have exported to both. There is no significant effect on those who did not receive treatment.

We have performed standard diagnostic tests on the quality of matching and common support. In all cases, we confirm that the common support assumption is valid. On the quality of matching, we present in Figure 7 the matching Balance plot for the column 1 Panel A model, which indicates that the matched sample is considerably more balanced in its propensity scores relative to the original one. Matching Balance plot helps to assess the balance of covariates between the treated and control groups after matching. It visualizes whether the matching process has been successful in reducing differences in covariate values between the two groups. The main purpose of this plot is to check whether the matched groups are now more comparable in terms of their covariate distributions. The left-hand side of the plot shows propensity scores distribution for treated and control groups in the raw data, which are significantly different in their propensity scores and underlying distributions of the covariates. The right-hand side of the plot shows the distributions of the propensity scores for control and treated groups after matching, which are now similar to each other, indicating successful matching procedure that balanced out covariates for treated and control groups really well.

Figure 7 Balance plot for all creative industries firms

Note: Matching Balance presents the balance of covariates between the treated and control groups before and after matching. The distribution of propensity scores before the matching differs between control and treated firms (left panel), after the matching is similar (right panel).

Robustness checks

The accuracy of our estimation procedure relies on an important assumption: the selection of firms into those that receive the support after we account for all relevant differences in their observable characteristics relative to those who do not receive the support it as good as randomly assigning them to receiving and not receiving support. However, there is not a simple test to check if this assumption holds true and whether the characteristics, we used for matching truly make the assignment across matched observation as good as random.

To make sure that our results are not sensitive to the choice of methodology or to the identifying assumption presented in the previous paragraph, we use an alternative method called "inverse-probability-weighted regression adjustment" (IPWRA, Robins et al., 2000). It uses weighted averages of predicted outcomes for the treated group, where the weights are based on the estimated likelihood of someone receiving treatment. The idea is that by giving more weight to those who were more likely to receive treatment, we can account for any differences in their characteristics.

IPWRA consists of two steps: First, a treatment model is fitted to estimate the propensity score, which is the probability of receiving the actual treatment given the covariates. Each firm is then assigned a weight that is the inverse of their propensity score if they are treated, or the inverse of one minus their propensity score if they are untreated. Second, an outcome model is fitted to the weighted data to estimate the potential outcomes under each treatment level. The treatment effects are then computed as the contrasts of these potential outcomes.

One attractive property of IPWRA is that it is doubly robust to different types of violations in the underlying assumptions. Even if one of the two modelling assumptions (the one for deciding who gets treatment or the one for predicting the outcome) is not perfect, the results can still be reliable.

Table 11 presents the results of the impact of the export support on the probability of export using IRWRA methodology. When we compare the results from IPWRA to those from our original matching method (Propensity Score Matching or PSM), they are consistent. The only important difference we noticed is that the effect of "export support" on "exporting to the rest of the world" appears to be weaker for those who received treatment in the IPWRA results.

Table 11 Creative sector, IPWRA Method

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	Exports, all		**Export to EU**		**Export to non-EU**		**Export to both EU and non-EU**	
	ATET	**ATE**	**ATET**	**ATE**	**ATET**	**ATE**	**ATET**	**ATE**
Received export support=1	0.131***	0.522***	0.136***	0.396***	0.035	0.488***	0.040	0.362***
	(0.034)	(0.057)	(0.034)	(0.065)	(0.042)	(0.069)	(0.041)	(0.071)
Observations: 12800*; # Non-treated:* 12370*; # Treated:* 430								

Note: Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001.

6. Discussion and policy implications

Our comprehensive examination of export disruptions and firm heterogeneity using the BICs data provides valuable insights into export disruptions in the UK creative service industries. First, as expected, significant numbers of creative industries firms experienced export disruptions during 2021. According to the survey, roughly one-third of creative industries firms exported less than in normal times, and, in the worst months, 9% of firms stopped exporting altogether. This headline masks important differences across sub-sectors. Design & Designer Fashion and Publishing were the hardest hit, while IT, Software and Computer Services fared better. This is consistent with broader trends which show that typically IT, Software & Computer Services firms performed more strongly in the economic crisis than firms in other services sectors (Kim et al., 2020). Those most negatively impacted experienced disruptions and challenges created by production delays, cancellations and closures, and disadvantageous shifts in consumer behaviour.

One distinct feature of the data that sets creative industries firms apart from non-creative services counterparts

is that they were less inclined to attribute their main trade challenges to Brexit. Only one-quarter of creative industry firms who responded attributed their problems to Brexit, compared with more than 57% in the case of non-creative industries services firms. Strikingly, a substantial proportion (more so than in non-creative sectors) of creative industries firms either did not respond to that question or responded that they were "unsure." Although the BICs data do not allow us to establish the reason for the latter, a possible explanation could be the considerable uncertainty and confusion about the nature of export disruptions at that time. More research is needed on this area.

Our empirical analysis demonstrates the nuanced impact of export challenges, highlighting the specific challenges that creative industries firms face and the diverse ways in which these challenges affect disruptions. Not all export challenges were disruptive in the same way and to the same magnitude. The most important challenges for UK creative industries firms appear to have been a reduced demand for products and services, work permit or visa restrictions, customs duties and levies, and the lack of hauliers to transport goods or lack of logistics. We now discuss these in turn.

6.1 Reduced demand for products and services.

The primary driver of the export decline and disruption encountered by creative industry firms appears to have been a reduced demand for their products and services. This decline in export demand serves as tangible feedback from the market, indicating challenging economic conditions. However, it is essential to recognise that the weakening of export demand can stem from various factors, encompassing economic, social, and political dynamics.

Economic literature on trade elasticities underscores that changes in export demand can be attributed to several key determinants, including relative price shocks,[7] product quality and innovation,[8]consumer preferences,[9]availability of substitutes,[10] trade policies,[11] macroeconomic conditions,[12] and foreign income shocks.[13] In the specific context of UK creative industries in recent years, most of these factors did not radically change. Hence, the most likely culprits of the reduced export demand and disruption are currency depreciation, price pressures, heightened trade barriers and frictions.

First, the prolonged depreciation of the sterling currency since January 2021 increased the costs of importing goods and services.[14] This, coupled with rising energy prices and cost-push inflation, led to higher production costs, eroding the competitiveness of exported products in foreign markets.

The second factor is price pressures, which led to increased production costs and weakened competitiveness of their products and services. Depending on the substitutability of their offer, this could have resulted in lost

[7] The relative price, which compares the price of a domestically produced good in a foreign market to the price of the exported good in that overseas market, plays a crucial role. Fluctuations in relative prices can significantly impact export demand.
[8] The quality and innovation of products and services can influence their competitiveness in international markets. Continuous improvement and innovation are vital for sustaining export demand.
[9] Shifting consumer preferences and tastes can affect the demand for specific products and services in export markets. Firms need to adapt to evolving consumer choices.
[10] The presence of substitute products or services in international markets can alter demand patterns. Competition from substitutes can lead to changes in market share.
[11] Trade policies, including tariffs and non-tariff barriers, have a direct impact on export demand. Changes in trade policies can either facilitate or hinder international trade.
[12] Broader economic conditions, such as inflation rates, exchange rates, and economic stability, can affect the attractiveness of exported goods and services.
[13] The economic well-being and income levels of foreign consumers influence their purchasing power and, consequently, their demand for imported products.
[14] See the movement of currency and inflation time series at https://www.economicshelp.org/blog/170996/economics/the-effect-of-fall-in-pound-sterling/.

customers or thinner profit margins for those firms that opted to maintain lower prices.

Further, increased trade barriers and frictions over the examined period due to the implementation of the TCA at the conclusion of the Brexit transition introduced significant trade barriers and disruptions. Firms engaged in trade with EU markets, particularly those transitioning from EU member to third-country status, experienced heightened challenges due to the altered trade relationships.

In response to the identified issues, we offer a series of policy recommendations aimed at improving the current situation of weakened demand. First, it is a crucial time to understand the changing dynamics of firms' involvement in internationalisation. This should include the whole spectrum of international commitment and performance, not only high performers and successfully internationalised firms, but also those firms that stopped exporting in recent times. It is important to invest in export promotion initiatives that assist creative firms in identifying and accessing new markets (or re-entering international markets), enhancing competitiveness, and navigating trade barriers.

Particularly, it is recommended to encourage creative industry firms to diversify their export markets, reducing dependence on a single market and mitigating the impact of reduced demand in one region. More broadly, businesses also need to think of ways to achieve innovation and quality enhancement which may compensate the loss of price competitiveness in international markets. To do this, supports in technological upgrading and adoption and improving managerial capability and best practices, as well as developing international networks can be instrumental.

Second, there is room for policymakers to improve the international trading condition. In addition to the essential work aiming to alleviate cost pressures on businesses, such as supporting initiatives to stabilise currency values and addressing inflationary pressures, as well as promoting economic stability (which the UK government and Bank of England have been doing), it is important to continuously monitor and evaluate the impact of trade agreements, such as the TCA, on creative industries firms. Evidence needs to be collected and curated to feed into the mechanisms through trade policies and agreements can be adjusted to minimise disruptions and support exporters. The 2025 review on the TCA is the next opportunity. Creative sectors need to feed into this important step to improve their trading conditions with the EU.

In short, while reduced demand for creative industries' products and services was a prominent factor in export disruptions, a comprehensive approach involving policy support and economic stability measures can help mitigate the challenges and strengthen the sector's resilience in the global market.

6.2 Customs Duties and Levies

The next most disruptive trade barrier revealed from our analysis is increased customs duties and levies. Changes in customs documentation requirements since 2021 impacted firms' eligibility for zero-tariff treatment. Simplified documents with evidential easements were discontinued, and comprehensive documentation became necessary to prove product origin. Failure to provide evidence could lead to duties, suggesting a persistence of this obstacle.

The British Chambers of Commerce has reported that certain simplified documents that provided evidential easements on proof of origin in trade with the EU were discontinued on 31 December 2021. As a result, national customs authorities are now requiring firms to present more comprehensive documentation to demonstrate that their goods meet the product-specific rules of origin that are necessary for qualifying for zero-tariff treatment. Failure to provide evidence of the goods' origin could result in firms having to pay duties. While border disruptions may eventually subside, customs duties and levies are likely to persist for the foreseeable future, unless there are significant modifications to the EU-UK trading relationship. Arguably, there is limited room for policy to alter this situation substantively. Assistance and resources to firms to meet customs documentation requirements

would no doubt be helpful.

6.3 Work permit and visa restrictions

Work permit or visa restrictions have clearly stood out from the analysis as a key challenge for creative industries firms. This contrasts with non-Creative services and hence underscores a particular area of disruptions. We reviewed the key issues around the mobility of creative professionals and mutual recognition of professional qualifications at length in Section 2. The requirements to comply with the TCA agreement (or lack thereof) for work permits, visa requirements, and professional qualifications, and the costs of doing so, represent significant impediments to EU trading for creative industries businesses.

This finding implies that the sector was negatively impacted not just by the impaired freedom of movement during the Covid-19 pandemic, but also by the fetters on the freedom of regulated professionals to provide cross-border services, and compliance costs associated with TCA requirements on mobility. The evidence that small firms particularly were negatively affected shows the greater fragility of the creative sectors, populated by many small businesses.

6.4 Hauliers to transport goods or lack of logistics.

The lack of hauliers to transport goods or lack of logistics relate to the new regulations around transport and logistics, including the new rules for the movement of goods. In Section 2, we reviewed the new rules on cabotage, Admission *Temporaire*, and movement of cultural goods that the TCA imposed in 2021. This raft of legislation is expected to weaken the ability of creative industries firms to provide services in the EU, especially in the music and entertainment sub-sectors. Again, there may not be quick fixes. The government should continuously monitor the impact of trade agreements, such as the TCA, and adapt policies to minimise disruptions. In the short-term, tailored supports and export promotion initiatives can help firms navigate trade barriers and explore alternative markets.

6.5 Firm characteristics and export challenges

The analysis explored how firm characteristics (size, productivity, and age) interact with export challenges. Larger and more productive firms exhibited resilience in certain areas but were also more susceptible to border-related disruptions. More specifically:

- Larger and more productive firms showed resilience to trade disruptions but vulnerability to specific challenges.
- Productive capacity and competitiveness can alleviate short-term export problems.
- There is acute need for tailored support for firms of different sizes and sub-industries.

Even before Covid-19, creative industries firms were seen as facing industry-specific barriers to international trade, most specifically, their small company size (Department for Business, Energy & Industrial Strategy, 2018). It is also well known that the creative industries consist of disproportionally more micro and small-sized firms. The average creative company has 3.3 full-time employees, and 34% of creative sector workers are self-employed, which is more than double the UK average (Bazalgette, 2017).

Further, the Creative Industries Sector Deal states that micro-companies lack the "absorptive capacity" to take on the extra activities associated with exporting, such as identifying and assimilating useful information

and using it for commercial ends (Department for Business, Energy & Industrial Strategy, 2018). Therefore, helping these small businesses to overcome specific challenges and build productive capacity is an area of policy that requires strategic thinking rather than a generic menu of exporting support. Even very small creative industries firms (e.g., Liverpool's Baltic Creative cluster) can be successful in export entry and global reach (Patha et al., 2019), and these experiences of success and knowledge of best practices should be collected and shared with businesses in similar conditions.

6.6 Export support and its effectiveness

Useful insights also emerge from our analysis of government export support. Intuitively, the BICs data suggest that export supports were more likely provided to firms that had experienced export challenges. In particular, those firms that experienced reduced demand for goods and services, and those facing increased customs duties and levies and UK border disruptions were more likely to have received export support. On the other hand, firms experiencing a lack of hauliers and logistics equipment were less likely to get support. In addition, more mature firms in terms of age were more likely to get support, which we might speculate have been related to their, possibly, more experienced managers, greater ability to access support, and their wider business networks. We also find that the types of support received for the different sub-sectors making up the creative industries varies considerably in importance. Firms in Crafts were most likely to get export support overall. Music, Performance, and Visual arts firms appear to have been less likely to have received export support than firms in other creative sub-sectors.

Our causal analysis suggests that in 2021, the export supports that creative industries firms received had been effective in helping firms stay in the export market. On average, creative industries firms that received export support were around 10% more likely to continue exporting than if they had not received support. The effect of export support on firms more generally i.e., not just those in the creative industries, measured by average treatment effect, was higher. On average, both assisted and non-assisted firms were 50% more likely to export if they all had received export support compared with the (hypothetical) case where none of them received the support. The estimated effects on exporting for firms exporting to only non-EU markets was higher than for firms exporting to only EU markets and those exporting to both EU and non-EU markets. Again, the effects were more pronounced for small firms.

7. Conclusions

The challenges that besieged the UK's creative industries in the arena of exports, arising from the perfect storm of Covid-19 and the culmination of the EU transition period were nothing short of monumental, cresting in the early months of 2021. Our meticulous examination has revealed new insight:

1. **Disruptive Prevalence:** A substantial portion of UK creative industry firms encountered disruptions in their exports throughout 2021. Alarmingly, nearly a third of these firms saw their export operations diminish, with the worst months witnessing a staggering 9% of firms entirely ceasing exports.
2. **Uncertainty**: A cloud of uncertainty enveloped UK creative industry firms, eclipsing the levels experienced by the broader economy. When asked about the primary cause of export disruptions (Covid-19, Brexit, Both, or Other), an astonishing 71% of creative industry firms either expressed uncertainty or chose not to respond, in stark contrast to the 39% among non-creative industry service firms.
3. **Brexit Impact:** Firms within the UK creative industries that exclusively exported to the EU were hit hardest by export disruptions in 2021, with those solely exporting to non-EU countries experiencing the least disruption. In stark contrast, for non-creative service firms, diversifying exports across both EU and non-

EU destinations proved the least disruptive strategy.

4. **Major Export Challenges:** A formidable array of export challenges confronted UK creative industry firms in 2021, with the most detrimental factors being, in order of significance: diminished demand, customs duties and levies, work permit requirements or visa restrictions, and haulage issues.
5. **Sectoral Disparity:** The impact of export challenges was far from uniform, with certain creative industry sub-sectors being more severely affected than others. For example, the Designer & Designer Fashion and Publishing sub-sectors bore the brunt, with 27% experiencing export reductions, while the IT, Software & Computer Services sector remained the least affected, with a 16% reduction.
6. **Firm Resilience:** Larger, older, and more productive firms within the creative industry exhibited a better capacity to weather export challenges related to the Brexit in 2021, although this resilience did not extend to challenges posed by Covid -19. Among firms attributing their export disruptions to the Brexit, larger creative industry firms faced fewer disruptions.
7. **Policy Support:** The policy measures implemented by the UK government during this period significantly assisted UK creative industry firms, particularly smaller entities. Notably, the receipt of export support bolstered the likelihood of exporting by 6.6%, with figures increasing to 7.9% for exports to the EU, 9.2% for non-EU exports, and 10.5% for firms exporting to both. For firms with fewer than fifty employees, the impact was even more pronounced, reaching 15.1% for those exclusively exporting to the EU.

These findings underscore the inescapable need for comprehensive trade policies and measures to dismantle the barriers obstructing the UK's creative industries. Collaboration between the UK and the EU is indispensable, with knowledge sharing and best practices being paramount. Our policy recommendations, while concise, are profoundly impactful:

1. **Targeted EU Export Support:** The development and promotion of specialised support for creative industry firms exporting to the EU are an imperative to mitigate the trade barriers arising post-Brexit. This entails targeted advice, particularly for smaller firms grappling with declining EU exports and navigating new rules of origin, work, and visa restrictions. Grants could be offered to alleviate administrative burdens, with a particular focus on small businesses.
2. **Export Decision Aid:** Offering guidance to creative industry firms to inform their export decisions is crucial. Providing tailored advice that aids firms in evaluating the feasibility of exports, exploring new export markets, and delivering timely and consistent market intelligence and advice is instrumental.
3. **Revive Exporting**: The revival of support for UK creative industry firms that ceased exporting is paramount. Developing digital resources and advisory programs to stimulate and assist previous exporters in resuming their international trade operations is an urgent need.
4. **Inspire Innovation:** The UK's creative industry firms should be encouraged and inspired to explore innovative approaches to exporting. Showcasing inspiring case studies of firms delving into new export markets and approaches, and fostering platforms for industry insights and best practice, is essential.
5. **Regulatory Alignment:** Ensuring continued alignment between the UK and the EU on intellectual property protections, product standards, sustainability measures, and data protection is paramount. Additionally, efforts should continue to strengthen alignment on professional qualifications between the UK and EU member states.

In addition to these measures, extending the reach of trade support organisations, promoting collaboration with diverse entities, and providing specialised assistance will be pivotal in supporting firms grappling with multifaceted challenges extending beyond mere technical export issues. By collaboratively addressing these challenges, we can bolster the resilience and global competitiveness of the UK's creative industries.

The UK Department of International Trade, now the Department of Business and Trade (DBT), has already played a significant role in supporting businesses seeking assistance. However, there is a pressing need to broaden its outreach to encompass businesses that have not yet initiated their journey into exporting. This necessitates mobilising a wide array of public and private trade support organisations, fostering cohesive partnerships with the British Chambers of Commerce, growth hubs, UK Export Finance, and other associations supporting firms. It is vital to recognise that the challenges firms face are not solely related to procedural and technical export hurdles but may extend to business models, operations, marketing, and overall business management. Thus, a compelling case exists for offering multifaceted support that allows firms to draw upon various areas of expertise for assistance.

To lay the groundwork for more effective and precisely targeted export support strategies for the UK's creative industries, further research is necessary. This entails:

1. **Precise Mechanisms:** Delving deeper into the nuanced intricacies of export support mechanisms. Research in this domain is instrumental in uncovering the detailed mechanics of what export support strategies prove most effective. It delves into the granular workings of support systems, such as export processes, network building, financial aid, advisory services, and operational assistance, to determine which elements are most pivotal for success in international trade. By meticulously scrutinising these 'precise mechanisms' of export support, this research equips policymakers and industry leaders with the insights necessary to fine-tune and optimise support initiatives. It paves the way for a more targeted and efficient approach, ensuring that export support measures are not only well-intentioned but also strategically effective, thereby empowering creative industry firms to overcome export challenges and flourish in the global market.

2. **Inclusive Distribution:** A comprehensive exploration of 'Inclusive Distribution' is essential within the context of supporting creative industries export performance. This facet of research delves deeply into the equitable distribution of export support, ensuring that it is not only accessible but also tailored to the specific needs of firms of varying sizes, ages, sectors, and product lines. It necessitates a nuanced understanding of the diverse costs and benefits incurred by each group. Research in this area should aim to unravel the unique challenges faced by different segments of the creative industries, recognising that what works for a smaller, emerging design studio may not be the ideal strategy for a well-established global music streaming platform. By scrutinising the 'Inclusive Distribution' of export support, this research strives to create a level playing field, ensuring that all creative industry firms, regardless of their size or sector, have equitable access to the support measures necessary to thrive in the international marketplace. It is about empowering the entire spectrum of creative industries, from startups to industry giants, to leverage export support effectively and contribute meaningfully to the UK's creative economy on a global scale.

3. **Innovative Outreach:** Tackling the persistent challenge of connecting with businesses in need through innovative solutions is of critical importance when it comes to bolstering creative industries export performance. This facet of research is dedicated to seeking unconventional and ingenious methods to identify and engage firms requiring export support. It involves the exploration of non-traditional data sources, harnessing the power of big data analytics, and integrating cutting-edge technologies such as artificial intelligence and machine learning. By leveraging these advanced tools, this research aims to pinpoint firms facing export challenges, even before they may fully recognise their own needs. It is about proactively reaching out to these businesses, offering targeted assistance, and creating a dynamic, responsive ecosystem of support. In essence, 'Innovative Outreach' ensures that no creative industry firm is left unaided, pioneering a paradigm shift in how support is offered and ensuring that even the most nascent startups find their place in the global arena, contributing to the vibrant landscape of the UK's creative industries.

4. **Skills and Education:** In the realm of the UK's creative industries, the significance of advancing research in skills and education cannot be overstated, particularly in light of the surging influence of artificial intelligence (AI). As AI technologies increasingly become integral to creative processes, there exists an urgent imperative to examine how this transformation impacts job roles, the specific skills required, and the educational programs necessary to cultivate a workforce capable of effectively collaborating with AI in the realm of exports. This research serves as a guiding light, directing policymakers, educators, and industry leaders in tailoring educational curricula and training initiatives to align with the evolving demands of exporting in the creative sector. It plays a pivotal role in uncovering the precise skills and knowledge that empower individuals to harmoniously integrate human creativity with AI innovation, ultimately bolstering export performance.

5. **IP Protection:** In the context of enhancing export performance, the need for research on intellectual property (IP) protection within the creative industries is paramount. These industries, integral to export growth, thrive on innovation, originality, and the creation of valuable intellectual assets. As the creative industries expand their presence in international markets, the preservation of intellectual property rights takes on even greater significance. Research in this domain should look into the evolving landscape of IP protection, addressing the specific challenges posed by digital platforms, the influence of international agreements, and the implications of AI and automation on creative works. It is essential to understand the intricate framework of copyright, trademark, and patent laws that underpin these industries, especially how these laws adapt to the digital age. Furthermore, this research plays a pivotal role in identifying best practices, effective strategies, and policy recommendations to strengthen IP protection. By nurturing an environment where creativity is not only celebrated but also incentivised, we ensure that artists, creators, and innovators are rightfully rewarded. As the creative industries venture into global markets, the knowledge and insights derived from such research will prove instrumental in safeguarding the rights of these individuals, thereby enriching the cultural and economic landscape of the United Kingdom and the global stage, ultimately contributing to improved export performance.

In closing, the UK's creative industries stand at a pivotal juncture, and their resilience in the face of global challenges is of paramount significance. The insights gained from this study offer a beacon of guidance as these industries chart a course beyond the turbulence of Covid-19 and Brexit, towards a future brimming with opportunities for growth and global prominence.

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Technical notes

Estimating the causal impact of receiving export support on exporting requires certain selection and treatment biases to be addressed. Exporting firms may have characteristics that are fundamentally different (e.g., size, productivity, managerial experience) from those of non-exporters, and the firms that received export support may have been very different from those that did not. If we do not control for selection the estimated impact might not be well identified: a firm's export performance and whether it had received support may be positively (negatively) correlated purely because firms that were more likely to export were more (less) likely to claim and receive support.

Using the BICS surveys for this purpose presents an additional challenge because the surveys are not a balanced panel. We, therefore, cannot observe the whole sample of firms over time and thus control more easily for the unobserved firm heterogeneity. The BICS data are repeated cross-sections; they, therefore, do not allow us to use the difference-in-differences or synthetic difference-in-differences methods, which are the standard methodologies for evaluating the impact of a "treatment" (the export support) on the outcome of interest. Using an ordinary least squares estimation to regress the outcome of interest on treatment is a poor option due to the selection problem already outlined. Likely selection biases will lead to a biased estimate of the coefficient of interest if it is not properly dealt with.

"Matching" allows us to estimate the average treatment effect on the treated and the average treatment effect on a cross-section under the following assumptions: a) the treatment is applied at random but conditional on the observed selection factors; b) there is a pool of untreated firms that have similar characteristics to the treated firms; and c) a single dimensional propensity score matching (PSM) is sufficient to deal with the rich and multidimensional space of factors that affect selection (Rubin, 1977; Rosenbaum and Rubin, 1983).

More formally, we rely on the conditional independence assumption, modelled using the potential outcomes notation (Rubin, 1974). Consider an observed measure of firm's performance which in this case is the firm's export performance. The treatment variable of interest is the export support $D_i$dicator, which takes the value of 1 for firms that received the support and 0 otherwise. Denote Y_i^1 as an outcome of interest if firm *i* received the export support and Y_i^1 if it did not. Only one of those outcomes is observed for any given firm. The link between the potential outcomes and the one observed is written as:

$$Y_i = Y_i^1 D_i + Y_i^0 (1 - D_i)$$

Two assumptions need to be met to obtain the population average treatment effects. Assumption 1 is ***Conditional Random Assignment*** to export support. This means that the assignment of export support (which is conditional on the observable firm, industry, and time characteristics) is as good as random:

$Y^0, Y^1 \perp\!\!\!\perp D|Z$.

Z is a vector of the observed characteristics that determine firms' selection into the treatment. In other words, selection into exporter support is based on a firm's characteristics (size, productivity, age), the characteristic of the industry where it functions, and the external environment (lockdowns, TCA challenges). The remaining heterogeneity in the choice of exporting/non-exporting is assumed to be random.

A second assumption, **Common Support**, is needed to ensure that the received treatment is not determined with certainty by the underlying observed characteristics. This means that we can find a firm that did not receive the treatment for any value of Z:

$0 < Prob(D = 1|Z) < 1$.

This second assumption is somewhat technical; it holds that for any firm that received export support, there is a similar firm that did not receive export support. We further define two types of casual inference estimates, the

first of which is **Average treatment effect on treated (ATET):**

$$\delta_{ATET} = E\left(Y_i^1 - Y_i^0 \middle| Z, D_i = 1\right) = E\left(Y_i^1 \middle| Z, D_i = 1\right) - E\left(Y_i^0 \middle| Z, D_i = 1\right)$$

In this expression, the second term is unobserved. It is a hypothetical that estimates what would be the outcome for the support-receiving firms if they had not received that support. ATET is the mean causal effect of the treatment for firms that actually received the treatment. Put differently, it is the average outcome difference across firms that are actually treated between the (actual) case where the firms received the treatment and the (hypothetical) case where none of them did so. Under Assumption 1, $E(Y_i^0 | Z, D_i = 1) = E(Y_i^0 | Z, D_i = 0)$, so the second term can be replaced by the observed outcome for firms who had not received support:

$$\delta_{ATET} = E\left(Y_i^1 - Y_i^0 \middle| Z, D_i = 1\right) = E\left(Y_i^1 \middle| Z, D_i = 1\right) - E\left(Y_i^0 \middle| Z, D_i = 0\right)$$

The second estimate is **Average treatment effect (ATE**), which is measured by

$\delta_{ATE} = E\left(Y_i^1 - Y_i^0 \middle| Z\right) = E\left(Y_i^1 \middle| Z\right) - E\left(Y_i^0 \middle| Z\right)$.

This is the average causal effect of the treatment amongst all firms in the population; hence, it is preferred. ATE is the average outcome difference between the (hypothetical) case where all firms received the treatment and the (hypothetical) case where none of them received the treatment.