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Brexit Uncertainty and Trade in Services: Evidence from the UK Creative Industries 2014–2019

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Abstract

The creative industries in the UK are a vibrant, fast growing, and innovative part of the economy. Not only do they generate many jobs and add significant economic value, parts of the sector can also produce social value for the nation and its regions. This study takes a first step in using the available data to quantify the Brexit impact on the UK's creative sectors' international trade performance during the period between the referendum result and 2019, when there was high trade policy uncertainty. This analysis is complemented by analysis of the services trade restrictions and their effects. We conclude that the services trade of five UK creative sectors – Audio-visual distribution and licences, Computer services, Advertising and market research services, Architecture services, and Audio-visual related services – have, as a whole, been negatively impacted by the policy uncertainty following the Brexit referendum (2016-2019). We also project that after the EU exit, UK businesses may experience significant challenges in exporting to the EU. Policy recommendations are discussed.

Keywords: Brexit, services trade, creative industries, Synthetic difference-in-difference, EU, UK
JEL codes: F14, F15

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1. Introduction

The creative industries form one of the world's most economically dynamic sectors. Between 2002 and 2015 the size of the global market for creative goods more than doubled, reaching US$509 billion. Over the same period, the world's creative sectors have bounced back from the last global financial crisis of 2008 to grow their international trade by more than 7%. In 2015, nearly 30 million jobs were provided by the creative sectors globally, and these sectors employ more young people than any other (UNCTAD, 2021). The creative industries are expected to play an even more important and longer-term role in the age of sustainable development, as creativity is likely to be a key driver of economic growth.

The UK's creative industries cover vast and diversified sectors in the economy, from traditional artistic activities such as music, publishing, and the performing arts, to activities that are more knowledge-based (e.g., software and computer services) or services-oriented (e.g., film, television, and design). The 2001 Creative Industries Mapping document of the UK Department of Culture Media and Sports (DCMS) defines the creative industries as "those industries which have their origin in individual creativity, skill and talent, and which have a potential for wealth and job creation through the generation and exploitation of intellectual property" (DCMS, 2001). In the UK, the creative industries grew nearly twice as fast as the rest of the UK's economy from 2011 to 2019, contributing £115.9 billion to the UK economy in gross value added and accounting for 5.9% of the UK GDP in 2019 (DCMS, 2020). The UK's creative sectors are ambitious exporters and contribute to the UK's trade surplus. Growing at a pace of 10% since 2015, the creative sectors in the UK exported £37.9bn worth of services in 2019, representing 12% of the total UK exports in service (DCMS, 2021). Overall, the UK's creative economy has been a success story and it is expected to play a crucial future role in the UK's productivity and growth (Bazalgette, 2017).

The 2016 Brexit referendum created high uncertainty for the creative sector businesses that trade with EU countries (Di Novo et al., 2020). Potentially significant changes in the rules and regulations governing trade and investment between the UK and EU countries could worsen the conditions for the UK's trade in services with its closest neighbours, who are also its largest trade partners. The UK's value proposition as an investment destination also altered. Relying on skills and talent, the UK's creative industries now face restrictions on freedom of movement. Although there are provisions that facilitate mobility in the interests of trade, the new regime includes restrictions on mobility that might disproportionately disrupt the creative sectors (Fazio, 2021, January 22). These sectors have also lost European funding, while their opportunities for collaboration with European partners have been reduced. Finally, there are potential changes in the intellectual property protection regimes. All these changes make the UK-EU trade

in services more costly, with the likely consequence of reducing trade between the two parties.

Expectations of future changes may have negatively affected the outlook for the future growth and profitability of the UK creative industries. These expectations have created a degree of uncertainty for UK businesses during the four-and-a-half years of Brexit negotiation and transition, impacting on their business investment decisions. Existing evidence shows that the Brexit uncertainty has hurt the UK trade as a whole in some significant way (Castelnuovo, 2022). That evidence is mostly based on goods, with the evidence on trade in services being very limited (Ahmad et al 2020; Douch and Edwards, 2021; Du and Shepotylo, 2021, 2022); however, that evidence concurs that the UK services trade has been weakened as a result of the Brexit referendum. The estimates vary with the data, methodologies, and the period of examination, but they indicate an average decline in UK services exports ranging from 5% to 10% per year between 2016-2019 (see a detailed review in Du and Shepotylo, 2021).

Unfortunately, there is as yet no direct evidence on the creative sectors' trade performance, largely due to the lack of data. The peculiarly pervasive heterogeneity within the creative sectors hampers attempts to generalise the lessons derived from other sectors. Given that the creative sectors are among the most vital parts of the services economy of the UK, and that great concerns have been expressed by these usually lively and innovative sectors about their future following the withdrawal from the EU[1], it is important to understand the disruptions experienced by firms in the course of the Brexit transition and to learn valuable lessons for future policy and support. To this end, this report takes a first step in providing a causal analysis of the Brexit impact on the services trade of the UK's creative industries during the period 2016-2019, covering the period from the announcement of the outcome of the Brexit Referendum up to the implementation of policy changes in the trade relationships between the EU and UK. The overall aim is to identify if and how the effect of trade policy uncertainty differs across creative industry sub-sectors and the destinations for services exports.

The root of the Brexit uncertainty was the expectation that trade terms might worsen between the UK and the EU. How would such new trade arrangements affect the UK's trade in services in the future? Although trade terms were established once the EU-UK Trade and Cooperation Agreement (TCA) came into effect in 2021, the question can only be answered once real-time data become available. However, we can shed some light on this 'billion-pound' question by analysing the relationship between service trade restrictiveness and exports flow

[1] See House of Commons Digital, Culture, Media and Sport Committee Second Report of Session 2017-19, *The Potential Impact of Brexit on the Creative Industries, Tourism and the Digital Single Market.* (HC365, 2018).

in the recent past. This will help us to project the likely impact when certain areas of UK services trade become more restrictive.

In this report, we first set up the conceptual foundation for studying uncertainty and trade, explaining why trade can be affected during the period prior to the enforcement of a new trade policy. We then discuss the theoretical underpinning of why the Brexit uncertainty might have caused harm to UK trade. Section 4 explains the data used in this study. Section 5 provides a detailed description of the global trends for five of the UK's creative sub-sectors. Our empirical analysis takes two parts. In Section 6, we focus on causal analysis of how the Brexit referendum impacted on the creative sector trade in services, while Section 7 provides an analysis of how restrictiveness in services affects trade flows. Section 8 discusses the overall findings and the implications. Section 9 concludes.

2. Uncertainty and creative industry trade

The UK entered a long period of uncertainty from June 2016, when the Brexit referendum result was announced, until the end of the transition period in 2021. The referendum result triggered potentially significant changes in the relationship between the UK, the EU, and their trading partners in the world economy. For the next four-and-half years there was a high degree of trade policy uncertainty about when and how the UK would leave the EU (Carballo et al., 2018; Graziano et al., 2020; Du and Shepotylo, 2021). This prolonged period of persistent and widespread uncertainty about many aspects of the EU-UK relationship caused harm to the UK economy as a whole, dampening investment, weakening business financial conditions, and reducing household spending (Bank of England, 2019).

Do we expect that Brexit uncertainty had an impact on the creative sectors during the Brexit transition period? There are theories predicting a negative impact from Brexit uncertainty on overall trade, but it is not clear how the effect would unfold, in that uncertainty could promote trade as well as depress it because different channels can be at work. First of all, most theories predict uncertainty to have a negative impact on trade. Uncertainty increases the risk of making long-term investments and hiring; hence firms are likely to delay such investments when tackling an uncertainty shock because the adjustment costs to reverse the investment can be high (Bloom, 2014). This is expected to be especially the case when the investments relate to international operations, cost-reduction technologies, or human capital for the international markets, and when businesses face trade policy uncertainty shocks.
Uncertainty also stimulates the re-organisation of the firm's production and services. Facing higher uncertainty, firms may reduce foreign inputs (which tend to cost more) and opt for domestically sourced inputs to minimise risks. The substitution of imports leads to a bigger contraction in international trade flows than in domestic economic activities (Novy and Taylor, 2020). Further, uncertainty

dampens consumer confidence and therefore reduces demand. This is particularly relevant for the services trade, with reduced demand explaining reduced services provision.

In terms of the trade in services. reversing trade liberalisation may cause more reduction in services than in goods, given that it is generally more challenging to liberalise services trade than the goods trade. The deep integration of the UK in the EU's services networks gives reason to expect a large fall when restrictions on services are put in place as a result of the disintegration. Hence, the likely loss of the frictionless trading conditions between the UK and EU might dampen trade in a way similar to that experienced by the other exporting sectors. Creative industry sectors have been operating with a significant number of uncertainties, including trade policy uncertainty, in that the key operation conditions were likely to change substantially. These include the free movement of the labour upon which the sectors heavily rely to deliver services, and the webs of regulatory, economic, employment, legal, and tax issues in which they are embedded.

On the other hand, there are theoretical grounds for arguing that uncertainty may lead to more trade. Baley et al. (2020) predict that uncertainty increases both the mean and the variance in the returns to exporting. Reactions of trade flows to increased uncertainty depend on the trade elasticities of the goods traded. These authors build a model with information frictions and show that uncertainty facilitates cross-country risk sharing, and hence there is more trade. Where there is an absence of information, uncertainty may fuel increases in trade because risk-sharing is most effective when both parties are uninformed. Creative industries are characterized by high uncertainty of demand and information asymmetries (Caves, 2000), which means that the risk sharing plays a specifically important role in production, investment, and trade.

That being said, there are reasons to argue that the Brexit referendum will have no significant impact on the creative services sectors because they may be more subject to demand drive than the other services sectors. Caves (2000) argues about the high uncertainty of consumer responses to the new products and services provided by creators. Compared with some other sectors, the provision of creative services and their successful sales abroad may rely more on the perceived value of the service itself and the ability to deliver it, and less on the long-term prospects of the creative business and its future profitability. By contrast, the long-term prospects of, say, the transportation and travel industries tends to be of paramount importance to investors, given the likely size of investment. Interestingly, Du and Shepotylo (2021) find that the UK trade in services by Transport and Travel respectively declined by 12% and 8.6% annually over 2016-2019 relative to the 2019 level as a result of Brexit uncertainty. Over that period, Spain was the biggest winner in these sectors, enjoying export growth that was up by 10.5% on its 2019 level.

The situation is not as clearcut for the creative industries, in that while Brexit uncertainty has impacted the creative sectors' capability to trade services, the overall aggregate statistics of their growth and export dynamics during 2016-2020 do not show clear signs of decline, as we outline in Section 5 below. The upshot of our findings is that the case of the creative sectors warrants a careful and specific empirical investigation. Our findings will not only help assess the costs of Brexit but will also help build preparedness for future shocks.

3. Brexit and services trade restrictions

The 2016 Brexit referendum created uncertainty for UK businesses, with the creative industries being no exception. Generally, the uncertainty lay in the expectation that future trade terms might deteriorate, likely inflating trade costs. The distinctive features of the creative goods and services sectors mean that they are sensitive to risks and uncertainty (Fazio, 2021). Specifically, the high uncertainty of demand for creative versus non-creative works leads to higher uncertainty and information asymmetries in its production and investment. Further, creative industry services are often delivered through project-based work that requires a variety of skills, with time being generally of the essence. Brexit exacerbated this already high uncertainty by adding another layer of unpredictability regarding the future conditions for the creative sectors' trading relationship with their closest and largest trade partner.

To understand how Brexit might affect trade in creative services, it is helpful to think about how the services are supplied. Trade in creative services mostly takes place via one of the four forms of supply as defined by the General Agreement on Trade in Services (GATS). The first form is the cross-border supply of services (GATS mode 1) whereby services are electronically supplied from one country to another, as is the case with the broadcasting services. The second is delivery through a commercial presence in other countries, where a foreign affiliate or subsidiary sells services to the host country (GATS mode 3). For instance, the services that a UK multinational sells to the EU via its EU subsidiary are deemed exports of the UK company. Likewise, foreign direct investment into the UK's creative sectors often focuses not only on the UK market but also targets a wider range.[2] The third is where trade in creative services occurs through consumption abroad (GATS mode 2), whereby consumers travel to the location where the service is provided. Finally, a national of one Member country can provide services in the territory of another. This mode includes service suppliers who are

[2] This is according to the oral evidence submitted to Select Committee on the European Union Internal Market Sub-Committee, on Brexit: Future Trade between the UK and the EU, on 3 Nov 2016, at http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/eu-internal-market-subcommittee/brexit-future-trade-between-the-uk-and-the-eu-in-services/oral/43076.html.

independent and those who are employed by another's Member's service supplier. Examples are an UK musician performing in France, or a German IT consultant being hired to fix equipment belonging to a UK firm.

The supply of creative services can be restricted when the trade relationship between partners change. In the case of Brexit, exiting from the EU would certainly imply new trade barriers being erected between the UK and the EU. The areas of restrictions could emerge from regulation and market access, mobility of people, mutual recognition of professional qualifications, information flow, and intellectual property protection. Below, we review three main areas of uncertainty that the Brexit referendum might have created for the creative sectors: potential restrictions on the mobility of creative sector professionals and the mutual recognition of professional qualifications, the likely withdrawal of EU funding, and the possible divergence of UK and EU provisions on intellectual property.

3.1 Mobility of creative professionals and mutual recognition of professional qualifications

Creative production often requires the contribution of different inputs and skills, and thus relies strongly upon human capital, connections between people, and global collaboration. Therefore, the competitiveness of the creative industries depends on their access to global skills and talents, and sustained cooperation efforts (Fazio, 2021). Losing access because of potential restrictions on the movement of people was a deep concern for many creative sectors. For example, the mobility of creative professionals such as musicians and performers is key to their creative production. Concerns about restrictions on freedom of movement were frequently expressed by the performing sectors' representatives during the Brexit transition period. The likelihood of mobility restriction could significantly reduce and even decimate business opportunities in what is, for many UK performing sectors, their largest market.

A distinct feature of the creative sectors' workforce is the degree to which workers are self-employed or freelance. Few sectors rely as much on flexibility in working hours and movement as the creative industries, where the share of self-employed in the sector's workforce reaches 29% (DCMS, 2021) and almost half of creative employment is closely associated with freelancing (Easton and Cauldwell-French, 2017). For most creative workers, freelancing is not so much a choice as the only way of doing the work. Creative businesses rely on freelancers to access much needed specialist skills and a niche workforce. It is crucial for businesses to find the best and most appropriate talent, and being able draw on an international network of freelancers and short-term contractors allows firms to quickly and easily overcome skill shortages in their own creative workforce. Given that non-British freelancers are widely employed by the creative sectors (Easton and Cauldwell-French, 2017), it is understandable that post-Brexit restrictions on

freedom of movement is a major concern for the creative sectors, especially given the lack of a specific visa route (something that has been noted by sector correspondents) (Easton and Cauldwell-French, 2017).

Moreover, any potential mobility restrictions would affect small and medium firms disproportionally more (Deardorff and Stern, 2005; Portes and Forte, 2017). New rules regarding visas and work permits will raise the costs of recruitment and/or relocation, and therefore reduce the UK's attractiveness to talent. For example, once a visa or work permit becomes a requirement, each European member state has different work rules and visa regimes. These complicated and fragmented regulations raise concerns over increased bureaucracy for creative businesses seeking to tour and work in the EU.[3] Again, these challenges are particularly burdensome on SMEs that already struggle to meet hiring costs, and which may not have the necessary cashflow for visa application procedures. Small firms in creative industries cite such Brexit-related uncertainties with dismay (Patha et al., 2019).

Further, the potential loss of freedom of movement has serious implications for business travel, particularly for foreign multinationals who need to move staff around their offices in different countries; these firms export a lion's share of the UK's services (Lowe, 2021). More generally, eroded household spending and the pessimistic view about the UK's economic outlook affect not only exporting firms but also firms that do not rely on sales to the EU (Bank of England, 2019). Hence, firms might be motivated to move their businesses, in whole or part, away from the UK, which would result in reduced services exports.

In addition to the freedom of movement, the freedom to provide cross-border services for regulated professionals is crucial for the creative sectors. Enabling professionals to practise across Europe is essential; the lack of recognition of professional qualifications would incapacitate creative services to trade. The UK, as a Member state, was party to the general system of mutual recognition of professions as defined by the EU General Qualifications Directive (Directive 2005/36/EC). In the post-Referendum era, the uncertainty about the recognition of professional qualifications by the EU countries has increased concerns that the recognition process will become more costly in terms of paperwork, time, and capital. This will create challenges in domestic procurement for both firms and the creative workers themselves (Fazio, 2021). Further, there are worries about losing the standardization of the training programs and having to deal with new regulations. Finally, for regulated professions, the national reciprocity of professional recognitions can pose issues for UK professionals if there is no single corresponding profession in the relevant trading country.

[3] There is a large amount of evidence provided by creative sector companies.

3.2 Intellectual property and copyrights protection

Creativity requires a high standard of intellectual property protection. It is crucial to the success of the creative industries that intellectual property and copyright protection balances the rights of creators, producers, distributors, and platforms, and that these protections are subject to strong, clear, and efficient enforcement. According to the ONS definition, the UK services trade of intellectual property (IP) refers to payments received for the use of trademarks, design rights, and copyrighted works, including music recordings, films, and television programmes. More than one-third of UK IP services exports are to the EU and it is a sector that creates a trade surplus.[4]

Technological advances and digitalisation mean that the creative industries are more open to the international markets, where constant evolutions in national and international intellectual property legislation create both challenges and opportunities. The UK has historically maintained high standards in the protection of IP rights, and transposing the EU's IP law into UK legislation did not water down these standards. However, whether that might change after the Brexit referendum has been one of the major worries for creative industry professionals. The main concern surrounds whether the UK will be able or willing to avoid the parallel imports and grey markets that present significant threats to copyright owners such as publishers, recorders, and designers. In the longer term and as new technologies emerge, there might be regulatory divergence over copyright and intellectual property rights.

3.3 Market access

Market access to single market is considered vital for sectors like Audio-visual media.[5] The UK Audio-visual sectors have been hugely successful as a "preeminent hub for international broadcasting in the EU",[6] forming a strong cluster that attracts investment.[7] That success has been partially due to

[4] This is according to the ONS' written evidence (TAS0064) submitted to House of Lords European Union Committee, 2017, as in HL Paper 135.

[5] See House of Lords European Union Committee 18th Report of Session 2016-2017, point 174 on page 55.

[6] This is according to the written evidence submitted to House of Lords European Union Committee by Enders Analysis, a leading market research firm on the media, entertainment, mobile and fixed telecommunications industries in Europe, with a special focus on new technologies and media. See http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/eu-internal-market-subcommittee/brexit-future-trade-between-the-uk-and-the-eu-in-services/written/42176.html.

[7] This is drawn from the Association for Commercial Broadcasters and On-demand Services (COBA)'s evidence provided to House of Lords Select Committee on European Union, at http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/eu-internal-market-subcommittee/brexit-future-trade-between-the-uk-and-the-eu-in-services/written/41500.html.

membership benefits achieved through the Audio-visual Media Services Directive (Directive, 2010/13/EU), which defined production and access to "European works" for both linear and on-demand services.

Clearly, losing that market access was a significant concern for the audio-visual sector, which expressed the need for bilateral efforts to ensure that the UK's content continued to count as European works. As UK broadcasters exit the jurisdiction of the EU's Audio-Visual Media Services Directive, they will require a licence to be issued by each EU member state to provide services. Another impact of the new broadcasting and audio-visual services restrictions on the creative industry may be seen in the UK's advertising sector.[8]

3.4 Creative Europe funding

One of the uncertainties related to Brexit's impact on the creative industries concerns its future funding.[9] EU funding makes up the capital investment for many firms, especially the small ones. The inability to run businesses reduces ability to trade. The UK has greatly benefited from the Creative Europe funding programme. The UK received more than £100 million in the CULTURE sub-program that supports cross-country collaborative cultural projects. Similarly, the MEDIA sub-program had a significant role in the development of the UK's film industry (HC1141, 2018). As the UK no longer has access to these funds, ensuring funding alternatives and replacing the EU's structural funding with UK funds so that the sector's projects and international collaboration may be supported is key to its future, particularly for the smaller firms in the industry.

It is clear that the uncertainty during the Brexit transition period was not concerned only with the UK's future trade policy. It was a mixture of political, economic, and social uncertainty. The various sources of uncertainty at play mean that it is tricky to disentangle the channels through which uncertainty might have affected the creative industries' production and services, and their international trade. Hence, in the sections that follow, we use a reduced form estimation to assess the potential impact.

[8] See evidence #334 provided to House of Lords Select Committee on European Union at https://publications.parliament.uk/pa/ld5801/ldselect/ldeucom/248/24808.htm#footnote-070, where the audio-visual sector representative, Harriet Finney, Director of External Affairs at the British Film Institute, said: "For both UK and European producers, it is incredibly important to make sure that we continue to have very robust protection for copyrighted TV and film works, for both sides of the equation". She added: "The issue of copyright theft continues to be a major challenge, even within the European market."

[9] Concerns about the future of the funding programmes were raised in the House of Commons, Fourth Special Report (HC1141, 2018)

4. Data

In this study, we draw on the WTO Balanced International Trade in Services Database (WTO, 2022) in which the sub-sectors of services are defined according to the EBOPS 2010 classification. It covers the main countries (including Canada, UK, USA, and EU countries) that export services to 59 EU and non-EU destinations (including Brazil, China, India, US, and non-EU countries in Europe). In the database, the annual values of commercial services exports, in million US dollars, are provided by sector and partner. Services trade data is not easily available in the conventionally classified format due to the nature of the trade. In addition, data for the creative service sectors' trade is relatively new and there is no globally comparable basis for sub-sector definitions. Any standardised measurements of the creative industries and definitions provided by the international organizations are complex and changeable (Maioli et al., 2021). Further, there are significant gaps in the data due to the difficulties of matching the required level of creative services category aggregation against the EBOPS 2010 classification.

As a result, the availability of the data provided is limited, which restricts the choice and quality of the econometric analysis. For the purpose of the analysis, we first collect the creative industry sub-sector data available for each country's total trade flow during 2005-2019. Bilateral trade data for the creative industries is available after 2015 for most countries; however for the UK, it is available only after 2016. This means that we could not carry out an effective assessment of the Brexit effect. To mitigate this problem, we rely on mirror data, which is the data reported by the UK's trading partners. For example, German imports from the UK are considered to be UK exports to Germany. Although theoretically the two mirroring statistics should be the same, in practice they are usually not. This generates the caveat that using mirror data may create a large measurement error and may lead to a higher measurement error in the estimated coefficients.
There is no one-to-one match for the DCMS definitions of creative industry categories and the conventional global bilateral trade classifications.

Furthermore, it is risky to use the upper-level classifications of services because these can incorporate unrelated sub-sectors. For example, the upper-level classification of architectural services (SJ31) includes engineering and technical services as well as architectural services (SJ311). Hence, we use the sub-sector services classifications of the EBOPS 2010 that best match the creative industries as defined by DCMS (2020)[10]. Unfortunately, not all the trade in the creative

[10]According to DCMS classification (DCMS, 2020), there are nine sub-sectors of the creative industry: Advertising and marketing; Architecture; Crafts; Design and designer fashion; Film, TV and video, radio and photography; IT, Software and Computer services; Museums, Galleries and Libraries; Music, Performing and Visual Arts; Publishing. In our analysis, based on data descriptions, audio-visual licences and distribution, and audio-visual services such as music and performing arts are defined as two categories of Creative Industries. For a detailed

services industries is captured by the available official global statistics. Therefore, our analysis focuses on the five creative industry sectors that have available data and good coverage of the exports of the sector. Table 1 provides the list of creative industry sectors available to this study, and the linking classification names, definitions, and data availability within the Balanced International Trade Services EBOPS 2010 database.

Table 1: Creative Industry Categories

Creative Industry	**Description**	**EBOPS 2010**	**Data Availability**
Licences & Distribution of Audio-Visual Products	Licences to reproduce and/or distribute audio-visual and related products	SH4	To world, for 16 years. No bilateral data.
Computer services	Computer services	SI2	Bilateral data (59 partner countries, 2015-2019), to world for 16 years
Advertising and marketing	Advertising, market research, and public opinion polling services	SJ22	Bilateral data (59 partner countries 2015-2019), to world for 16 years
Architecture	Architectural services	SJ311	To world for 15 years. No bilateral data.
Audio-Visual Services	Audio-visual and related services (Music, performing and visual arts; Film, TV, video)	SK1	Bilateral data (59 partner countries, 2015-2019) to world for 16 years

Despite these various challenges, we have constructed a set of the most comprehensive data available for the world's creative industries' trade in services. This can be further built upon when more data becomes available.

5. UK Creative Industries Services Trade: A Global Perspective

To set the scene for the empirical analysis, we first describe the trends in the services trade for the sectors of interest. Globally, international trade in creative industry services has been growing at an impressive pace. From 2011 to 2015, the

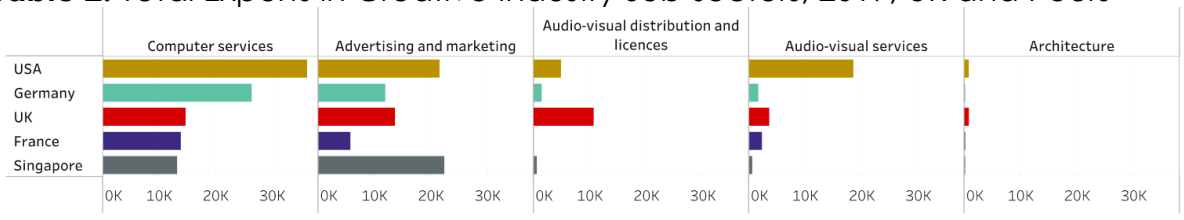
understanding of each category, please see the EBOPS 2010 data definitions for each sub-sector in the Appendix 1.

average growth of trade in the creative services was 4.3%, which is more than double that of the trade in all services (UNCTAD, 2018).

As the second largest services trader in the world, the UK has a strong competitive position in the world economy. Di Novo, Fazio, and Vermeulen (2020) document stylised facts describing the trends of international trade in the UK's creative industries. Exporting £38bn worth of services in 2019, the UK creative sectors account for nearly 12% of all the UK exported services (Di Novo et al., 2020). The contribution of the UK creative industry services trade has, despite the Covid pandemic, further increased in 2020 to be worth £41.4 billion in exports, corresponding to 14.2% of the UK's service exports (DCMS, 2022). As well as having a high value of total exports, the UK's creative industries grew nearly two times faster than the rest of the UK's economy prior to the Brexit referendum in 2011-2016, and the international trade in creative goods and services experienced an unprecedented average annual growth rate (BEIS, 2018). International trade is important for the UK's creative industries not only because of the value of exports that the sectors create, but also the potential jobs that might be provided through the expansion of trade.

We delve deeper into five creative sub-sectors to study their trade in services in a global context.[11] These are Audio-visual distribution and licences, Computer services, Advertising and market research services, Architecture services, and Audio-visual related services. Table 2 provides a general picture of the major economies and the total global exports in 2019 in these creative industry (CI) sub-sectors.

Table 2: Total Exports in Creative Industry Sub-sectors, 2019, UK and Peers



	Computer services	Audio-visual services	Audio-visual distribution and licences	Architecture	Advertising and marketing
USA	36,312	18,531	4,896	942	21,425
Germany	26,347	1,661	1,472	176	11,822
UK	14,774	3,727	10,571	813	13,596
France	13,864	2,388		148	5,742
Singapore	13,247	656	639	239	22,310

Source: WTO. Values are in million USD. Global total is the sum of all available countries in the database with reported export values in 2019.

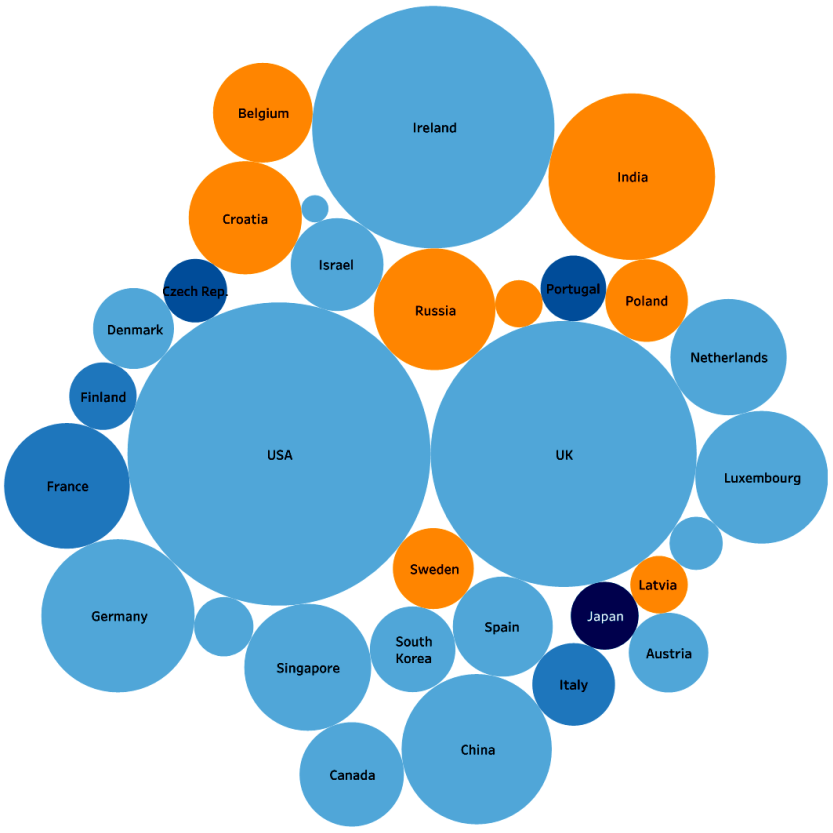
According to the trade volume in 2019, the computer services sector accounts for the lion's share of the world's trade in creative services, followed by

[11] This analysis focuses on five CI sectors that trade in services and for which the data are available and consistent.

advertising and marketing. We can see that compared with the other major economies, the UK has the biggest share in the distribution and licensing of audio-visual products and it comes second to the USA in all other categories save for computer services. For computer services, Germany appears to be a strong contender, coming just after the USA. The architectural services sector has the smallest share of exports among these CI sectors because it is a sector in which the USA dominates international trade.

To identify visible differences between the two periods of interest – before and after 2016 – we graph the size of exports in services by country, and the speed of growth in these markets in each period in Figure 1 and 2.

Figure 1: Total Services Exports in Creative Industries by country: 2014-2016



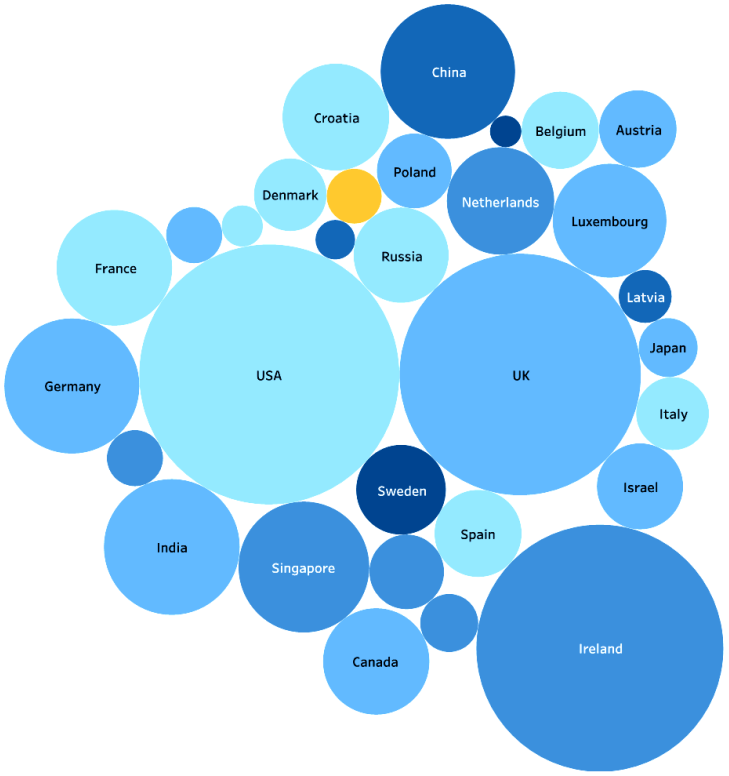
Note: Country. Colour shows average of Export growth. Size shows average of Global market Share. The marks are labelled by Country.The data is filtered on Year, which ranges from 2014 to 2016.

Year
2014 to 2016

Avg. Export growth
-23.3% 116.4%

Country	Avg. Global market Share	Avg. Export growth
USA	26.7%	7.8%
UK	20.6%	2.8%
Ireland	17.1%	10.9%
India	8.1%	-2.5%
Germany	6.8%	5.7%
China	6.6%	17.7%
Luxembourg	5.1%	17.3%
Singapore	4.7%	9.7%
France	4.6%	25.0%
Russia	4.3%	-14.7%
Netherlands	3.9%	6.2%
Croatia	3.7%	-8.8%
Canada	3.2%	8.8%
Spain	2.9%	0.8%
Belgium	2.9%	-3.0%
Israel	2.5%	13.3%
South Korea	2.1%	5.1%
Italy	2.0%	42.4%
Poland	2.0%	-3.1%
Sweden	1.9%	-5.9%
Denmark	1.9%	2.4%
Austria	1.8%	0.4%
Japan	1.3%	116.4%
Finland	1.3%	36.3%
Portugal	1.3%	57.7%
Czech Rep.	1.2%	49.3%
Hungary	1.0%	14.9%
Latvia	1.0%	-15.5%
Romania	0.7%	-11.2%
Bulgaria	0.2%	14.9%

Figure 2: Total Services Exports in Creative Industries by country: 2017-2019



Year
2017 to 2019

Avg. Export growth
-0.1012 0.5062

Country	Avg. Global market Share	Avg. Export growth
USA	24.5%	8.6%
Ireland	22.1%	26.7%
UK	21.1%	10.7%
India	6.7%	15.2%
Germany	6.6%	14.5%
China	6.6%	30.7%
Singapore	6.2%	24.3%
France	4.9%	6.2%
Luxembourg	4.7%	12.7%
Netherlands	4.2%	24.9%
Croatia	4.2%	7.7%
Canada	4.1%	10.4%
Russia	3.3%	8.2%
Sweden	2.9%	50.6%
Spain	2.8%	9.8%
Israel	2.7%	13.2%
Austria	2.2%	11.5%
Belgium	2.2%	5.9%
Poland	2.0%	16.1%
South Korea	2.0%	21.2%
Italy	1.9%	9.5%
Denmark	1.9%	9.2%
Japan	1.3%	10.5%
Czech Rep.	1.2%	21.8%
Finland	1.2%	11.8%
Hungary	1.1%	29.6%
Portugal	1.1%	-2.2%
Latvia	1.0%	33.7%
Romania	0.6%	36.6%
Bulgaria	0.4%	48.7%

Note: Country. Colour shows average of Export growth. Size shows average of Global market Share. The marks are labelled by Country.The data is filtered on Year, which ranges from 2017 to 2019.

A few observations may be drawn from the global landscape of the key creative sectors. First, the UK is clearly a major player, claiming one-fifth of market share globally. This puts it closely behind the USA, which exports around one-quarter of all global services. Together, the USA and the UK provide nearly half of the creative services demanded by the world. This has been maintained over time and, in this sense, there has been no dramatic shift in the world order for the creative sectors over recent years.

Having said that, during 2014-2016, Ireland was the third largest exporter and its trade has grown at 11% annually. This is significantly faster than the UK's 2.8% average growth, catapulting Ireland into replacing the UK as the second largest exporter of creative sector services in the second period after the Brexit Referendum. However, the Ireland factor does not alone account for the lost market for the UK's trade in services. We will carry out a causal analysis of this in a later section of this report.

What is striking from both periods is the fast growth of services exports for the world as a whole and in most countries. In the period of investigation from 2014

to 2019, the total values of world exports for the five sectors expanded by 11.6%, with computer services and advertising and marketing services showing the highest growth. During 2014-2016, world exports of computer services grew at an average of 10% annually, and the speed of growth increased to 15% in the period 2017-2019. Advertising services grew an average of 11% annually in the first period of analysis, and 12% in subsequent years. Similarly, both audio-visual services and their distribution and licences experienced fast growth. The annual average growth rate of the audio-visual services almost doubled from the first period's 5% to nearly 9% in the second period. The exports of audio-visual distribution and licences and services continued to expand 8% annually in both periods. Even architecture services grew at an average annual rate of 6% from 2017 to 2019, recovering from its low performance in the previous period.

A comparison of these two periods reveals a slow diversification of market shares towards relatively new competitors such as India, Singapore, the Netherlands, and Sweden. For example, South Korea and Singapore perform well in audio-visual licences and distribution. China, Israel, and Finland are high performers in computer services, while Singapore and Netherland do well in advertising and marketing. For audio-visual services, Sweden, Germany, and Netherland are the stand-out new competitors due to their significantly above average growth rates during 2017-2019.

A key characteristic of the creative industry sectors is their substantial heterogeneity. Different sub-sectors have their own features in terms of trading values and partners, and they experienced a variety of challenges and opportunities during the Brexit period. These differences are reflected in the different trends and growth trajectories, which we discuss in more detail in Appendix 2.

6. How did the Brexit Referendum impact on UK creative services trade?

To estimate the causal impact of Brexit on the UK's exports of CI services, we need to compare the actual performance of the UK creative sector with the counterfactual performance which would have been observed if the UK had not exited the EU. There are several methodologies that are available to construct the counterfactual, including difference-in-difference (DID), synthetic control (SC), and synthetic difference-in-difference (SDID). In what follows, we touch on these different estimation methodologies, providing a more detailed discussion of them in Appendix 3.

The DID method (Card and Krueger 1994; Abadie 2005) is based on the parallel trend assumption. The SC method (Abadie and Gardeazabal, 2003) constructs

the counterfactual based not on all available data, but only on a few comparison units selected from the control group. The major drawback of SC is that it is unable to draw statistical inferences. A more recent method combines the strengths of both DID and SC. This is the synthetic difference-in-difference approach (SDID) of Arkhangelsky et al. (2021). SDID estimators are consistent and more efficient than both the SC and DID methods. In particular, the parallel trend assumption is likely to hold for SDID even if it is violated for the standard DID. It may also improve the precision of the estimation because it applies not only the unit weights but also time weights, weighting more heavily the periods that are more similar to the post-intervention periods. Unfortunately, it is also prone to poor performance when the quality of data is not very good. This is clearly an issue when working with CI trade flows where high monthly volatility and high level of transitory shocks relative to the steady, long-term component combine with poor measurement to increase the noise to signal ratio, reducing the efficiency of the estimator.

Some additional data issues also have an impact on the methodologies we can adopt. The UK does not have bilateral export data on the creative sectors at a level sufficient for causal inference prior to 2016. Thus, to construct bilateral data on the UK exports, we rely on the so-called bilateral mirror trade reported by the UK's trading partners. For instance, the US reports bilateral imports from the UK for the whole period of the analysis. From the UK standpoint, these are UK exports to the US. In theory, the direct measure of export and its mirror measure should be the same, but in practice there can be significant discrepancies between the two, which introduces an additional measurement error.

Given the difficulties inherent in the task, we adopt a combined approach for investigating trade in the CI sub-sectors. We report both the synthetic difference-in-difference and the difference-in-difference methods to make the desired inferences on the effects of Brexit on UK creative services trade, as presented in the next section.

6.1 Findings

This section reports the results of the analysis of the causal impact of the Brexit referendum on the UK trade in creative industries. We use two approaches. First, the difference-in-difference (DID) method using aggregate exports and imports (see Table 3), and then the synthetic difference-in-difference (SDID) method using bilateral imports with the EU and non-EU countries to test any Brexit effect on EU trade versus non-EU trade (see Table 4).[12] Both approaches obtain the average treatment effect on treated (ATET); that is, the effect of the Brexit Referendum on UK trade.

[12] The UK did not report bilateral trade in creative sectors at the required level of detail prior to 2016, which precludes use of the UK bilateral export data to each trade partner.

According to panels A and B in Table 3, both the imports and exports of the overall UK creative services experienced a decline relative to other countries post-2016. Specifically, UK exports declined by 12%, which is also statistically significant. UK imports declined by 6% but the effect is not statistically significant. However, as we have already explained, the limited data and the mirroring approach may lead to imprecision in the estimation, which prevents statistical significance being obtained.

The analysis of the creative service sub-sectors shows substantial heterogeneity in the experience of the different sectors. Our results suggest that exports of Audio-visual licenses and distribution, Computer services, and Audio-visual services have declined significantly since the Brexit Referendum, whereas exports of Advertising and marketing, and Architecture have been growing faster post-2016 than during the previous period.

Turning to the estimation based on bilateral trade flows in panel C, we examine if the UK exports to EU countries have been affected more strongly than the UK exports to the rest of the world. Our results do not show strong support for this hypothesis. There are negative estimates on Computer services and Audi-visual distribution and services, but they are not statistically significant. Interestingly, we find that the growth of exports in Advertising and marketing services has come from the EU markets, in that the UK significantly increased its exports to EU countries relative to the rest of the world.

Table 3: Difference-in-difference: using aggregate exports and imports

	All	**Audio-Visual Licenses and Distribution**	**Computer services**	**Advertising and marketing**	**Architecture**	**Audio-Visual Services**

ATET	A. Aggregate import. Dependent variable log of import					
Brexit on UK import to all countries	-0.0559	0.428	0.0748	-0.116	-0.0934	-0.368
	(0.115)	(0.278)	(0.180)	(0.116)	(0.219)	(0.308)
N	5728	698	1497	1566	622	1345
	B. Aggregate export. Dependent variable log of export					
Brexit on UK exports to all countries	-0.121**	-0.289**	-0.482***	0.282***	0.454***	-0.377***
	(0.0534)	(0.142)	(0.118)	(0.104)	(0.154)	(0.0862)
N	1056	93	276	238	172	277
	C. Aggregate export EU vs non-EU countries. Dependent variable log of export[13]					
Brexit on UK exports to EU countries	0.120	0.683	-0.0532	0.213**	0.0354	-0.0949
	(0.152)	(0.458)	(0.290)	(0.0890)	(0.267)	(0.159)
N	5728	698	1497	1566	622	1345

Note: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4 presents the results of the synthetic difference-in-difference estimation, which also reports the ATET coefficient as the indicator of the post-Brexit referendum effect. We find that on average, the bilateral exports of the UK with other countries have declined by 15% relative to the case where the referendum did not happen. However, the estimates are not estimated precisely, resulting in large standard errors of the estimated coefficients. It is well known that the synthetic control and related methods are sensitive to poor measurement and large transitory shocks, which can occur trade between countries is subject to large fluctuations from one year to another. Both high measurement errors and large transitory fluctuations are present in the creative industry trade data. Different countries produce different data qualities, and highly disaggregated trade creates lumpiness, where a single large transaction may dominate one year of data.

Comparing exports to the EU and non-EU countries does not allow us to say that the UK exports to EU have declined significantly when compared to UK exports to the rest of the world. The results for the overall trade by sub-sectors show a negative and economically large impact in all sub-sectors except for Audio-visual licenses distribution. However, the coefficients are not statistically significant due to the high standard errors of the estimated coefficients and the quality of the services trade data at the highly disaggregated level.

Table 4 Synthetic difference-in-difference: using bilateral trade data

[13] The so-called mirror data were used for this analysis, where the UK export to country i is measured by the country i import from the UK.

	All	Audio-visual licences and distribution	Computer services	Advertising and marketing	Architecture	Audio-visual Services
Brexit, UK exports to all countries[14]	-0.15	0.06	-0.02	-0.1	-0.08	-0.03
	(0.16)	(0.12)	(0.15)	(0.15)	(0.05)	(0.27)
Brexit, UK exports to EU vs non-EU	0.01	0.08	0.13	0.09	-0.09	0.27
	(0.09)	(0.13)	(0.08)	(0.17)	(0.06)	(0.30)

7. Services trade restrictiveness and the future of EU-UK trade in creative sectors

7.1 Services restrictiveness: literature and statistics

The uncertainty on trade policy over the Brexit period has been shown to be harmful to the trade in services by the UK's creative sectors. However, the essence of Brexit uncertainty was around the changes in the trade terms between the UK and the EU, which would not materialise until 2021. We cast some light on how the new trade arrangement might affect the UK's trade in services in the future by analysing the relationship between service trade restrictiveness and exports flow in the recent past. The premise here is that the UK would be expected to face more restriction of trading services outside the EU post-Brexit, which was by far the most integrated trade block in the world (Borchert and Morita-Jaeger, 2021; Hall and Heneghan, 2021).

Although the analysis of barriers to service trade has much in common with the analysis of the goods trade, trade policy is much more complex for the services sectors because of the scope and types of government relations that inhibit trade in services.[15] Compared to typical tariffs and quotas, services trade barriers are less transparent, more complex in their implementation, and harder to measure. Restrictiveness in service trade can take the form of delays at the border, quantitative restrictions on foreign products, government purchasing policies that give preference to local suppliers, use of subsidies, and quality and certification requirements that favour local suppliers (Copeland and Mattoo, 2008). Furthermore, the difficulty of negotiating trade liberalisation for services (because the trade distorting effect of many policies are heavily intertwined with other government policy objectives) means that a highly liberalised block

[14] We use the so-called mirror data for this analysis. See footnote 12.

[15] A non-tariff barrier for services trade could be any government policy that has the effect of favouring local producers over foreign producers, or which restricts or raises the cost of access to domestic markets by foreigners (Copeland and Mattoo, 2008).

of trade in services is very rare. The degree of service trade liberalisation achieved by the EU has been unprecedented and unique.

We analyse services trade restrictiveness as a tool to examine how different types of restrictions impact on trade in services. We use the Service Trade Restrictive Index (STRI) from the OECD database to measure the service sector trade barriers. This database provides service sector trade barriers for 48 countries, both OECD and non-OECD, and data is available for the period 2014 to 2019.[16] Specifically, the STRI database provides information on regulations affecting services trade at the country-sector level, covering aspects such as the importer and exporter restrictive index, restrictions on foreign entry and movement of people, barriers to competition, regulatory transparency, and other discriminatory measures. The data covers 19 major service sectors.[17] We match these sectors to the Extended Balance of Payments Services Classification (EBOPS) and then match them to the creative sub-sectors described above.

The STRIs range from 0 to 1, with 0 representing no trade restrictions and 1 representing a trade-prohibitive level of restrictions. The overall index, which varies over countries and time, is the sum of five categories of trade restrictions, detailed below as defined in Geloso Grosso et al. (2015). Each index is created by scoring and weighting the various policy measures and regulations being analysed for each sector, country, and year. Separate indices were also measured for within the EU common market, representing the barriers to services trade for the EU country members. OECD defines 5 components of services trade restrictiveness:[18]

- ***Restrictions on foreign entry*** include information on foreign equity limitations, requirements that the management or board of directors must be nationals or residents, foreign investment screening, restrictions on cross-border mergers and acquisitions, capital controls, and a number of sector-specific measures.
- ***Restrictions on movement of people*** include information on quotas, labour market tests, and restrictions on the duration of stay for foreign natural persons providing services as intra-corporate transferees, contractual services suppliers, or independent service suppliers. These categories are covered by the GATS and the commonality that the natural persons do not seek employment in the host country. This policy area also contains

[16] We combine the multilateral STRI indices and the intra-EEA indices in one integral measure. If both countries are EEA members, then EEA one is used, while if both or even one of the trading pairs is not the member of EEA, we use the multilateral indicies.
[17] The sectors are Computer and related services, construction, architecture and engineering services, telecommunication services, distribution services, audio-visual services, financial services, transport and courier services, and logistics services.
[18] https://qdd.oecd.org/subject.aspx?Subject=STRI

information on recognition of foreign qualifications in regulated professions.

- ***Other discriminatory measures*** include discrimination against foreign services suppliers, e.g., as far as taxes, subsidies and access to public procurement are concerned; and instances where national standards differ from international standards where relevant.
- ***Barriers to competition*** include information on anti-trust policy, government ownership, and the extent to which government-owned enterprises enjoy privileges and are exempted from competition laws and regulations. Sector-specific pro-competitive regulation in network industries also falls under this category.
- ***Regulatory transparency*** includes information on consultations and publications prior to the enactment of laws and regulations. It also records information on administrative procedures related to establishing a company or obtaining a license or a visa.

Table 5 reports the STRI summary statistics for the creative services sub-sectors for EU versus non-EU countries. The overall services trade restrictiveness in the creative industry sub-sectors ranges between 0.24-0.27 outside the EU, and between 0.04-0.19 within the EU. At mean, the EU STRI is around 47% of the non-EU level, suggesting that the creative sectors enjoy much more frictionless trade when they are located within the EU single market.

Among all sub-sectors captured in the data, the largest difference between the level of trade restriction in the EU and non-EU markets are in the Audio-visual distribution and licences sector, with EU trade on average experiencing less than one-fifth of the trade friction of non-EU trade. The next largest differences are in the Architecture and Computer services sectors, where EU trade experiences one-quarter of the trade frictions of non-EU trade. Therefore, it is reasonable to expect that being part of the EU single market makes a large difference in the ability to trade services with the EU for Audio-visual distribution and licences, Architecture, and Computer services sectors. By contrast, the differences are least in the Advertising and marketing and Audio-visual services sectors services trade, where the reported STRI level outside the EU is three-quarters that of within it. This implies that for these two sectors, the UK's departure from the EU common market may not create as significantly many barriers as it has for the other three sectors' trade with the EU.

Looking closely at the five components of STRI, we observe that the highest restrictions imposed on the creative sectors that are outside the EU compared to those within it are the restrictions on foreign entry. This is more than twice as impactful as the second highest restrictions, which are related to the movement of people. These are the areas where tightened trade restrictions are imposed on countries outside the single market, i.e., they embody the advantages of EU membership. Therefore, they are most likely to manifest when the UK's EU exit

has not been substituted with trade and investment arrangements. They also do not apply equally to all sectors. For example, the restriction on foreign entry presents barriers that are far less significant to Advertising and marketing and Audio-visual services than they are to Audio-visual distribution and licences, or Computer services. Movement of people is a major barrier mainly for Audio-visual distribution and licences, Architecture, and Computer services.

Moreover, some trade barriers are even higher within the EU than they are for non-EU countries. The most prominent areas are barriers to competition in all sectors, and regulatory transparency barriers in some sectors, such as Advertising and marketing, and Audio-visual services. This indicates that the EU has developed regulations on competition that are relevant to the member countries but are not applicable to third countries. In some instances, the EU laws require more regulatory transparency between the member countries than between a member country and a third country.

Table 5 Services trade restrictiveness for creative services: EU vs non-EU in 2014-2019

Region	Over all	Restrictions on foreign entry	Restrictions to movement of people	Other discriminatory measures	Barriers to competition	Regulatory transparency
Average across all sub-sectors						
Non-EU	0.253	0.107	0.083	0.034	0.011	0.024
EU	0.120	0.037	0.044	0.013	0.017	0.017
Eu vs non-EU	**47%**	**35%**	**53%**	**38%**	**155%**	**71%**
Non-EU	0.256	0.116	0.063	0.044	0.008	0.025
EU	0.044	0.009	0.007	0.006	0.016	0.006
Eu vs non-EU	**17%**	**8%**	**11%**	**14%**	**200%**	**24%**
SI2: Computer services						
Non-EU	0.236	0.093	0.079	0.031	0.009	0.025
EU	0.061	0.014	0.017	0.004	0.015	0.010
Eu vs non-EU	**26%**	**15%**	**22%**	**13%**	**167%**	**40%**
SJ22: Advertising and marketing						
Non-EU	0.257	0.123	0.072	0.036	0.014	0.025
EU	0.190	0.061	0.074	0.024	0.019	0.028
Eu vs non-EU	**74%**	**50%**	**103%**	**67%**	**136%**	**112%**
SJ311: Architecture						
Non-EU	0.265	0.084	0.125	0.024	0.009	0.022
EU	0.066	0.024	0.024	0.001	0.012	0.006
Eu vs non-EU	**25%**	**29%**	**19%**	**4%**	**133%**	**27%**
SK1: Audio-visual Services						
Non-EU	0.257	0.123	0.072	0.037	0.014	0.025
EU	0.190	0.061	0.074	0.024	0.019	0.028
Eu vs non-EU	**74%**	**50%**	**103%**	**65%**	**136%**	**112%**

7.2 Services restrictiveness: analysis and findings

Next, we analyse the impact of services restrictiveness on services exports in the creative sectors, by estimating the following regression model of export flow:

$$Exp_{ij,t}^{k} = exp\ exp\left(\gamma_1 STRI_{it}^{k} + \gamma_2 STRI_{jt}^{k} + D_k + D_i + D_j\right) + u_{ijt}^{k},$$

where *Exp* is exports, i is reporting country or exporter, j is partner country or importer, k is creative services sub-sector, and t is year. The model is estimated by the Poisson pseudo maximum likelihood method, which accounts for zero trade flows. The results are presented in two tables that report the coefficients

for STRI and their components. Robust standard errors are presented in parentheses. Table 6 reports all sub-sectors and Table 7 each sub-sector separately, and we explain them now in more detail.

Table 6 reports the average impact of all restrictions applied to all creative services. As expected, exporting countries export significantly less when facing more restrictions in the partner country, given that tighter restriction acts as a higher trade cost. Most types of service restrictions in the export destination country generally lead to reduced exports, but the magnitudes differ. Regulatory transparency is estimated to have the largest negative impact on the trade flow of creative services exports. This is consistent with previous findings on the large potential costs of regulations that restrict trade and investment in services (Nordås and Rouzet, 2017). What seems to matter more is the level of regulatory transparency in the importing country rather than that of the exporting country. This manifests itself in large, negative, and significant coefficients in the table, showing that trade-restrictive regulations are associated with raised costs for foreign suppliers for entering and serving the serving/host market. Higher restrictions on foreign entry in the export destination country also reduces exports significantly, and the pattern for other discriminatory measures is similar.

We also find a large negative effect of barriers to competition and other discriminatory measures from the exporting country on the export flow of services. This suggests that reduced competition in the domestic markets dampens exporting, while a higher competition level encourages exports. This is not surprising given that competitive markets force businesses to stay efficient and innovative, and such businesses are more likely to export. A discriminatory environment reduces exports of services, as do, though to a somewhat lesser degree, restrictions on foreign entry and movement of people (which have strong and significant negative effects). The evidence implies that an open, thriving, competitive, and non-discriminatory environment, where there is transparency in regulation, supports doing business and stimulates international trade.

Table 6: Services trade restrictiveness and exports of creative services: all sectors

	(1)	(2)	(3)	(4)	(5)	(6)
	Overall	**Restrictions on foreign entry**	**Restrictions to movement of people**	**Other discriminatory measures**	**Barriers to competition**	**Regulatory transparency**
Exporting country	-0.565	-2.226**	-9.392***	-31.79***	-43.31***	-3.180
	(0.621)	(1.059)	(1.455)	(2.602)	(8.708)	(3.529)
Importing country	-5.705***	-12.27***	-3.063**	-9.384***	-8.732*	-33.10***
	(0.627)	(1.175)	(1.281)	(2.288)	(5.494)	(4.032)
Number of observations	21680	21680	21680	21680	21680	21680
R squared	0.771	0.765	0.771	0.767	0.757	0.771

Note: Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The reporting county is the exporter country, while partner country is the importer country.

The sub-sectoral results presented in Table 7 show the strong negative effect of services trade restrictions in the Audio-Visual distribution and Licenses, Computer services, and Architecture services sectors. This is true in most cases for restrictions in both the exporting and receiving countries. The restrictions in the reporting country capture the impact of trade barriers on the productive capacity of the exporter, while restrictions in the partner country capture the costs of accessing a foreign market and delivering the product to foreign consumers. The effect is more pronounced for restrictions on foreign entry, restrictions to movement of people, and other discriminatory measures, while for some sub-sectors regulatory transparency is also very important.

Table 7: Services trade restrictiveness and exports of creative services: sub-sectors

	(1)	(2)	(3)	(4)	(5)	(6)

	Overall	Restrictions on foreign entry	Restrictions to movement of people	Other discriminatory measures	Barriers to competition	Regulatory transparency
SH4: Audio-Visual Licenses and Distribution (No. obs.=1406)						
Exporting country	-9.340***	-24.91***	-21.01***	-46.99***	-	-3.169
	(2.980)	(6.869)	(6.259)	(9.232)	-	(13.75)
Importing country	-5.609*	-20.70**	-13.88**	-44.94***	-181.5***	-70.51***
	(2.947)	(8.365)	(5.946)	(17.20)	(44.95)	(12.49)
R squared	0.826	0.821	0.823	0.822	0.804	0.827
SI2: Computer services (No. obs.= 5704)						
Exporting country	-6.920***	-15.16***	-10.97***	-43.91***	-	-22.64***
	(1.154)	(2.318)	(2.662)	(5.307)	-	(5.820)
Importing country	-3.875***	-22.81***	-8.967**	-11.33	-9.245	-47.47***
	(1.425)	(2.768)	(3.496)	(8.150)	(32.97)	(6.834)
R squared	0.855	0.854	0.849	0.835	0.816	0.854
SJ22: Advertising and marketing (No. obs.= 5233)						
Exporting country	6.666	6.813	7.079	7.670	280.0***	18.26*
	(5.749)	(8.865)	(6.434)	(15.18)	(55.82)	(9.430)
Importing country	-1.411	-10.12*	13.87**	-8.592	-72.22*	-11.61
	(3.373)	(5.261)	(5.422)	(8.357)	(44.92)	(9.602)
R squared	0.824	0.824	0.825	0.824	0.828	0.825
SJ311: Architecture (No. obs.= 3463)						
Exporting country	-3.533**	-19.17***	-2.988**	-40.61***	-	-65.44***
	(1.230)	(5.761)	(1.376)	(12.41)	-	(12.58)
Importing country	-10.46***	-18.70***	-16.97***	-44.76***	-10.25	-31.50**
	(2.709)	(5.832)	(4.917)	(10.64)	(27.68)	(15.41)
R squared	0.517	0.499	0.516	0.500	0.489	0.520
SK1: Audio-Visual Services (No. obs.= 4884)						
Exporting country	-8.007	-1.138	-2.118	68.74***	161.2	17.25*
	(7.742)	(9.640)	(9.963)	(20.85)	(193.3)	(10.61)
Importing country	10.66	27.16***	20.69***	30.48**	-20.98	17.13*
	(7.229)	(9.255)	(8.000)	(13.53)	(37.47)	(10.52)
R squared	0.803	0.803	0.804	0.803	0.803	0.803

Note: Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01. The reporting county is the exporter country, while partner country is the importer country.

8. Discussion

8.1 Brexit Referendum effect

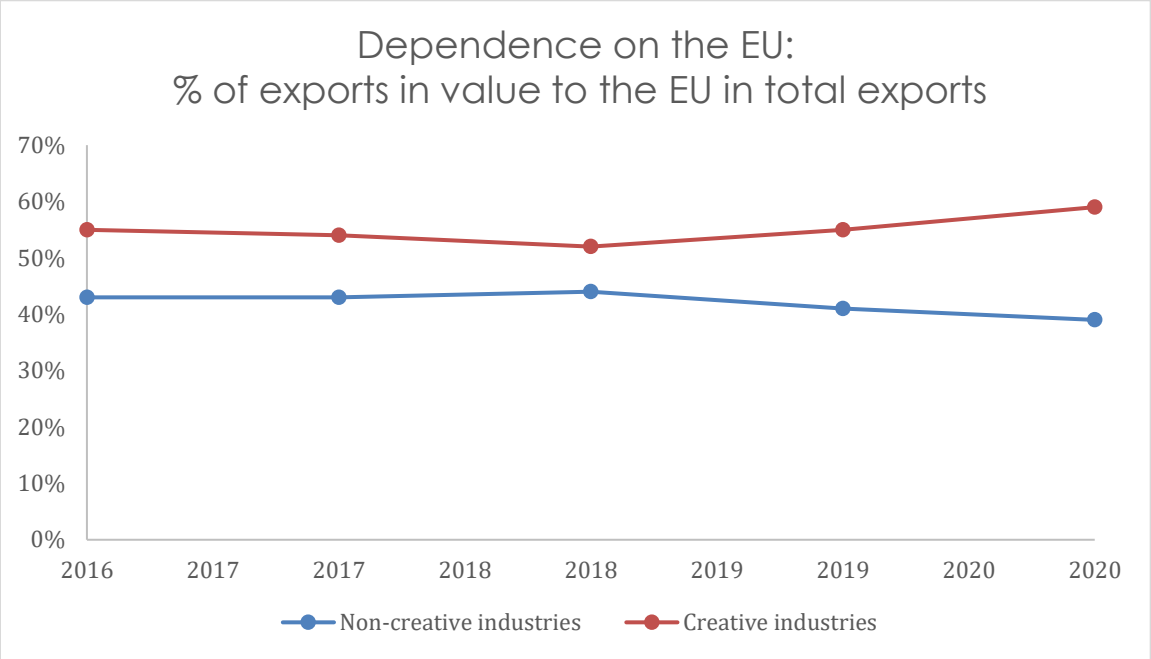
The existing evidence shows that even before Brexit actually took effect in January 2021, the UK's trade in services had been negatively impacted as a result of the uncertainty created by the UK's vote to leave the European Union (Douch and Edwards, 2021; Du and Shepotylo, 2021). Uncertainty about the future UK-EU trading relationship limited the future growth potential of businesses, and one of the ways in which this was manifested was through a reduction in international trade. In this study, we test if this is the case for one of the UK's fastest growing and most actively exporting sectors: the creative services sector.

Our empirical analysis offers some support for this hypothesis. Based on the results of our difference-in-differences analysis, we find that the UK's overall creative services exports to other countries have declined by 15% relative to the scenario in which the referendum did not take place. However, the evidence is not as strong as that found for the economy as a whole, and nor is it as strong as the evidence found for other services-exporting sectors, such as the Transport, Travel, Insurance, and Telecoms sectors (Du and Shepotylo, 2021).

There could be several reasons why the creative sectors have not been affected as seriously as some of the other services sectors. First, the creative sectors might be more resilient to uncertainty than other services-exporting sectors, such as transportation and travel sectors. As we argued in the hypothesis development section, the creative services may be shielded from the negative impact of uncertainty because the perceived value of the service itself and the current ability to deliver it are the most important factors for the creative services. The work of the creative sectors is also typically delivered through contracts and projects. Hence, the long-term prospect of profitability, which is the usual driver of investment, may matter less to the creative services than to other sectors such as transportation and travel.

Second, the creative sectors are mostly comprised of micro and small enterprises, with relatively few large firms. Trade participation is often smaller in sub-sectors that have a larger number of firms (Di Novo et al., 2020). The EU is by far the largest trading partner for the UK's creative industries, with more than 50 per cent of exports in value being directed to the EU (which is more than most other services sectors: Hall and Heneghan, 2021). It is interesting to observe from the data employed in this analysis that the proportion of exports to the EU has grown for the creative industries, compared with that of non-creative industries post-2018. Consistent with our findings and discussions above, this might suggest that the creative industries have been resilient to the negative impact of Brexit uncertainty.

Figure 8: Services exports dependence on the EU



Third, creative industry firms can be considered as flexible organisations, advanced users of technologies, introducers of innovations that rely on the questioning of established logics, and significant employers of creative and technical talent (Protogerou, 2021). Their advantageous management and organisational practices allow them to adapt to market demands and changes in preferences during uncertain times. Indeed, the creative sectors have been found to be more resilient to the economic recessions of the last financial crisis (De Propris, 2013; Montalto et al., 2020). Some sub-sectors, such as Computer services, produce highly tradable and knowledge-intensive products and services. Like Audio-visual distribution and licences, this sector might have been not just resilient; it may also have proved that it is able to thrive.

Furthermore, as discussed in the data section, the lack of high-quality data for CI sub-sectors has limited the choices of methodologies available for robust econometric modelling. Obtaining consistent and high-quality data on the creative sectors' international trade is challenging. Maioli et al (2021) carefully document the potential sources of official data that could be useful in studying trade issues and they highlight this particular challenge in information and data availability, which affects the creative industries more than other parts of the economy. Even though we collected the best data possible, our experience is that the lack of longitudinal data and the inadequate quality of the existing data combine to create limitations in the resulting analysis. Such deficiencies present challenges to measuring the trade in services for the creative sectors (UNCTAD, 2008, 2018; Maioli et al., 2021) and also highlights the need to invest in research into better measurements. As such, we echo Bruce and Yu (2022) in emphasising the need for large scale and systematic data collection for further

research on the creative sectors. This is a pressing issue, given that the digitally intensive nature of creative sector services means that their skills, technology, and intellectual property rights (IPR) may experience accelerated digitalisation in the post-Brexit/post-Covid era.

Reflecting on this, it is important to draw the attention of DCMS, the statistics authorities, and agencies like the Office of National Statistics to these gaps. The Policy Evidence Centre for creative sectors is in a position to spur progress towards building better measurements and data collection. The consequent generation of evidence will support better policymaking.

8.2 Service trade restriction and future trade in creative sectors

Given that the services trade post-Brexit has become more restrictive and that this is a trend that may continue in future, our analysis on how trade restrictiveness has affected trade flow helps us to set expectations of the areas in which we may see a stronger impact of the new trading relationship between the UK and the UK. This study models and applies recently developed tools to answer policy questions about the impact of services restrictiveness on the services trades of the creative sector. The OECD STRI database provides a useful tool to measure services trade restrictiveness and allows us to capture the heterogenous effects of the underlying variation in the STRIs on the services trade in different sub-sectors of the creative industries.

Inside the EU, restrictions are more relaxed on foreign entry and movement of people, but are tighter in terms of discrimination and competition. The restriction on foreign entry is the most significant barrier for Advertising and marketing, and Audio-visual services. Restrictions on the movement of people and the mutual recognition of qualifications are major barriers for Audio-visual distribution and licences, Architecture, and Computer services. Moreover, the EU has higher levels of competition and regulatory transparency compared to outside the EU.

We find that for the five creative sectors of interest, the EU service restrictiveness is around 47% of the non-EU level, suggesting that the creative sectors enjoy much more frictionless trade when they are based in the EU single market. This is particularly the case for the Audio-visual distribution and licences, Architecture, and Computer services sectors. Hence, for them, leaving the EU is expected to raise trade barriers and reduce trade flows. By contrast and based on the observations we draw on the data for the examined period, the Advertising and marketing, and Audio-visual services sectors may be less affected by services restriction compared to the other analysed sub-sectors. Our empirical analysis shows that the creative sectors export significantly less when facing more services restrictions in the partner country or export destination country. Among these, the most significant types of service restrictions that reduce exports are regulatory transparency, restrictions on foreign entry, and other discriminatory

measures. Barriers to competition and other discriminatory measures in the exporting country also dampen export flow, which suggests that reduced competition in the domestic markets restrains businesses' capability to export services.

What is clear from this study is that trade liberalisation for services depends on domestic/internal regulations and cross-country cooperation on investment. It is simplistic and unhelpful to consider trade liberalisation only in terms of tariffs. The removal of tariffs is a relatively straightforward step and it may have clear benefits for trade. But for services, there are so many other constraints related to so many parties who are advocating for their own varied interests, and it is these constraints that are the actual barriers to the services trade. These empirical results indicate areas in which the creative sectors trade may experience decline when trade restrictions tighten. Our study indicates important questions that must be addressed when more data become available.

An important caveat of the analysis on services restrictiveness is that the historical data of SRTI may not predict well the level of services restrictiveness that the UK creative sectors might experience post-Brexit. In fact, there is very limited research on how the trade disintegration might affect trade partners. The specific effects depend on the new trade terms and conditions, as well as on how businesses can adapt to the new trade environment. Again, this warrants careful examination when data becomes available.

8.3 Caveats, Policy implications and future research

Besides their contribution to job creation and value generation, the UK's creative sectors export £1 of every £7 exported by the UK's services overall. The existing statistics show that the UK's creative services sectors grew even in 2020 when the services sectors were hit hard by the Covid pandemic (DCMS, 2022). It must be noted however that the growth was concentrated in certain sectors such as IP, gaming, and animation. More broadly, the creative industries are significant parts of many developed economies because their highly globalised cultural impacts go beyond their economic values (Deloitte, 2021). Creativity is recognised as a driver of innovation and as a driver of resilience in the "globotics upheaval" (Bakhshi et al., 2015, Fazio, 2021). Therefore, there are strong reasons to expect that developing and strengthening the creative sectors' competitiveness must remain a priority for the UK's future industrial strategy, both domestically and globally.

To sustain and further develop the competitiveness of creative sectors, policy makers need to understand the challenges and barriers to growth and trade that are faced by creative businesses in a fast-changing global environment. They also need to identify the areas in which the UK creative sectors are

competitive, can remain competitive, or could potentially become (more) competitive.

The UK has been clearly a strong global competitor in the five UK creative sectors for which we had data to analyse. It is the world leader in some sub-sectors such as Audio-visual distribution and licences. As a whole, these sectors were negatively impacted by Brexit-induced policy uncertainty during 2016-2019. They are estimated to have lost 15% of exports relative to the scenario where the referendum did not happen. This was the cost of Brexit uncertainty.

Given that service restrictiveness for the creative sectors outside the EU is twice as high as its within-EU level, UK businesses may experience significant challenges in exporting to the EU after the UK's exit from that market. Policy supports would be required to help businesses to overcome emerging trade barriers by providing information and guidance, financial support, and public investment in R&D, skills, and training. The areas in which assistance is needed to reduce the effect of trade restrictions in the exporting destination countries include regulatory transparency, restrictions on foreign entry, movement of people, and other discriminatory measures. Some sectors are more vulnerable to the overall restrictions than others, namely Audio-visual distribution and licences, Computer services, and Architecture services; these sectors are also some of the UK's most competitive services traders. Further, some sectors may be subject to particular types of restrictions. For example, foreign entry restriction is particularly relevant to Advertising and marketing and Audio-visual services, while restrictions on the movement of people strongly affect Audio-visual distribution and licences, Architecture, and Computer services. In addition, a competitive market at home will continue to be instrumental to promoting businesses to export.

It is important to note that as well as these direct effects, services trade restrictions have indirect effects. They increase the costs of doing business and harm the downstream industries, such as manufacturing industries. Smaller sized businesses are especially exposed to such barriers. Hence, the impacts of uncertainty and the loss of trade liberalisation for the creative sectors are not limited to just these sectors. It is important to have a holistic view when developing and reflecting on the UK industry strategy.

Even within the EU single market, there are considerable policy and regulatory barriers. Our report shows that in many areas of services, there are substantial differences within the EU and outside the EU. Hence, it is reasonable to expect that the UK's creative businesses will experience tightened restrictions when trading with the EU post-Brexit. So far there is no available data to examine the extent to which the creative sectors' trade has been affected post-2020. Addressing this should be at the top of the research agenda.

This study has not taken into account the digital restrictiveness or non-tariff barriers due to IPR protection, which undoubtedly affect the creative sectors' trade in services. The unevenness of legal institutions also has consequences for international competitiveness and international creative trade. Further research is clearly needed.

9. Conclusion

The creative industries in the UK are a vibrant and fast growing, innovative, and job-creating part of the economy. They not only generate considerable value added for both the economy and for UK international trade, they also hold important social value for the nation and its regions. This study makes a first step in quantifying the Brexit impact on the international trade performance of the creative sectors during the Brexit Referendum period, and the effects of the services trade restrictions for the creative services.

We conclude that the services trade of five UK creative sectors – Audio-visual distribution and licences, Computer services, Advertising and market research services, Architecture services, and Audio-visual related services – have as a whole been negatively impacted by the policy uncertainty during 2016-2019 due to the Brexit Referendum. Our analysis on the effect of service restrictiveness on creative services shows that after the EU exit, UK businesses may experience significant challenges in exporting to the EU

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Appendix 1: EBOPS Classifications

Licences to reproduce and/or distribute audio-visual and related products (SH4), is broken down into two sub-components:

—*Licences to reproduce and/or distribute audio-visual products,* which covers fees and charges for the authorised reproduction and/or distribution, through licensing agreements, of produced audio-visual originals or prototypes (for example, cinematographic works and sound recordings). Also included are rights relating to the reproduction and/or distribution of recordings of live performances and radio, television, cable, and satellite broadcast. Retransmission rights for sports events are also covered.
—*Licences to reproduce and/or distribute other products* covers fees and charges for the authorised reproduction and/or distribution through licensing agreements of original works of authors (for example, translation rights), painters, sculptors, etc., excluding those relating to products of an audio-visual nature.

Computer services (SI2) consists of hardware- and software-related services and data processing services. The category presents a classification of various arrangements involving software products and the related charges for their use as intellectual property. Computer software transactions are all transactions relating to computer software (be they services or goods transactions). It is recommended that computer services is broken down into computer software and other computer services. Some forms of software are classified under goods.

Computer software includes:

1. Sales of customised software (however delivered) and related licences to use
2. Development, production, supply and documentation of customised software, including operating systems, made to order for specific users
3. Non-customised (mass-produced) software downloaded or otherwise electronically delivered, whether with a periodic licence fee or for a single payment
4. Licences to use non-customised (mass-produced) software provided on a storage device such as a disk or CD-ROM with a periodic licence fee
5. Sales and purchases of originals and ownership rights for software systems and applications

Other computer services (SI22) includes:

- Hardware and software consultancy and implementation services, including the management of subcontracted computer services
- Hardware and software installation, including installation of mainframes and central computing units

- Maintenance and repairs of computers and peripheral equipment
- Data recovery services, and provision of advice and assistance on matters related to the management of computer resources
- Analysis, design, and programming of ready to use systems (including web page development and design), and technical consultancy related to software
- Systems maintenance and other support services, such as training provided as part of consultancy
- Data-processing and hosting services, such as data entry, tabulation, and processing on a timesharing basis
- Web page hosting services (that is, provision of server space on the internet for hosting of clients' web pages)
- Provision of applications, hosting clients' applications, and computer facilities management

Advertising, market research, and public opinion polling services (SJ22) transacted between residents and non-residents, includes the design, creation, and marketing of advertisements by advertising agencies; media placement, including the purchase and sale of advertising space; exhibition services provided by trade fairs; the promotion of products abroad; market research; telemarketing; and public opinion polling on various issues.

Architectural services (SJ311) includes transactions related to the design of buildings

Audio-visual and related services (SK1) covers services associated with audio-visual activities (movies, music, radio and television) as well as services relating to the performing arts. In EBOPS, audio-visual and related services is further broken down into audio-visual services (corresponding to CPC, Version 2, group 961: "Audio-visual and related services") and artistic related services (corresponding to CPC, Version 2, group 962: "Performing arts and other live entertainment event presentation and promotion services") and group 963 ("Services of performing and other artists").

3.256. *Audio-visual services (SK11)* relates to the production of motion pictures (on film, videotape, or disk or transmitted electronically), radio and television programmes (live or on tape), and musical recordings. The recording of live performances is included in audio-visual services and for these recordings, the same treatment as for other audio-visual products applies. Included in audio-visual services are amounts receivable or payable for rentals of audio-visual and related products, and charges for access to encrypted television channels (such as those offering cable and satellite services).

Mass-produced audio-visual products (movies and music, including recordings of live performances) that are purchased or sold outright or for perpetual use

are included under audio-visual services if downloaded (in other words, delivered electronically). However, those on CD-ROM, disk, etc., are outside the scope of the EBOPS 2010 standard categories (and included under general merchandise). Similar products obtained through a licence to use (other than when conveying perpetual use) are included in audio-visual services, as is other online content related to audio and visual media. Charges or licences to reproduce and/or distribute audio-visual products are excluded from audio-visual services and included in charges for the use of intellectual property. Also included are purchases and sales of ownership rights for entertainment such as radio and television broadcast originals, sound recordings, motion pictures, videotapes, television and radio programme originals, etc., over which legal or de facto ownership can be established by copyright.

Artistic related services (SK12) includes the services provided by performing artists (actors, musicians, dancers, etc.), authors, composers, and sculptors. It also includes services provided by independent models as well as set, costume, and lighting designers. Transactions are included if the service providers are not employees of the entity making payment (otherwise, they represent compensation of employees). Also included are presentation and promotion services for performing arts and other live entertainment events. However, the recording of such events is included in audio-visual services.

Appendix 2: EBOPS Classifications

The creative industry sectors are diverse. Different sub-sectors have their own features in terms of trading values and partners, and they experienced a variety of challenges and opportunities during the Brexit period. We discuss the differences in the different trends and growth trajectories below.

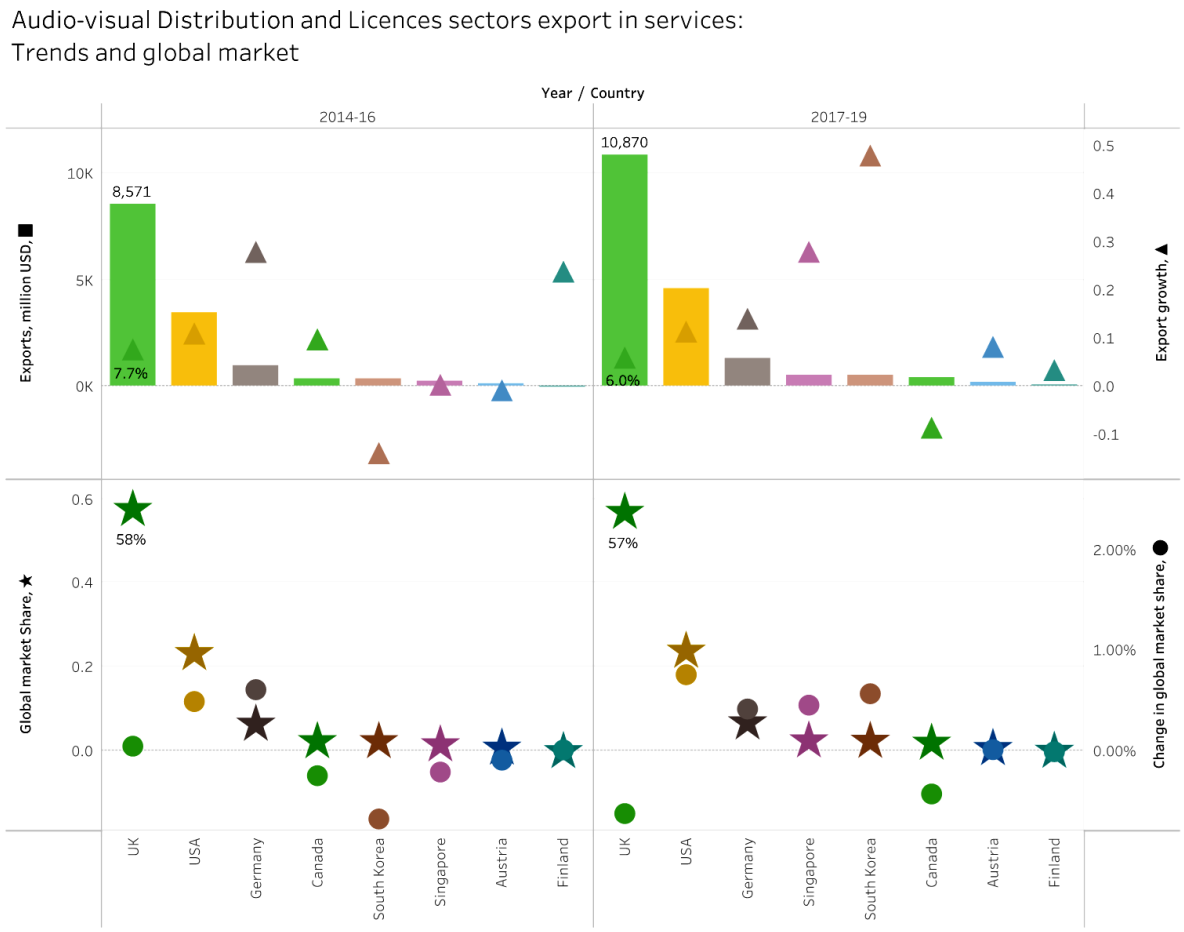
Audio-visual Distribution & Licences

The distribution and licences of the audio-visual products include the fees and charges for authorised usage through the licensing of live performances, TV, and broadcasting, or through any licensing agreements of original works from authors, artists, and so on. The sector is subject to strong IPR, trademarks, and copyright issues.

The UK leads the global market in Audio-visual distribution and licences, exporting nearly USD20 billion during 2014-19 and claiming over half of the world's exports. The second largest exporter in this sector is the US, which exports less than half the UK's share. However, the UK's post-Brexit Referendum period average growth rate (6%) was lower than the global average (8%). There are several players who are growing rapidly, including Germany, South Korea, and Singapore, especially since 2017. Figure 3 presents the country ranking in total

exports, growth in exports, global market share, and change in global market over the two periods of interest.

Figure 3: Total Exports in Audio-visual Distribution & Licences



Computer services

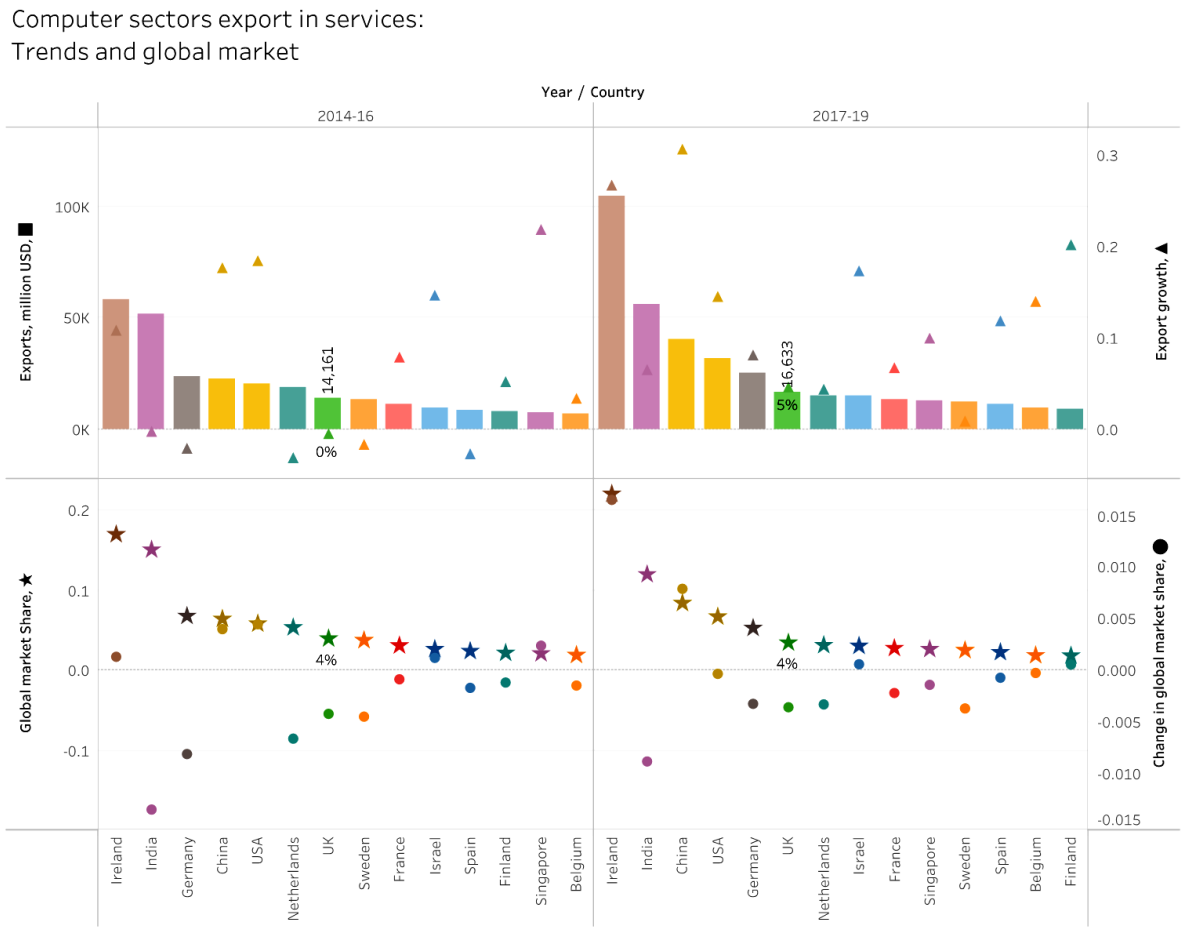
Computer services are hardware- and software-related services, and data processing activities. Any arrangements involving these services, including consultancy, software programming and processing, and charges for their use as intellectual property are part of computer services and are included in this category.[19] Having the highest volume of trade among the creative economy sectors, the sector has great potential, enjoying a global average growth rate that has been higher than 10% since 2014.

Ireland takes the lead globally in computer services exports, and boasts the fastest growth among all countries, acquiring an impressive 22% market share over 2017-2019. Ireland is followed by the Asian giants India and China, both of whom have experienced fast growth over the examined period such that

[19] Please see the Appendix 1 for a detailed explanation of the classification of the categories.

together they hold 20% of the global market share. Germany is the largest exporter of computer services in mainland Europe, taking 7% of the global market share during 2014-2016 to be the third largest exporter globally; it dropped to 5% in the second period to become the fifth largest exporter. While it seems to be recovering from that decline during 2017-2019 to enjoy a fast growth of average 8% annually, it is overall losing global market share. The UK was the seventh largest exporter of computer services during 2014-2016, surpassing the Netherlands in the second period to reach sixth place by growing at an average 5% annually during 2017-19. However, the UK growth rate of exported services is still among the lowest in the world, losing out to strong contenders such as Israel, Spain, Belgium, and Finland.

Figure 4: Total Exports in Computer services



Advertising and marketing

Based on WTO data, the Advertising and marketing sub-category of the creative industries covers the design, creation, and marketing of advertisements by advertising agencies. It also includes exhibition services provided by trade

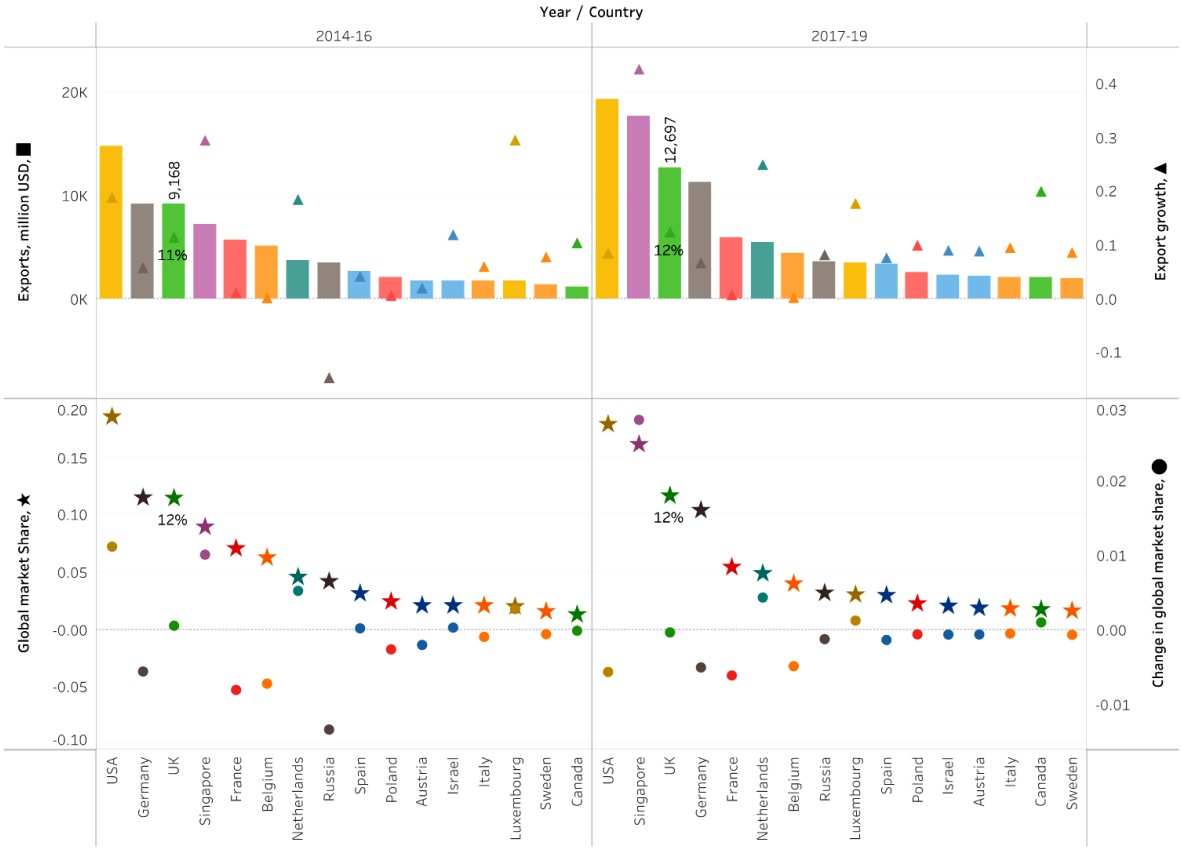
fairs, the promotion of products abroad, and market research and public opinion polling on various issues.

The USA is the largest exporter of advertising and marketing services, claiming nearly 20% of the world market. The UK is a major competitor, enjoying 12% of the global market share and exporting USD13 billion over 2017-2019. UK exports in Advertising and marketing services have grown with two-digit speed consistently over both periods, surpassing Germany. While Asia's market share is limited, the most significant growth has been seen in Singapore, who has become the second largest exporter, overtaking the UK.

In advertising and marketing services, the UK's main export partner is the EU. In 2019, 50% of the UK's advertising and marketing services were imported by the EU countries. The USA is the next largest recipient of the UK's advertising services, followed by the rest of Europe. The UK's share of Asian countries remains limited. Sectoral barriers associated with cultural restrictions may explain the limited share of the Asian countries as trade partners. Product customisation and differentiation are key to the development of advertising campaigns, requiring non-standard, localised, campaign-specific inputs during the production process (Horsky et al., 2012). Thus, the sector is prone to facing cultural restrictions (Fazio, 2021).

Figure 5: *Total Exports in Advertising and marketing services*

Advertising sectors export in services:
Trends and global market

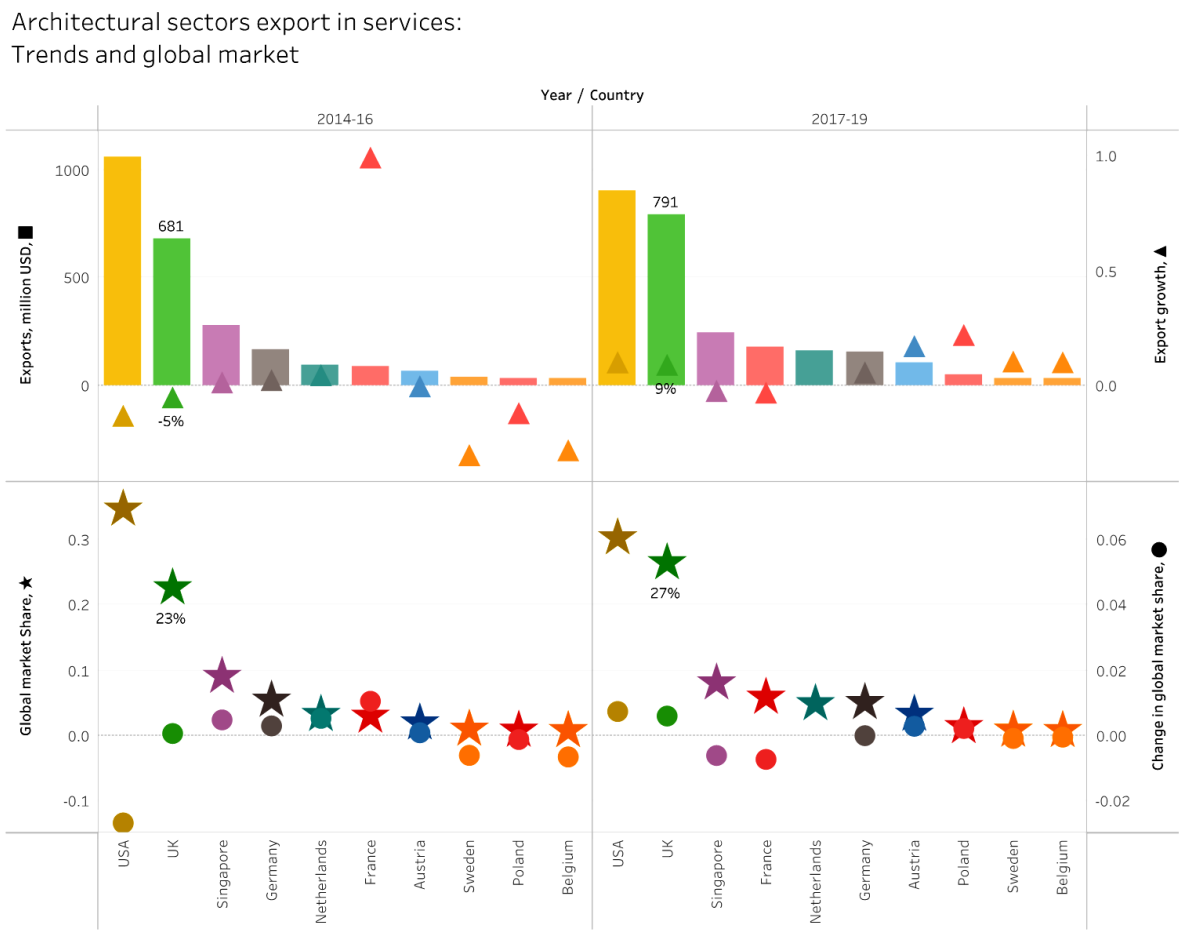


Architectural services

Any cross-border transactions that are related to construction design are part of the Architectural services trade. This sub-sector has, compared to the other CI sectors, a relatively small share in terms of volume. The sector also faces some international non-tariff barriers. For example, business certificates are required for foreign presence and unrestricted domestic procurement, and this is in addition to requirements related to the recognition of architectural qualifications, which apply in most cases. (Fazio, 2021)

The USA is the global leader in exporting architectural services, enjoying around one-third of the global market. The UK is the second largest exporter, exporting 27% of global architectural services over the period 2017-2019. It thus gained in the marketplace compared to 2014-2016. Indeed, the UK's growth in this area has been strong in recent years (9%), catching up with the USA.

Figure 6: Total Exports in Architectural services

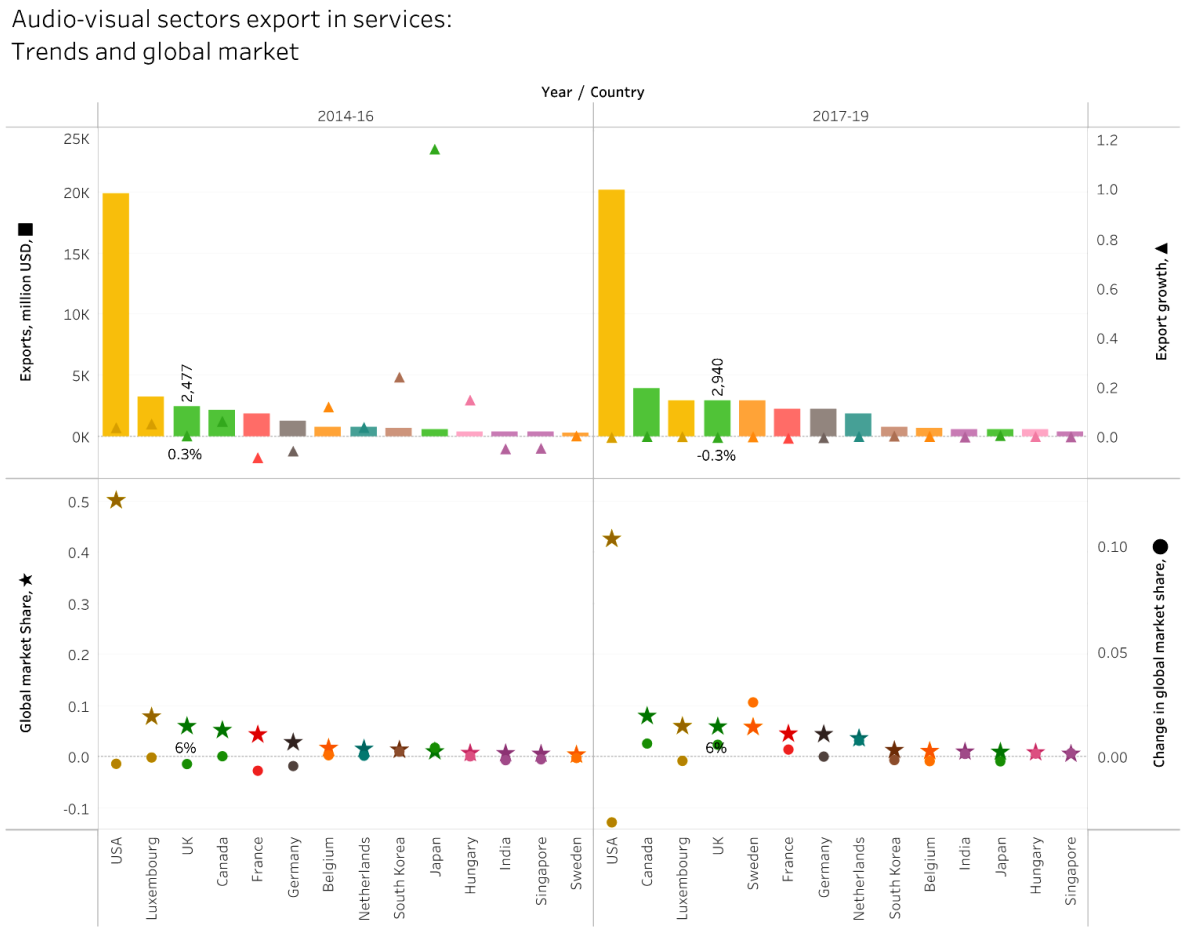


Audio-visual services (Music and visual Arts)

Music and visual arts provide great economic value as well as being a unique, creative, and cohesive tool for mankind. The audio-visual sub-sector is the CI's third largest exporter, behind computer services and advertising. The sector provides small and medium businesses with dynamic and innovative opportunities, and it has high growth potential (European Commission, n.d.).

In audio-visual arts services, the USA dominates the global market by exporting USD20 billion during 2017-2019, claiming more than half the global market. Canada and European countries are also strong competitors, with relatively stable market structures. The UK has 6% of the global market share, despite seeing a small drop in growth and market share in recent periods.

Figure 7: Total Exports in Audio-visual services



Appendix 3: Technical notes: Identification strategy for evaluating the effect of the Brexit Referendum on UK creative services trade

We consider CI services exports of the UK as the main variable of interests. We denote $X_{ij,t}^{k}$ as the value of export of sector k, from country i to country j, at time t. The counterfactual exports (i.e., assuming that the Referendum's outcome was to remain in the EU) is denoted as $\tilde{X}_{ij,t}^{k}$. The causal impact of Brexit is defined as the difference in the average effect of treatment on treated

$$\tau^{ATT} = E\left(ln\ ln\ X_{ij,t}^{k}\ - ln\ ln\ \tilde{X}_{ij,t}^{k}\ | Brexit = 1\right)$$

We consider the treated observations to be those that occur from 2016 onward and involve exports of UK to EU countries. For some creative industries, bilateral data is not available. It is still possible to identify the Brexit impact by comparing the aggregate services exports of the UK relative to the other countries. In that case we consider $X_{i,t}^{k}$, which is the value of export of CI k from country i at time t. The counterfactual export is denoted as $\tilde{X}_{i,t}^{k}$. The causal impact of Brexit is defined as the difference in the average effect of treatment on treated

$$\tau^{ATT} = E\left(ln\ ln\ X_{i,t}^{k}\ - ln\ ln\ \tilde{X}_{i,t}^{k}\ | Z, Brexit = 1\right)$$

The UK exports from 2016 onward are considered as treated and the exports of other countries are considered as non-treated. To calculate the average treatment effect on treated requires the estimation of the expected value of unobserved counterfactual values of either bilateral exports $E(ln\ ln\ \tilde{X}_{ij,t}^{k} | Brexit = 1)$ or aggregate exports $E(ln\ ln\ \tilde{X}_{i,t}^{k} | Brexit = 1)$. Substantial progress has been made in recent years in developing methodologies for causal inferences, and we discuss these next.

Different methods are based on different sets of assumptions to construct the counterfactual scenario, and they require different data. The difference-in-difference (DID) method (Card and Krueger 1994; Abadie 2005) is one of the most popular approaches. It is based on the *parallel trend assumption*, which postulates that the services export flows that are not affected by the policy and those that are affected by the policy have similar trends prior to the policy intervention and that they would have continued along these parallel trajectories in the absence of the intervention This method uses all available data and estimates the policy impact using a standard regression with time and country-pair fixed effects. This allows it to estimate most efficiently, drawing the standard statistical inference for coefficients and the model fit. However, if the

assumption of the parallel trend is violated, the estimate is biased. The DID approach is best suited to when a substantial number of units are exposed to the policy intervention.

The synthetic control (SC) method (Abadie and Gardeazabal, 2003) constructs the counterfactual based not on all available data, but only on a few comparison units selected from the control group. It weights those units with the optimally selected weights that produce a synthetic comparison that closely matches the trajectory of the treated units before the intervention. Unlike the DID, it works well even when there is only one treated unit, which is the case for some CI sectors for which only aggregate trade is available. The major drawback of SC is that it is unable to draw statistical inferences. Another very substantial drawback, which is relevant to the case of the creative industries, is that the data requirement is demanding. It works well when the data reflects smooth trends with long-run underlying determinants and where transitory shocks are small, which is the case for highly aggregated flows or very well-measured observations. For the creative industries, neither of these requirements is likely to hold. The data is highly disaggregated and the transitory shocks are very high, which may be due to the uneven flow of the sector's trade or to the high level of mismeasurement and missing data.

A more recent method combines the strengths of both DID and SC. This is the synthetic difference-in-difference approach (SDID) of Arkhangelsky et al. (2021). SDID estimators are consistent and more efficient than both the SC and DID methods. In particular, the parallel trend assumption is likely to hold for SDID even if it is violated for the standard DID. SDID may also improve the precision of the estimation because it applies not only unit weights but also time weights, weighting more heavily the periods that are more like the post-intervention periods. At the same time, it has advantages over the SC method because it allows us to make statistical inferences about the estimated coefficients. Unfortunately, it is also prone to poor performance when the quality of data is not very good, which is clearly an issue when working with the creative industry trade flows: high monthly volatility and high level of transitory shocks relative to the steady, long-term component, and poor measurement increases the noise to signal ratio, reducing the efficiency of the estimator.

Some additional data issues also have an impact on the methodologies we can adopt. The UK does not have bilateral export data on the creative sectors at the level sufficient for causal inference before 2016. Thus, to construct bilateral data on the UK exports, we rely on the so-called bilateral **mirror** trade reported by the UK's trading partners. For instance, the US reports the bilateral imports from the UK for the whole period of the analysis. From the UK standpoint, these are UK exports to the US. In theory, the direct measure of export and its mirror measure should be the same, but in practice there can be significant discrepancies between the two, which introduces an additional measurement error.

Given the difficulties inherent in the task, we adopt a combined approach for investigating trade in the CI sub-sectors. We report both the synthetic difference-in-difference and the difference-in-difference methods to make the desired inferences on the effects of Brexit on UK creative services trade.

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