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Geo-blocking regulation: an assessment of its impact on the EU Digital Single Market.

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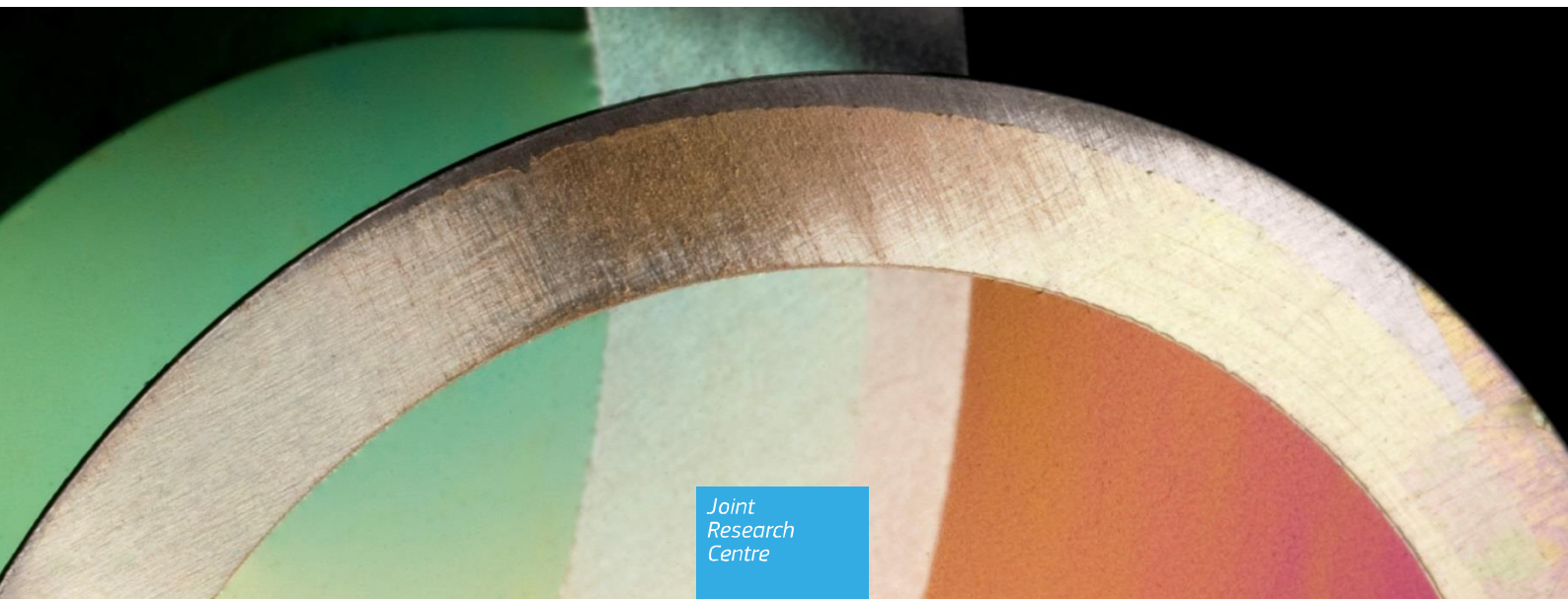

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Abstract

In February 2018 the EU adopted the Geo-Blocking Regulation that prohibits any attempts to restrict consumer access to e-commerce websites on the basis of their nationality or country of residence. This paper seeks to evaluate the impact of that policy on cross-border e-commerce. We use page view data for about 10k e-commerce websites over the period February 2018 to October 2019, approximately 10 months before and after the entry into force of the regulation in December 2018. We classify the data in cross-border country pair traffic between countries of origin of visitors and countries of establishment of websites. Despite the fact that there may still be a significant amount of delivery restrictions in cross-border trade, we conjecture that any variation in traffic to e-commerce websites will correlate with variations in monetised e-commerce, even if modest. We find that the regulation increased real cross-border e-commerce activity inside the EU from 9.2% to 13%, depending on model specifications. It increased cross-border trade between EU consumers and e-commerce sites anywhere in the world by 11.2% to 11.9%. Applying different criteria for the definition of purely domestic websites slightly weakens the results for intra-EU cross-border trade and gives it a further boost for worldwide cross-border trade.

1 Introduction

It is often believed that Internet-based transactions are borderless (Cairncross, 1997). Indeed, consumers are entitled to search the entire world for the products that best match their preferences and firms can view the entire world as the potential market for their products. However, consumers and firms continue to face real barriers to cross-border online transactions. Earlier studies (Blum and Goldfarb, 2006; Gomez-Herrera et al, 2014) confirm the strong reduction in geographical distance-related trade costs in online trade, compared to offline trade. Gomez-Herrera et al (2014) show that other sources of trade costs associated with language barriers, the quality of legal institutions, online payments systems and parcel delivery costs become more important. In a linguistically segmented market like the EU, online home market bias is higher compared to offline trade. Consumers are motivated to go cross-border in search of better prices and products not available locally (Cardona et al, 2015). Firms face extra costs in cross-border transactions related to product guarantees and settling cross-border disputes, and administrative costs created by regulatory differentiation across countries (Duch-Brown and Martens, 2015).

The European Commission has placed the achievement of a European Digital Single Market (DSM) high on its policy priorities list. This includes measures to reduce online regulatory trade costs to facilitate cross-border online trade in goods, services and media content, such as reductions in parcel delivery costs, facilitating the management of different VAT rates, and opening cross-border access to copyright-protected media content. Online e-commerce has become a very common activity in the EU. According to data from Eurostat, 63% of all consumers bought goods or services online in 2019 and 53% can be considered frequent online buyers, though e-commerce penetration rates still vary substantially by country, from 74% in Denmark to 14% in Bulgaria. On the vendors' side, around 18% of all firms were selling online, of which 15% are selling via their own website and 7% pass through e-commerce marketplaces. About 7% of turnover is associated with online sales, 6% via own websites and only 1% from e-commerce marketplaces. While e-Commerce has gained ground in domestic transactions, this is less so in cross-border transactions. However, only 22% of EU consumers ordered goods or services online from another EU country and only 17% bought from non-EU countries. Similarly, only 9% of firms sell online across the border (statistics from Eurostat's Digital Economy and Society indicators). This is not surprising because consumers have a well-known preference for home markets. Physical transport costs, regulatory barriers and cultural and linguistic differences create trade costs that reduce cross-border trade, offline as well as online.

Apart from regulatory barriers to trade, online sellers may deliberately create their own barriers to trade. The Internet IP protocol facilitates the geo-location of users. Geo-location can be legitimate and help to comply with restrictions in trade in national legislation. It is useful for example for localised advertising and search and helps in fraud prevention. However, geo-location tools can also be used to erect barriers and discriminate between consumers according to their location. Using data from an EU-wide online mystery shopping survey, Cardona et al (2015) find that the practice of erecting virtual barriers is common in cross-border ecommerce within the EU. Large websites block foreign shoppers' IP addresses at the access stage. Blocking is more frequent however when consumers get to the delivery stage. It is less probable between countries with a common language but a common border

and geographically proximity have no effect. They also find evidence of geographical price differentiation.

In February 2018, the EU adopted the Geo-Blocking Regulation (EU) 2018/302)[1] that aims to give all EU consumers equal rights to access traders' online sales of goods or services, irrespective of their nationality or place of residence. It prohibits any deliberate attempts to restrict access to e-commerce websites on the basis of information about the users' country of residence. Firms can have several motives for geo-blocking access to their online shops. First, the perceived costs of dealing with regulatory and administrative complications may discourage them from selling abroad. Second, retailers with online stores in several countries may want to practice geographical market segmentation to maximise price differentiation across markets with different demand and increase profits. Third, the producers of goods, services and content distributed by online retailers may want to geographically segment the market and impose "vertical restraints" on online retailers that force them to block cross-border access. The e-commerce sector inquiry by the EU competition authority[2] shows that vertical restraints account for a small minority of geo-blocking cases only. The vast majority are self-imposed restrictions by retailers that are not related to regulatory issues. It seems likely that geo-blocking is mostly caused by the reluctance of online retailers to sell cross-border because of perceived high trade costs and/or commercial strategies that seek to impose geographical market segmentation.

This paper assesses the impact of the Geo-Blocking Regulation (GBR) on online cross-border trade in the EU. There is so far no empirical evidence on the overall economic impact of the GBR, also because the regulation became effective in December 2018 only. An earlier study by Duch-Brown and Martens (2015) investigates the potential economic impact of removing geo-blocking restrictions, using detailed data on consumer electronics products prices and sales for ten European countries for the period 2012-2105. They find that policy scenarios that lift geo-blocking restrictions could have a positive impact both on consumer and producer surplus in all EU Member States, and even more so in smaller countries. The present paper collects empirical evidence from actual cross-border e-commerce activities before and after the entry into force of the GBR.

We find that the regulation increased real cross-border e-commerce activity inside the EU by 9.2% to 13%, depending on model specifications. It increased cross-border trade between EU consumers and e-commerce sites anywhere in the world by 11.2% to 11.9%. Applying less stringent criteria for the determination of the country of establishment of a website slightly weakens the results for intra-EU cross-border trade and gives it a further boost for worldwide cross-border trade. We conclude that the GBR has effectively facilitated cross-border online trade in the EU.

This paper is structured as follows. Section 2 discusses data sources and presents some descriptive e-commerce trade statistics. Section 3 present the model specifications and estimation results. Section 4 concludes.

[1] See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0302&from=EN
[2] See https://ec.europa.eu/competition/antitrust/sector_inquiries_e_commerce.html

2 Data Sources and Description

Despite its importance for many years now, there is very limited data on e-commerce in general, and about its cross-border dimension in particular. Most existing sources do not distinguish between domestic and international e-commerce. Official statistics rely on enterprise surveys to keep track of B2C and B2B e-commerce, or consumer surveys to look at B2C and C2C transactions. UNCTAD (2016) identifies several public and private data sources that can be used to measure e-commerce.

In this study we use internet traffic as a proxy for cross-border e-commerce. We assemble a dataset comprising visits made to a large number of e-commerce websites located in EU and non-EU countries. While they are not be able to capture actual e-commerce transactions, or the monetary value of these transactions, they are a good proxy because they provide a precise indication on existing bilateral exchanges of information on goods and services, which typically precede and follow actual e-commerce transactions (UNCTAD, 2016). Moreover, facilitating cross-border access to offers is actually the general objective of the Geo-blocking Regulation. This section provides a description of the data and an explanation of the empirical methodology to be used for the analysis.

2.1 Data Sources and Sample Specification

The data for this study come from Similarweb[3] (SW), a digital market intelligence company that provides information on worldwide internet traffic. We start from SW lists of monthly Top-10k e-commerce websites by country for the period from February 2018 to October 2019. The "E-commerce and shopping" category includes web domains for marketplaces, auction sites, price comparison websites, and ticket selling webs, among others. The time span was chosen to cover a 10-month period before and after the entry into force of the GBR, on 3 December 2018. It allows us to study if significant changes have occurred with respect to cross-border online traffic to e-commerce websites before and after the geo-blocking regulation was implemented in the EU Digital Single Market.

This lists are ranked by frequency of visits ("clicks") on the websites. Unfortunately, the data only captures desktop traffic, which overlooks and important source of visits (and purchases) coming from mobile browsers and applications. The combined lists constitute an initial sample of around 25,000 websites. We select a number of domains from the top, the middle and the tail end of the visit frequency distribution to guarantee representativeness for large, medium and small e-commerce websites in the sample, as well as highly internationalised and local vendors. We take the world Top-1500 e-commerce websites to include all big operators. We then randomly select websites in the middle and the bottom end of the distribution from country lists. The resulting sample includes 9.423 e-commerce websites.

We obtain from SW the geographic distribution of traffic for the selected e-commerce websites, i.e. the country of origin of the visitors who clicked on the website. The selected websites attract visits from users located in 168 countries. This allows us to identify origin-destination pairs and study the evolution of cross-border traffic flows before and after the implementation of the geo-blocking regulation.

[3] See https://www.similarweb.com/

In order to assign a geographic (country) location to a website we apply the same cascade of rules as in Alaveras and Martens (2015):

i. If a website has a country top level domain, the website is assigned to this country.
ii. If a website is "overwhelmingly visited" from a particular country, then the website is assigned to this country. “Overwhelmingly” means that either a majority of visitors come from one country or that visitors from the top country is at least double the number of visits of the second country. Note that for each website we used the geographic distribution of visits for the entire sample period.
iii. For remaining unallocated websites e use information from the who.is directory for registered websites.
iv. If all this fails we use the website IP address.

An important question concerns the allocation of big platforms such as amazon.de to the country they are serving (Germany) or to the country of origin of their mother company, amazon.com (US). Both the first and second rule allocated them to the country where they are operating and therefore divorce them from the location of the mother company. The underlying economic logic is twofold. This websites act mainly as platforms for local sellers and secondly the main warehouses and distribution hubs are located in the country of service.

With this procedure we assign the 9.423 e-commerce websites to 111 countries. The majority are assigned to the US (1011), Brazil (623), Germany (621) Japan (619) and Russia (520). In the EU, the countries that host the largest number of website are Germany, Poland (405), the UK (387) and France (383).

We also collect from SW data on the “bounce rate”, defined as the percentage of users who view only one page before leaving the website, normally the front page. They do not use the search engines of the website and do not go beyond the main hosting page, spending very little time in the website. The data include this variable for each country-pair website for the entire period. This allows us to distinguish between real and fake visits, i.e. visits with and without the intention to buy.

2.2 Methodology

According to the scope of application of the geo-blocking regulation, it applies to all traders offering their goods or services to consumers in the EU, regardless of whether they are established in the EU or not (Article 1). Traders established in non-EU countries that sell to consumers in the EU are, therefore, subject to the regulations. In addition, the regulation does not apply to purely domestic transactions that are confined in all respects within a single MS. Hence, we should expect that the regulation promotes cross-border flows from users located in the EU (originating in the EU) towards e-commerce websites located either in the EU or elsewhere.

Our focus group is the set of cross-border visits to e-commerce websites located anywhere in the world, originating from visitors located in EU MS, excluding purely domestic trade, i.e. when visitor and website are in the same country. This implies that websites located outside the EU and receiving visitors from any EU MS are assumed to be operating in the

EU and thus fall under the provisions of the GBR. This may be a restrictive assumption since e-commerce websites not operating in the EU can still receive visits from users located in the EU. Since this assumption can be a source of bias, it will be relaxed in the empirical section to confirm the robustness of the results. Our comparison group will be composed of all cross-border internet traffic to e-commerce websites anywhere in the world originating from users located in non-EU countries, as well as those cases where we observe only domestic traffic. This will help us to capture the home market effect, i.e. consumer preferences for domestic e-commerce services.

If the GBR has been effective in removing geo-blocking practices, we should expect an increase in cross-border traffic in the focus group compared to the comparison group. We assess this hypothesis by applying a difference-in-difference analysis to the data, with a before-and-after the GBR and a focus-versus-comparison group differentiation.

2.3. Some descriptive statistics

In this sub-section we describe the data used for the analysis. Table 1 presents a summary of worldwide e-commerce trade at the level of aggregated regional blocks, as measured by visits to e-commerce websites for the period under consideration. Countries in the sample are divided in four main trading blocks: China (CN), the EU[4], North America (NA, including US and Canada) and the rest of the World. China is the country of origin of 36.1 billion visits, the majority of which were domestic (83%). Visits to non-Chinese websites include 1Bn to the EU, 3Bn to North America and 2.2Bn to the Rest of the World. China-located e-commerce websites received only 7.6% of the total number of website visits in our sample. Visits originated in the EU amounted to almost 140Bn, 30% of total visits in the sample. Out of this total, 1Bn were directed to Chinese websites, almost 12Bn to North American e-commerce sellers, and an additional 7.4Bn to e-commerce vendors located in the rest of the world. In this case, 85% of visits generated in the EU were domestic, i.e., to other EU countries. The EU received 1Bn visits from China, 1.5Bn visits from NA and an extra 5.9Bn visits from RoW for a total of 126Bn. The balance of trade for the EU in terms of visits is thus negative in 12Bn visits. In the case of NA, a relatively small amount of visits go to foreign e-commerce websites (95% are domestic), but it receives a relatively large amount of visits (24%), resulting in a positive trade balance of 30Bn visits.

Table 1: Volume of online trade (Bn visits)

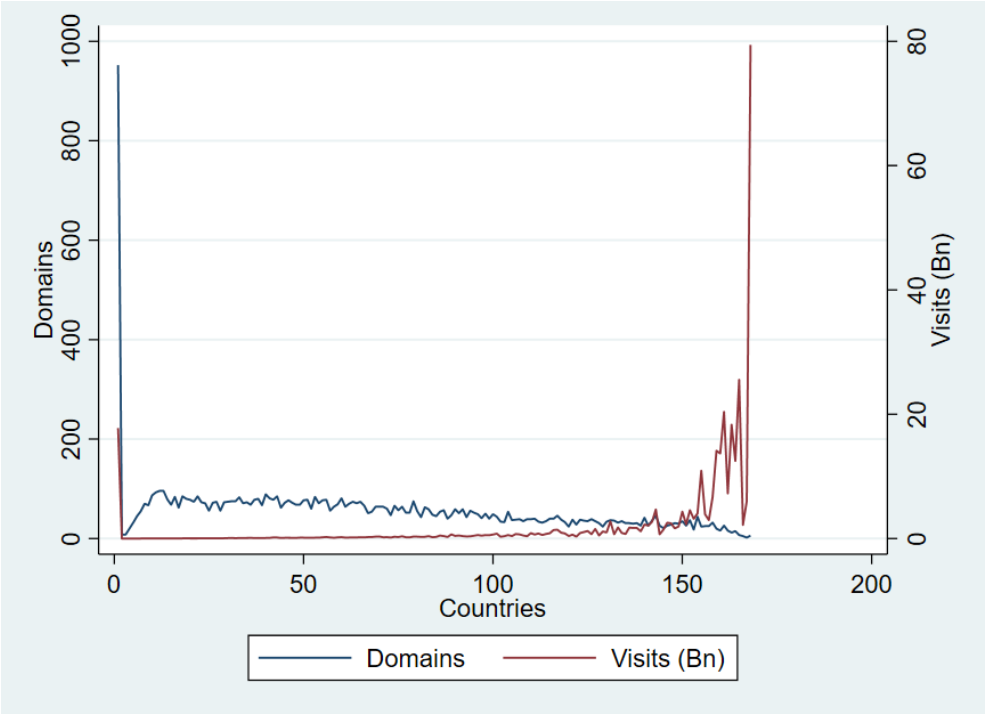
		Destination				
		CN	EU	NA	RoW	Total
Origin	CN	29.9	1.0	3.0	2.2	36.1
	EU	0.9	117.4	11.8	7.4	137.6
	NA	1.2	1.5	116.5	3.3	122.5
	RoW	4.1	5.9	21.1	146.2	177.2
	Total	36.1	125.8	152.3	159.1	473.4

Source: Similarweb and authors' calculations.

[4] Despite the departure of the United Kingdom of the EU, during the full period of analysis the UK was a member state, so it is included in the EU.

The distribution of domains and traffic is shown in figure 1, where the horizontal axis indicates the number of countries where a website is used, and the associated volume of traffic. Here, we classify e-commerce websites that receive 99% of their traffic from only one country as purely domestic e-commerce traders. The L-shaped distribution of websites (blue line) indicates that a large number of e-commerce websites are for domestic use only. The distribution would be even more skewed if, instead of 99%, we would adopt a classification criterion of 95% or 90% of traffic. On the other hand, the distribution of visits is U-shaped (red line). It shows that total traffic on strictly domestic sites (26Bn visits) is lower than traffic observed on a few very large worldwide e-commerce providers.

Figure 1: Geographic distribution of e-commerce traffic



3 Empirical Analysis

In order to quantify the effect of lifting geo-blocking restrictions on e-commerce under the GBR, we use a difference-in-difference gravity model of trade methodology, similar to Santos-Silva and Tenreyro (2010). In this section we first describe the model and the specifications to control for different biases in the data. Secondly, we show and discuss the results from the estimation.

3.1 Model Specification

We employ a gravity difference-in-difference estimation model. As explained above, the treatment group is the set of cross-border visits to e-commerce websites located anywhere in the world, originating from visitors located in EU MS but excluding purely domestic trade. The control group is formed by all cross-border internet traffic to e-commerce websites anywhere in the world originating from users located in non-EU countries, as well as purely domestic transactions.

Including domestic trade in gravity estimations is justified by several arguments. First, since consumers face the option to consume both domestic and foreign products, this guarantees consistency with theory and also with stylised facts about consumer behaviour. Second, it allows the identification of the effects of bilateral trade policies in a theoretically-consistent way (Dai et al., 2014). Third, it measures the relative effects of distance on international trade with respect to the effects of distance on internal trade (Yotov, 2012), the so-called "distance puzzle" in trade. Finally, it controls for the effects of globalization on international trade and corrects the potential biases in the estimation of the impact of trade agreements on trade (Bergstrand et al., 2015).

Since we observe the same domains and the same countries over several months in the period of analysis, the best methodological alternative is to use panel data estimation techniques. Various reasons justify this choice. First, panel data estimation improves the efficiency of the estimation. Second, the panel dimension enables the use of the pair-fixed-effects methods that will control the issue of potential endogeneity of trade policy variables (Baier and Bergstrand, 2007). Finally, the use of panel data allows for a flexible and comprehensive treatment and estimation of the effects of time-invariant bilateral trade costs with pair fixed effects.

From the discussion, the basic log-linearised regression equation then becomes:

$$ln(X_{ij,d,t}) = \alpha + \beta(postGB_t \times EU_j^O) + \gamma Z_{ij} + \mu_{ij} + \pi_d + \tau_t + \varepsilon_{ij,\mathrm{d},t} \quad (1)$$

The variable $X_{ij,d,t}$ indicates internet traffic from country i to destination j, directed to e-commerce website d in time t. when i and j differ, X captures international trade, and when i=j, then X reflects intra-national trade, or the so-called home bias. Since we have different e-commerce websites in each country, we differentiate between domains through the sub-index d, while t is the month. The term $postGB_t$ is equal to 1 for the months after the geoblocking regulation entered into force (i.e., from December 2018 onwards). Similarly, EU_j^O is equal to 1 for those traffic flows originating in the EU and zero otherwise. Hence, the variable $(postGB_t \times EU_j^O)$ is the difference-in-difference indicator and selects the treatment group (online cross-border traffic flows originating in the EU to e-commerce

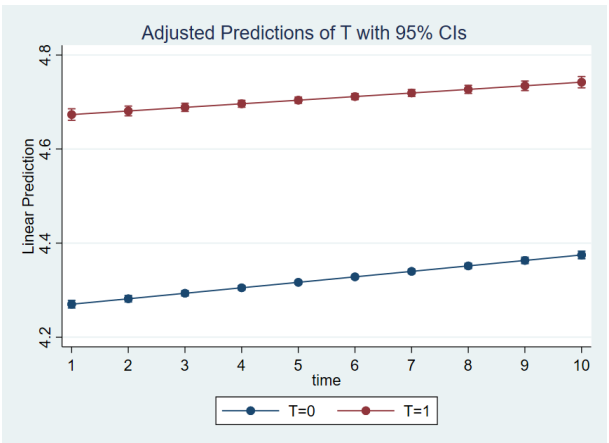
websites from December 2018 onwards) from the control group. A positive and statistically significant estimation of parameter b would indicate a positive effect of the geo-blocking regulation on cross-border trade, and, from our interpretation, an increased attention from users in different European countries to e-commerce websites located in other MS and also in other countries. We will also restrict the results to the case of intra EU trade, to look at the effects of the regulation on the Digital Single Market.

Additionally, Z_{ij} indicates a vector of different bilateral distances that are commonly used in trade studies to capture trade costs, such as contiguity, physical distance, common language or common currency. The term μij denotes the set of country-pair fixed effects, which serve one main purposes: it will absorb most of the linkages between the endogenous trade policy variables and the remainder error term εij,t in order to control for potential endogeneity of the former. In principle, it is possible that the error term in gravity equations may carry some systematic information about trade costs. However, due to the rich fixed effects structure in equation (1), we are more confident to treat and interpret εij,t as a true measurement error. Next, the term π_d is the set of domain fixed effects, to control for the heterogeneity of sizes of the different e-commerce websites, as well as for additional factors that may influence consumer behaviour such as brand or type of website. Similarly, τ_t represents month fixed effects and controls for the time effects due to seasonality or trends in e-commerce interest. Finally, εij,t is the error term.

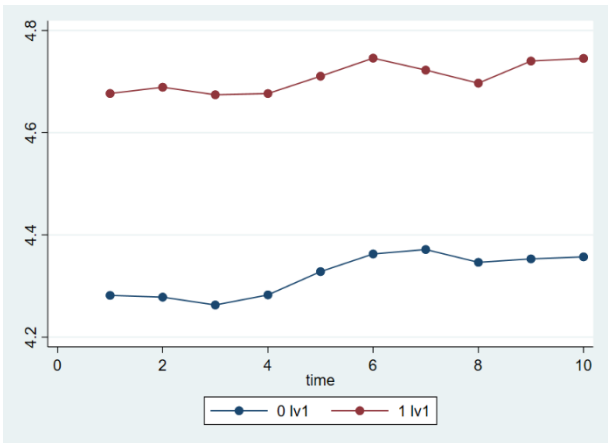
A critical assumption in the diff-in-diff model is that the treatment and the control groups should follow a similar trend before the treatment. In order to test this assumption visually, we plot the mean of the two groups in figure 2. The horizontal axis represents the 10 months prior to entry into force of the GBR. In the left-hand side panel, we show the comparison of the fitted trends pre-treatment, and we see they are quite similar although with some differences in levels. In the right-hand side panel, we show the plot of the treatment and control group means over the pre-treatment years, showing that the parallel trend assumption holds, at least from a visual inspection.

Figure 2: Visual inspection of the parallel trend assumption

Linear



Non-linear



3.2 Estimation Results

In this section we present the results of estimating model (1) under different hypothesis about the distribution of visits in order to appropriately control for visits and local domains. First, in table 2 we show the results under two different assumptions of visits. First, columns 1 and 2 use the total number of visits as the measure of trade. The difference between these two specifications is that the first one only includes the difference-in-difference indicator while the second includes, in addition, several variables that capture trade costs between the country of origin and the country of destination. The variables included are contiguity, the physical distance between the capital cities of the two countries (in logs), and dichotomous variables that indicate if the two countries share language and/or currency. Finally, we also indicate intra-national trade.

As the table shows, the effect of the geo-blocking regulation on cross-border trade, as measured by the total number of visits, is positive and significant. According to these results, the volume of cross-border visits to e-commerce websites post-December 2018 has increased by 2,9% (column 1) to 3,4% (column 2). In this last specification, we also see that the usual trade costs have the expected sign: neighbours tend to trade more, distant countries tend to trade less, and countries sharing a common language and a common currency are also expected to have higher trade volumes among them than with others. Finally, we confirm that home bias –or the preferences of consumers over locally provided goods and services - is relevant, showing the highest coefficient in the estimation.

We implement two variations on this baseline scenario.

First, we eliminate a potential source of bias in the data because many visits to websites may be due to unwanted actions or mistakes made by users. Users may land erroneously in a web shop after following a misleading link, or by clicking an unclear ad referral, among other options. The bounce rate data allow us to know the proportion of these visits that can be considered as "fake" or irrelevant visits with no intention to buy. The results of the estimations using this new variable are presented in columns 3 and 4 of Table 2. Eliminating irrelevant visits from the data gives a strong boost to the impact of the GBR. The effect of the GBR on the volume of visits more than triples, reaching between 11,8% (column 3) and 12,6% (column 4) depending on the model specification. The coefficients associated with trade costs and drivers are also significantly higher.

Second, we restrict the analysis to EU-based websites only. As explained in the introduction, the GBR applies worldwide to both European and non-European websites that sell to European consumers. Table 2 presents results for worldwide trade, i.e., visits of European users to both European and non-European websites. In Table 3 we show the results if we restrict the analysis to EU based e-commerce websites only. They are similar but somewhat weaker in magnitude. The effect of the GBR remains positive and statistically significant indicating that, in the months after the GBR entered into force, visits from EU users to e-commerce websites located in other EU MS increased by 2,5% to 2,9%, depending on the specification, and real visits increased between 9.7% and 13,8%. Figure 3 summarises the results.

Table 2: Estimation results: total and real visits in worldwide trade

	Total visits		Real visits	
	(1)	(2)	(3)	(4)
$(postGB_t \times EU_j^O)$	0.0284***	0.0334***	0.112***	0.119***
	(0.00324)	(0.00324)	(0.00604)	(0.00606)
Contiguity		0.889***		1.067***
		(0.0179)		(0.0277)
Distance (log)		-0.0418***		-0.129***
		(0.00844)		(0.0136)
Common language		0.425***		0.636***
		(0.0142)		(0.0211)
Common currency		0.286***		0.245***
		(0.0178)		(0.0293)
Home market		5.719***		6.980***
		(0.0312)		(0.0440)
Constant	5.380***	5.518***	3.383***	4.198***
	(0.0128)	(0.0685)	(0.0198)	(0.112)

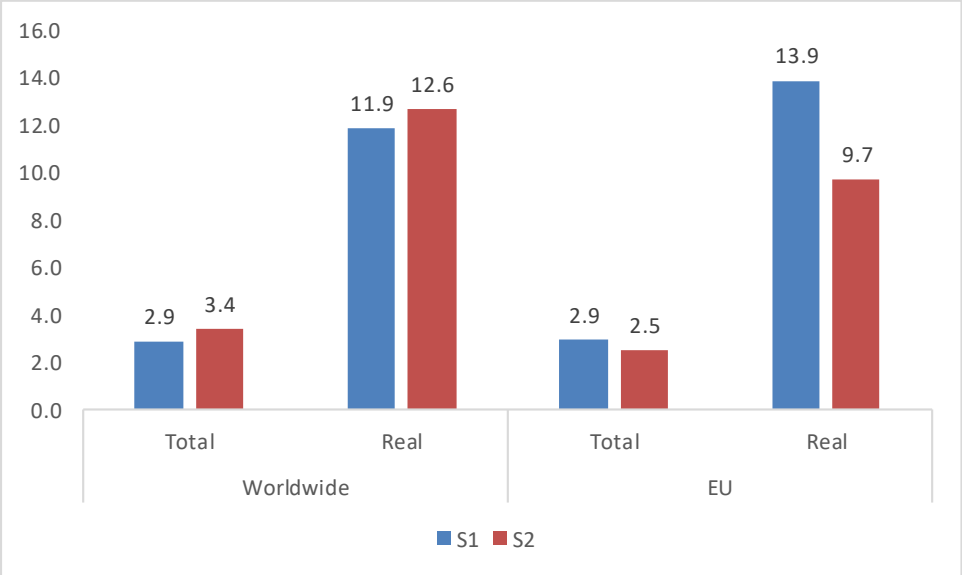
Note: 6,200,034 observations. All specifications include country pair, domain and time fixed effects. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3: Estimation results: total and real visits in European trade

	Total visits		Real visits	
	(1)	(2)	(3)	(4)
$(postGB_t \times EU_j^O)$	0.0288***	0.0248***	0.130***	0.0924***
	(0.00423)	(0.00427)	(0.00842)	(0.00856)
Contiguity		0.604***		0.781***
		(0.0187)		(0.0282)
Distance (log)		-0.177***		-0.318***
		(0.00520)		(0.00919)
Common language		0.572***		0.734***
		(0.0232)		(0.0349)
Common currency		0.386***		0.379***
		(0.0173)		(0.0291)
Home market		5.021***		6.125***
		(0.0301)		(0.0384)
Constant	5.253***	6.416***	3.235***	5.459***
	(0.0138)	(0.0462)	(0.0232)	(0.0789)

Note: 2,748,247 observations. All specifications include country pair, domain and time fixed effects. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Figure 3: Impact on cross-border visits



Note: S1 and S2 refer to specifications 1 and 2 in tables 2 and 3.
Source: own elaboration using estimation results from tables 2 and 3.

As discussed in section 2, one important element in online trade as measured by traffic, has to do with the definition of local websites. We showed in section 2.2 that considering as purely local websites those that receive at least 99% of their total traffic from domestic users changes considerably the shape of the distribution of cross-border transactions. In order to assess to what extent the results presented so far are robust to this choice, we have considered three scenarios for defining a local website, according to whether they receive 99%, 95% or 90% of their real traffic from domestic users.

Table 4 shows the results for worldwide trade. Columns 1 and 2 present the results when we consider that local e-commerce websites are those that receive 99% or more of their real traffic from local users. The results are similar to columns 3 and 4 of Table 1, although the effect of the regulation is a little bit higher, while at the same time, the home market effect also increases. As we move to the right, we "transform" e-commerce websites that may be receiving small amounts of visits from other countries into domestic websites. Hence, we eliminate from the dataset those cross-border transactions that in aggregate, do not make it to the 1%, 5% or 10% of real visits, respectively. At the same time, we increase the number of domestic transactions in relative terms. As a result, the effect of the variable of interest stays at the same level as we move to the right, indicating that the previous results are robust to different specifications of domestic websites. As the proportion of local vs cross-border observations is altered, we also observe that the coefficients associated to bilateral trade costs change. We observe an increase in the effect associated with contiguity and a decrease in the role of distance, common language, common currency, and also the home bias.

Table 4: Different definitions of local websites: real visits in worldwide trade

	Share > 99%		Share > 95%		Share > 90%	
	(1)	(2)	(3)	(4)	(5)	(6)
$(postGB_t \times EU_j^O)$	0.113***	0.121***	0.110***	0.127***	0.102***	0.127***
	(0.00614)	(0.00616)	(0.00738)	(0.00740)	(0.00889)	(0.00889)
Contiguity		1.178***		1.335***		1.419***
		(0.0289)		(0.0399)		(0.0531)
Distance (log)		-0.104***		-0.0841***		-0.0464**
		(0.0141)		(0.0180)		(0.0223)
Common language		0.624***		0.577***		0.500***
		(0.0216)		(0.0255)		(0.0306)
Common currency		0.236***		0.174***		0.138***
		(0.0296)		(0.0376)		(0.0478)
Home market		7.014***		6.999***		6.995***
		(0.0446)		(0.0568)		(0.0717)
Constant	3.433***	4.022***	3.609***	3.993***	3.792***	3.809***
	(0.0204)	(0.115)	(0.0260)	(0.149)	(0.0325)	(0.187)

Note: 6,007,995 observations in columns 1 and 2; 4,368,055 in columns 3 and 4; and 3,232,253 in columns 5 and 6. All specifications include country pair, domain and time fixed effects. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

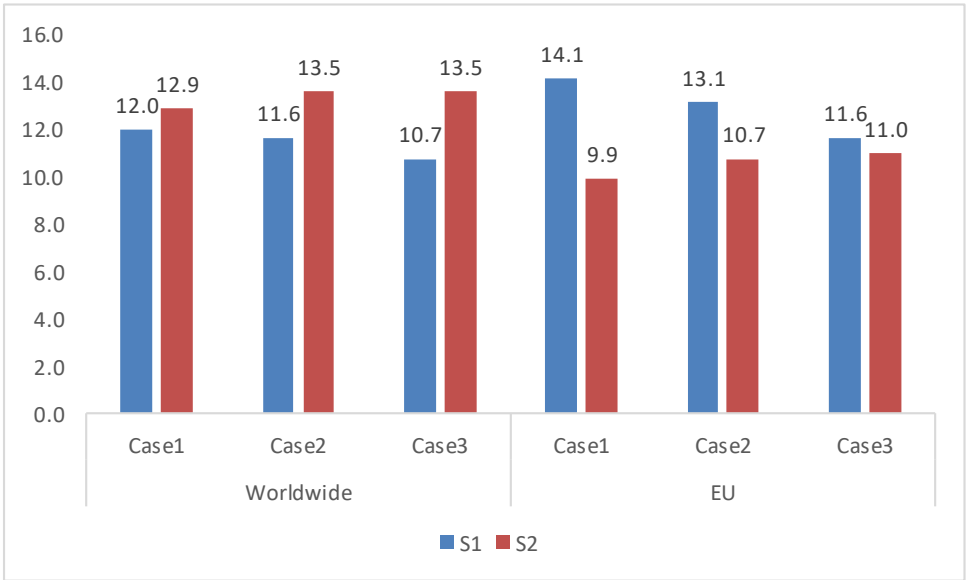
When we focus the analysis on intra EU visits to e-commerce websites, the results taking into account different definitions of local websites are also in line with the previous ones, as indicated in Table 5. Here again, the effect of the geo-blocking regulation is higher as we move from columns 1 and 2, when purely domestic websites are those that receive 99% of their traffic from local users, to columns 5 and 6 where the threshold is set up at 90%. From these results, the volume of intra-EU cross-border visits to e-commerce websites would increase between 9,9% and 14,1%, depending on the specification. On the other hand, the results obtained for the bilateral trade costs and drivers are less straightforward as with the previous results. In this case, we observe that contiguity first increases and then decreases. Both distance and language increase as we move towards a broader definition of domestic websites. Finally, the effects associated to common language and home bias decrease as we more from left to right in the table.

Table 5: Different definitions of local websites: real visits in European trade

	Share > 99%		Share > 95%		Share > 90%	
	(1)	(2)	(3)	(4)	(5)	(6)
$(postGB_t \times EU_j^O)$	0.132***	0.0943***	0.123***	0.102***	0.110***	0.104***
	(0.00846)	(0.00860)	(0.0106)	(0.0107)	(0.0133)	(0.0133)
Contiguity		0.800***		0.845***		0.794***
		(0.0286)		(0.0411)		(0.0566)
Distance (log)		-0.323***		-0.353***		-0.374***
		(0.00928)		(0.0122)		(0.0158)
Common language		0.739***		0.778***		0.788***
		(0.0351)		(0.0426)		(0.0535)
Common currency		0.377***		0.290***		0.216***
		(0.0293)		(0.0375)		(0.0485)
Home market		6.103***		6.004***		5.912***
		(0.0386)		(0.0501)		(0.0653)
Constant	3.247***	5.510***	3.398***	5.855***	3.575***	6.132***
	(0.0234)	(0.0799)	(0.0312)	(0.107)	(0.0400)	(0.140)

Note: 2,727,719 observations in columns 1 and 2; 1,881,823 in columns 3 and 4; and 1,318,766 in columns 5 and 6. All specifications include country pair, domain and time fixed effects. Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Figure 4: Impact of GBR on cross-border visits from different definitions of local websites (%)



Note: S1 and S2 refer to specifications 1 and 2 in tables 4 and 5. The different cases refer to different definitions of local domains: Case 1 defines a local domain if its share is greater than 99%, Case 2 defines local domains when the share of traffic is greater than 95%, and Case 3 uses a definition of local domains with a share above 90%>
Source: own elaboration using estimation results from tables 2 and 3.

4 Concluding Remarks

This paper presents an evaluation of the GBR by looking at the evolution of online e-commerce trade between many countries, including the EU28. It is based on the evolution of internet traffic and as such it does not attach a monetary value to these trade flows. In the data, the majority of the identified e-commerce websites belong to the US. However, the number of websites in the EU is also relevant. The data includes close to ten thousand e-commerce websites, located in 111 different countries, and receiving traffic from 168 countries.

In order to test whether the GBR had an effect in stimulating cross-border trade (measured by internet traffic), we adopt a difference-in-difference gravity approach. Here, we can capture bilateral trade between users located in one country and an e-commerce website located in a different country. In this setting, we can also add a "treatment effect" that controls for the fact that the regulation entered in to force on a specific date, and that it should affect only a targeted group, as defined by the regulation.

The econometric estimates obtained under different specifications while controlling for potential bias in the measure of trade and the definition of the scope of activity of e-commerce websites, indicate that the GBR had a positive impact on cross-border internet visits to e-commerce websites. Since there is a relationship between visits and real purchases, we conjecture that an increase in purchases has occurred too. These results hold when we consider trade directed to e-commerce websites located anywhere in the world, as well as when the analysis is restricted to intra-EU trade.

The size of the effects varies depending on model and data specifications. Using total visits data, we find that the GBR induces an increase in total cross-border visits of 3% for worldwide trade and 2,5% in the case of intra-EU online trade. When we restrict the analysis to real visits (total visits corrected for the bounce rate), we find that the regulation increased real cross-border e-commerce activity inside the EU by 9,2% to 13%, depending on model specifications. It increased cross-border trade between EU consumers and e-commerce sites anywhere in the world by 11,2% to 11.9%. Applying different thresholds for the definition of purely domestic websites slightly weakens the results for intra-EU cross-border trade and gives it a further boost for worldwide cross-border trade. We conclude that the GBR has effectively facilitated cross-border online access to offers in the EU.

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