European Commission

JRC TECHNICAL REPORTS

Institute for Prospective Technological Studies
Digital Economy Working Paper 2016/02

The Economic Impact of Removing Geo-blocking Restrictions in the EU Digital Single Market

Néstor Duch-Brown, Bertin Martens

2016

Joint Research Centre

The Economic Impact of Removing Geo-blocking Restrictions in the EU Digital Single Market

This publication is a Working Paper by the Joint Research Centre of the European Commission. It results from the Digital Economy Research Programme at the JRC Institute for Prospective Technological Studies, which carries out economic research on information society and EU Digital Agenda policy issues, with a focus on growth, jobs and innovation in the Single Market. The Digital Economy Research Programme is co-financed by the Directorate General Communications Networks, Content and Technology.

JRC Science Hub
https://ec.europa.eu/jrc

JRC101100

ISSN 1831-9408 (online)

How to cite: Néstor Duch-Brown, Bertin Martens; The Economic Impact of Removing Geo-blocking Restrictions in the EU Digital Single Market. Institute for Prospective Technological Studies, Joint Research Centre. Digital Economy Working Paper 2016/02.

Table of Contents

Abstract 2
1. Introduction 3
2. The empirical model 4
2.1. International price differences 5
2.2. The empirical approach 5
2.3 The model 6
2.3.1 Demand 6
2.3.2. Supply side: oligopolistic interactions 8
2.4. Counterfactuals 9
2.5. Welfare 11
3. Data 12
3.1. Price and quantity data 12
3.2. Complementary data 13
4. Results 14
4.1 Demand estimation 14
4.2. Simulations 16
4.2.1. The full removal scenario 16
4.2.2. The "shop like a local" policy option 17
5. Extension to all online sales 17
6. Conclusions 18
References 20
List of Figures 22
List of Tables 22

Abstract

In this paper, we present the results of a study which investigated the welfare impact of lifting geo-blocking restrictions to cross-border e-commerce in the EU, using a dataset for consumer electronics products in ten European countries for the period 2012-2105. We simulated two counterfactual scenarios where geo-blocking is either fully or only indirectly removed. This would allow consumers to arbitrage, taking advantage of price differences, and to expand product variety through imports. We computed the welfare effects, as changes in both consumer and producer surpluses. Finally, we extrapolated these partial results to all online sales in the EU28. The results indicate that both consumers and producers would gain from removing geo-blocking restrictions. Smaller countries would benefit comparatively more than larger countries.

1. Introduction

The importance of electronic commerce as a distribution channel for goods and services has increased steadily since the mid-90s. It represented 7.5% of total retail sales in the EU28 in 2015. According to Eurostat, 53% of the EU28 population purchased online in 2015, but only 16% made a cross-border purchase online. e-Commerce has gained ground well for domestic transactions but less so in cross-border transactions. To some extent this is natural. Consumers have a well-known preference for home markets and physical and cultural distance-related trade costs reduce cross-border trade. It is often believed that Internet-based transactions know no borders. Consumers can search the entire world for the products that best match their preferences and firms should view the entire world as the potential market for their products. In reality, both consumers and firms face barriers to cross-border online transactions. On the supply side, firms face additional costs related to providing product guarantees and settling cross-border disputes, and administrative costs created by regulatory differentiation across countries in a variety of areas (Duch-Brown & Martens, 2015a). Consumers are motivated to go cross-border in search of better prices and more product variety but have worries about their personal and payment card data and delivery conditions (Cardona et al., 2015). Moreover there are legal barriers to trade in several products that are subject to specific national laws (such as copyright-related digital content or restrictions on trade in specific products and/or services like gambling, tobacco or guns).

The European Commission has placed the achievement of a truly European Digital Single Market (DSM) high on the policy priorities list. The DSM policy agenda includes several measures to reduce trade costs and facilitate cross-border online trade in goods, services and media content, including initiatives to reduce parcel delivery costs, facilitate the management of differences in VAT rates, open up cross-border access to copyright-protected media content, etc.

The geo-blocking initiative targets a very specific type of obstacle to cross-border online transactions: the deliberate decision by online sellers to restrict access to websites based on the users' country of residence. Geo-blocking - and other online commercial practises such as geo-targeting - is based on recently developed geo-location tools which allow websites to identify the physical location of their visitors. These technologies may have positive effects for e-commerce because they enable localised advertising and search and help in fraud prevention, among other reasons. Additionally, geo-location can be legitimate and help to comply with restrictions in trade in national legislation. However, geo-location tools can also be used for commercial reasons to erect barriers in an otherwise borderless environment. A recent Mystery Shopping Survey (MSS) carried out on behalf of the European Commission (GfK, 2016) shows that, on average, 63% of all attempts at online cross-border purchase are blocked by sellers at different stages of the online shopping process.

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 boost their 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 results from an e-commerce sector inquiry by the EU competition authority[1] show that vertical restraints account for a small minority of geo-blocking cases only. The vast majority of geo-blocking cases for physical goods are self-imposed restrictions by retailers that are not related to

[1] SWD(2016) 70 final: Geo-blocking practices in e-commerce. Issues paper presenting initial findings of the e-commerce sector inquiry conducted by the Directorate-General for Competition.

regulatory issues. It is not clear yet to what extent geographical market segmentation by online retailers plays a role in geo-blocking, but it seems likely that geo-blocking is mostly caused by the reluctance of online retailers to sell cross-border either because they subjectively perceive trade costs to be prohibitively high or because of commercial strategies that aim to impose geographical market segmentation.

In our study, we therefore modelled geo-blocking trade barriers as infinitely high trade costs. In the empirical model simulations, we translated a removal of geo-blocking restrictions as a reduction in trade costs to more realistic levels. We looked at the potential welfare effects of policy initiatives to remove geo-blocking practices in the EU DSM. We simulate two scenarios. In the first "full removal" scenario, we replaced the infinite trade cost imposed by geo-blocking with an estimated real trade cost, based essentially on parcel delivery costs plus an additional cost margin. We then observed the resulting increase in trade volumes and consumer and producer welfare. This scenario imposes adaptation costs on businesses. In a second "shop like a local" scenario, sellers would have no obligation to deliver cross-border. Instead, they would deliver to a domestic address and the buyer would arrange delivery to his home address via an intermediary service provider. This would keep trade costs low for sellers. We modelled this with an additional fixed fee per transaction for the intermediary service provider.

We used a database on sales of four electronics products (smartphones, tablets, laptops and desktop computers) in 10 EU countries. The database contained information on prices, sales volumes and product characteristics. The Mystery Shopping survey has shown that consumer electronics is one of the sectors where geo-blocking is most prevalent (79%, well above the average of 63%). The empirical modelling was carried out as follows. First, we estimated a consumer demand model with product differentiation to capture preferences and substitution patterns. Second, we added an oligopolistic supply side to recover marginal costs and profits. Third, we performed a series of simulations to analyse the equilibrium described by the data and some counterfactuals where we recreated a world without geo-blocking. Fourth, we computed the welfare effects of removing geo-blocking in terms of consumer and producer surplus. Finally, we extrapolated the results of these four product categories to all e-commerce and the EU28.

The paper is structured as follows. Section 2, explains the model used, focusing on the definition of the different counterfactuals to be estimated, based on the different policy scenarios considered. Section 3 describes the data. Section 4 presents the results. Section 5 extends the results for the original four product categories in 10 countries, to all online sales in the EU28. Finally, Section 6 offers some conclusions.

2. The empirical model

Ideally, we would have estimated a standard trade model that links the observed volume of bilateral cross-border trade by product category to sources of real trade costs. In addition we would have added unilateral geo-blocking decisions as a separate factor to explain observed trade for different product groups. However, no detailed online cross-border trade data by country pair and product category were available for the EU28. Moreover, we had no data that would have enabled us to separate real trade costs from trade-restricting geographical market fragmentation practices and other reasons for geo-blocking decisions.

In our alternative approach, we assumed that the decision to geo-block access to a website is driven by two factors: either the seller has a subjective perception of prohibitively high cross-border trade costs or he imposes an infinitely high trade costs by geo-blocking access in order to practice geographical market segmentation. We did not take into account vertical restraints imposed by the product manufacturer that represent only a small minority of cases. We observed price and variety differences across country markets and estimated a realistic level of real trade costs. We then allowed arbitrage trade to occur on the basis of these real trade costs, including shipping costs for goods across borders, and possibly other sources of trade costs.

2.1. International price differences

Firms that operate internationally and face segmented markets often charge different prices for the same product in different countries. These price differences may be due to cost differences, exchange rate fluctuations, and/or price discrimination, where firms set prices according to what consumers are willing to pay for the product. There is extensive literature on international price differences (see Bergemann et al., 2015 and references therein). However, nearly all of this research has focused on traditional markets and physical goods, where price arbitrage — buying in a low-priced market to sell in a higher-priced market — tends to be relatively costly because of transaction costs (including search and transportation costs). In the case of e-commerce in physical goods, search costs can be lower but physical transportation costs do not change with respect to traditional trade. Comparing international prices for similar products in online stores relative to prices in traditional stores, Gorodnichenko and Talavera (2014) find that the duration of price spells are shorter; the size of price changes are smaller; exchange rate pass-through is larger; the speed of price adjustment is faster; and that differences in pass-through and the speed of adjustment are related to basic properties of the products considered and to the markets in which these goods are sold. Most of these findings are consistent with reduced frictions and increased integration in online markets with respect to traditional markets. Cavallo (2016) compares online and offline prices simultaneously collected from the websites and physical stores of 56 large multi-channel retailers in ten countries. He found that price levels are identical about 72% of the time for products sold on both channels, with significant heterogeneity across countries, sectors, and retailers[2]. One explanation relies on the possibility of arbitrage. In theory, pressure for international price convergence in online markets is especially strong due to the existence of ubiquitous price comparison websites and reduced search costs. Hence, the geographical location of consumers and stores should be largely irrelevant in e-commerce, where administrative borders and similar frictions are likely to play a much more limited role. However, consumers could arbitrage themselves, taking advantage of price, quality and variety differences, only in the absence of geo-blocking. These purchases can be equated to parallel imports, i.e., goods imported without the authorisation of the manufacturer, and are advocated worldwide as a means of undermining international price discrimination. However, from a theoretical point of view the welfare effects are ambiguous (Mueller-Langer, 2012) and empirical evidence is needed for a real assessment.

2.2. The empirical approach

This alternative approach is grounded in the tradition of structural estimation in empirical industrial organisation. It uses discrete choice models for the estimation of demand and adds a simulated supply side to compute the industry equilibrium given by the observed data. Moreover, by changing supply conditions, this framework allows us to design counterfactuals that simulate policy changes. On the demand side, discrete choice models of product differentiation have gained considerable importance in empirical work in economics over the past two decades. Their main value resides in the fact that by treating products as bundles of characteristics, they offer the possibility of uncovering rich substitution patterns with a limited number of parameters.

Berry (1994) developed a framework to estimate a class of discrete choice models with unobserved consumer heterogeneity based on aggregate sales data. This framework includes the random coefficient logit model (Berry, Levinsohn and Pakes 1995), the

[2] See also Cavallo and Rigobon (2016) for further analysis of online prices.

nested logit model (with special random coefficients on discrete product characteristics) and the logit model (without consumer heterogeneity).

The logit and nested logit models are popular because of their computational simplicity. At the same time, they have been criticized because they yield restrictive substitution patterns. In particular, the nested logit model allows products of the same group to be closer substitutes than products of different groups, but the aggregate substitution patterns remain restrictive. Cross-price elasticities within the same group are symmetric, and substitution outside a group is symmetric to all other groups. In contrast, the random coefficients logit model incorporates random coefficients for continuously measured product characteristics. This can create more flexible substitution patterns, where products tend to be closer substitutes as they have more similar continuous characteristics. However, the random coefficients model is computationally more demanding, and several recent papers have studied a variety of problems relating to its numerical performance (Knittel and Metaxoglou, 2008; Dubé, Fox and Su, 2012; and Judd and Skrainka, 2011).

To study a particular industry, the empirical industrial organisation approach proposes and estimates structural models of demand and supply where firms behave strategically. These models typically have the following components: a model of consumer behaviour or demand; a specification of firms' costs; a model of competition between firms in prices or quantities; and a model of competition between firms in some form of investment such as capacity, advertising, quality, or product characteristics. The parameters of these models are structural in the sense that they describe consumer preferences, production technology, and institutional constraints. This class of econometric models is a useful tool to evaluate the effects of public policies in oligopoly industries, to understand business strategies, or to identify collusive or anti-competitive behaviour. The approach used by this type of structural model, and the one we follow in this paper is counterfactual, in the sense that none of the scenarios that we consider have been actually implemented, though they have been proposed and discussed in the Impact Assessment Report[3].

2.3 The model

The following sub-sections explain the model we employed to study the welfare implications of removing geo-blocking restrictions for both consumers and producers. The demand side is described first and then the oligopolistic supply side of the market.

2.3.1 Demand

Demand for four different consumer electronics product categories was considered separately. The product categories were: Smartphones, Tablets, Desktop computers and Laptop computers. Consumers could decide not to buy a product at all, in which case they could spend their money on other goods. Alternatively, they could decide to buy an electronic product if the utility of doing so is positive. Since each product category included a large variety of vertically-differentiated products, consumers first choose which quality segment best matches their preferences subject to their budget constraints. Second, consumers could also decide to purchase these products in a traditional physical shop (offline) or through an online retailer. Since both steps were well defined in terms of categorical decisions, substitution patterns were specified by means of a two-level nested logit model. In this case, the market was segmented according to two discrete dimensions: quality, which could be either high or low, and the distribution channel, which was either offline or online[4].

---

3 For a more detailed description of these models, see Ackerberg et al. (2006).

4 In this respect, Grigolon and Verboven (2014) suggest that the choice between the more tractable nested logit model and the computationally more complex random coefficients model depend on the application. In the present analysis of removing geo-blocking restrictions,

More specifically, the specified nested model works as follows. We assumed there are L_c potential consumers in country *c (c=1,...,10)*. Each consumer *i* in country *c* can choose among J_c differentiated products. Here, a "product" is defined as the combination of the product itself (defined in terms of brand and model) and the distribution channel, but not all the electronic products are necessarily sold through both channels (online and offline). Hence, the choice set is split into different groups or nests g, one referring to the outside good and the rest to different quality categories (low to high quality). Except for the outside good category, each group is further divided in subgroups h of g, which refer to the distribution channel within the quality category. For example, in the case of media tablets, desktop computers and mobile computers, the groups are categories of random access memory (RAM). Similarly, in the case of smartphones, weight is the variable that defines the group. However, in all the cases the subgroups indicate the offline or online sales channel within each quality category.

Every month, a consumer *i* located in country *c* has the following indirect utility for product j:

$$u_{ijc} = \underbrace{x_{jc}\beta - \alpha p_{jc} + \xi_{jc}}_{\delta_{jc}} + \zeta_{igc} + (1-\sigma_1)\zeta_{ihgc} + (1-\sigma_1)(1-\sigma_2)\varepsilon_{ijc} \quad (1)$$

where δ_{jc} is the mean utility of product j in country c. For the outside good (j=0), the mean utility is normalised to zero ($\delta_{0c} = 0$). For the other goods, the mean utility depends on a vector of observed product characteristics x_{jc} (such as speed, memory, different measures of size, resolution, and processor, among others[5]), on the price of product j in country c (p_{jc}), and on an unobserved quality term (ξ_{jc}). The other components of the indirect utility function capture the individual specific-deviation of utility around that mean, here modelled as a weighted sum of three random variables: a common valuation across products in the same group g (ζ_{igc}); a common valuation for all products in the same subgroup h of g (ζ_{ihgc}); and an individual-specific valuation for product j (ε_{ijc}). As is standard in this type of models, the random variable ε_{ijc} is i.i.d. extreme value, and ζ_{ihgc} and ζ_{igc} have distributions such that the appropriate sums are i.i.d. extreme value (Cardell, 1997).

In the two-level nested logit, the nesting parameters σ_1 and σ_2 measure the degree of preference correlation for products of the same subgroup and group. If the demand function is to satisfy the axioms of random utility maximisation, then we should observe that $0 \le \sigma_2 \le \sigma_1 \le 1$. However, if $\sigma_1=1$, consumers perceive all products of the same subgroup (channel) as perfect substitutes. If in addition $\sigma_2=1$, consumers view all products of the same group (quality) as perfect substitutes. At the other extreme, if $\sigma_1=\sigma_2=0$, there is no preference correlation within subgroups and groups. In this last case, the model is simplified to a simple logit model, where consumers consider all products as symmetric substitutes. More generally, when $0<\sigma_2<\sigma_1<1$, products in the same quality category and distribution channel are the closest substitutes; products in a different distribution channel but the same quality category are weaker substitutes; and products of a different quality category are the weakest substitutes. The nesting parameters thus enable one to assess to what extent consumers view products in the same distribution channel and/or quality category as closer substitutes.

From this specification, the choice probabilities for every product j in every country c - including the probability of purchasing the outside good 0 – can be obtained, assuming that consumers choose the product with the highest utility (McFadden, 1978). Aggregating individual choices, the choice probabilities can be equated to market shares

consumer heterogeneity regarding the offline/online origin is particularly relevant, and the nested logit model should capture this reasonably well. Needless to say, the model used would gain from a more flexible specification of substitution patterns.

5 See Table 2 for a complete list of all these characteristics, by product category.

(relative to the potential market L_c). Here, we have assumed that the market size for each product category is represented by 40% of country population.[6] The market share system can be inverted[7] to obtain the following estimating equation:

$$\ln s_{jc}/s_{0c} = x_{jc}\beta - \alpha p_{jc} + \sigma_1 \ln s_{j|hgc} + \sigma_2 \ln s_{h|gc} + \xi_{jc} \quad (2)$$

where $s_{jc} = q_{jc}/L_c$ is the market share of product *j* (sales volume divided by potential market of country *c*); s_{0c} is the market share of the outside good; $s_{j|hgc}$ is the market share of product *j* in the subgroup *h* of *g*; and $s_{h|gc}$ is the market share of the subgroup *h* within the group *g*.

The demand model specified in (2) can be used to compute own and cross-price elasticities of demand. Following Berry (1994) and Verboven (1996), own-price elasticities are defined by:

$$\frac{\partial s_{jt}}{\partial p_{jt}}\frac{p_{jt}}{s_{jt}} = -\alpha p_{jt}\left(-\frac{1}{1-\sigma_1} + \left(\frac{1}{1-\sigma_1} - \frac{1}{1-\sigma_2}\right)s_{j|hg} + \left(\frac{\sigma_2}{1-\sigma_2}\right)s_{j|g} - s_j\right) \quad (3a)$$

The cross-price elasticities for products in the same sub-group (channel) are defined by:

$$\frac{\partial s_{jt}}{\partial p_{kt}}\frac{p_{kt}}{s_{jt}} = -\alpha p_{jt}\left(\left(\frac{1}{1-\sigma_1} - \frac{1}{1-\sigma_2}\right)s_{j|hg} + \left(\frac{\sigma_2}{1-\sigma_2}\right)s_{j|g} - s_j\right) \quad (3b)$$

Similarly, the cross-price elasticities for products in the same group (quality) are given by:

$$\frac{\partial s_{jt}}{\partial p_{kt}}\frac{p_{kt}}{s_{jt}} = -\alpha p_{jt} + \left(\left(\frac{\sigma_2}{1-\sigma_2}\right)s_{j|g} - s_j\right) \quad (3c)$$

Finally, the cross-price elasticities with all products outside the own quality group are:

$$\frac{\partial s_{jt}}{\partial p_{kt}}\frac{p_{kt}}{s_{jt}} = \alpha p_{jt} s_j \quad (3d)$$

These equations confirm how the preference correlations translate into aggregate substitution patterns. Products in the same subgroup have higher cross-price elasticity than products in a different subgroup – especially if the gap between σ_1 and σ_2 is wide–. We can therefore assess the extent to which changes in the online distribution channel – such as the removal of geo-blocking practices commonly employed by retailers – affect not only the traditional distribution channel but also the online channel itself. Moreover, this framework allows us to analyse policy counterfactuals, as described below.

2.3.2. Supply side: oligopolistic interactions

To be able to infer marginal costs and the current economic profits, and also to perform policy counterfactuals to compute the impact of removing geo-blocking restrictions, we add an oligopolistic supply side to the model[8]. The data does not include information about retailers, but includes information about brands. Although there is no direct correspondence between brands and manufacturers, we will define each brand as a firm. This assumption introduces some degree of competition in each country, since the

---

[6] In general, the types of products which we consider are purchased by consumers in a single unit. Hence, we can define a share of population as market size. Alternative definitions of the market size (30%, 35%, 45%, and 50%) give similar results.

[7] As shown by Berry (1994) for the nested logit and by Verboven (1996) for the two-level nested logit.

[8] Unfortunately, the data does not allow us to distinguish between manufacturers and retailers. However, most empirical models that explicitly model manufacturer-retailer relationships without detailed data (see, among others, Sudhir, 2001; Brenkers and Verboven, 2006; and Villas-Boas, 2007), can only uncover the sum of the manufacturer's and retailer's marginal costs, making it equivalent to a vertical integrated supply side, as in our case.

number of brands sold by country is different, but normally large. Alternatively, we could have assumed a representative firm (retailer) by country. However, in the presence of segmented markets, these would have behaved as domestic monopolies and competition would have been less intense. In this section, for simplicity's sake, we remove the country subscript *c*. We define F_f as the set of products sold by firm *f*. Then, profits of firm f are given by:

$$\Pi_f(\mathrm{p}) = \sum_{k \in F_f} (p_k - c_k) s_k(\mathrm{p}) L \tag{4}$$

In (4), c_k is the marginal cost of product *k*; $s_k(\mathrm{p})$ is product *k*'s market share as a function of the price vector, and *L* is market size measured as a proportion of population. If we assume that firms choose prices to maximize profits, then the Bertrand-Nash equilibrium[9] for products *j*=1,…,*J* is given by the system of first-order conditions:

$$s_j(\mathrm{p}) + \sum_{k \in F_f} (p_k - c_k) \frac{\partial s_k(\mathrm{p})}{\partial p_j} = 0 \tag{5}$$

In vector notation, the system can be written as:

$$s(\mathrm{p}) + [\theta^F \cdot \Delta(\mathrm{p})](\mathrm{p} - \mathrm{c}) = 0 \tag{6}$$

where p is the *J*×1 price vector, s(p) is the *J*×1 market share vector, $\Delta(\mathrm{p}) \equiv \partial \mathrm{q}(\mathrm{p})/\partial \mathrm{p}'$ is a *J*×*J* matrix of own- and cross-price derivatives, θ^F is a *J*×*J* block-diagonal ownership matrix, with ones for products of the same firm and zeros otherwise. Finally, · denotes the element-by-element (Hadamard) multiplication of two matrices.

At the current price and market shares, the system of first-order conditions (6) can be inverted to compute the current marginal costs c^0:

$$\mathrm{c}^0 = p + (\theta^F \cdot \Delta)^{-1} \mathrm{s} \tag{7}$$

Equation (7) represents the observed equilibrium, as characterised by the data. It basically assumes a segmented EU market where there is limited international competition, responsible for both limited cross-border online trade and international price discrimination. Clearly, the estimation and identification of the marginal costs rely on the demand estimates and on the assumption of Bertrand-Nash competition.

2.4. Counterfactuals

Within this framework, the system of first-order conditions (6) can be used to perform policy counterfactuals. In particular, we look at the welfare effects of removing geo-blocking restrictions that obstruct cross-border e-commerce in the EU DSM. We simulate two counterfactuals: (a) the complete removal of geo-blocking restrictions and (b) an indirect removal by means of a "shop like a local" scenario.

The main counterfactual completely removes all geo-blocking restrictions and allows consumers to buy online from the cheapest provider, thus partially arbitraging away price differentials, subject to trade costs. In addition, consumers in country c are able to access a wider choice of new products that were not accessible because of geo-blocking. This matches the findings from online surveys that consumers are motivated to go cross-border by lower prices, more quality and expanded variety (Cardona and Martens, 2015). The model is used to compute the counterfactual equilibrium prices when online products become accessible across the border and compute the counterfactual sales,

[9] Following the literature, we assume that this Nash equilibrium exists. See Anderson et al. (1992) for the proof of existence for the nested logit model with multiproduct firms assuming symmetry.

profits, and consumer surplus. The model takes into account both transport costs for every country pair as well as country-specific VAT[10] rates for each product category.

For transport costs, we use the official international postal tariffs taken from Meschi et al (2012), adjusted for the physical weight of the product to be shipped. On average, these official parcel tariffs will overestimate the true parcel delivery cost. Consumers who order in large web shops that have their own logistics system or bulk shipment agreements with parcel delivery services will benefit from substantially lower shipment costs. We nevertheless stick to these overestimated parcel delivery costs in order to compensate for other types of trade costs that are not taken into account by the model, including the cost of language barriers and consumer preferences for home markets. Moreover, we add a 25% additional trade cost margin to the parcel delivery costs to account for other sources of trade frictions. We know that trade costs play an important role in online cross-border trade (Gomez et al., 2014), possibly even more so than in offline trade.

The alternative "shop like a local" scenario allows online sellers to avoid additional cross-border trade costs by delivering the goods to a domestic address in the country where the shop is established. Hence, the buyer has to arrange for pick-up, either in person or through an intermediary. Commercial intermediaries of this kind already exist and provide a way of overcoming geo-blocking restrictions. They charge an additional cost for this task. In this counterfactual simulation, we add a fixed fee of 20€ per purchase, over and above physical transport costs, to capture the cost of intermediary delivery services.

These counterfactuals can be conceptualised as a two-stage game. In the first stage, consumers change behaviour and opt for price and variety arbitrage across country markets. However, both online and offline sellers will not remain passive and will respond to the new market situation in the second stage of the game. Offline sellers will see trade shifting to lower-priced online domestic and cross-border shops and will respond by adjusting their prices for offline sales in order to remain competitive. Domestic online sellers will also adapt prices to respond to increased competition from online shops abroad. On the other hand, online sellers will see more export opportunities and expanded profit margins because of economies of scale. The magnitude of price adjustments is determined by the price elasticities of supply and demand and production costs. At the moment, the model does not take into account the fact that sellers may start making losses on some products because of increased price competition and exit the market. Nor does it account for the fact that, in order to export, firms may incur additional costs. Some smaller sellers may also merge to gain more from economies of scale and become more competitive.

The model includes the impact of lower product prices on consumer purchasing power and estimate the resulting increase in total consumption. Price arbitrage will induce a trade substitution effect that shifts some consumer expenditure away from domestic online and offline markets towards imports. It will also generate a trade expansion effect driven by lower prices that stimulate consumers to buy more.

In technical terms (see Duso et al., 2014), the counterfactual assumes that the choice set in a scenario without geo-blocking is different to that of the status-quo scenario (with geo-blocking). Specifically, we define the counterfactual choice set - where a number of products are added to the observed choice sets - as $J_t^{sim} = J_t' + I_t$, where J_t' is the modified domestic choice set, where a number of highly priced products sold online will now

[10] Since January 2015, online sellers must charge the VAT rate in the country of residence of the consumer, not the rate in the country of the seller. The management of multiple VAT rates increases administrative costs for exporters, especially SMEs. A new Single Stop Shop VAT clearing house proposal would reduce test costs again and is being considered but it is not operational yet. As a result, online sellers are in a transition period, with higher VAT administration costs for exports for the time being.

disappear, and I_t is the number of "imported" products in time/market t. This vector is defined as

$$I_t = J_t^* + \tilde{J}_t \tag{8}$$

where J_t^* represents the set of products already available in country c, which now can be purchased elsewhere at a lower price, and $\tilde{J}_t$ is the set of new varieties accessible to consumers, who were geo-blocked before, located in c. In order to define $\tilde{J}_t$, we assume that consumers will search across the border for products that are similar – in terms of physical characteristics – to those originally available in the domestic market[11]. Hence, $\tilde{J}_t$ will be populated by all those products that are available in any other country except country c, and which are similar in terms of the observed preferences for product j in country c. Here, similarity has been defined as:

$$D_{\delta_c} = \{\|\delta_{jc} - \delta_{i-c}\| < r\} \tag{9}$$

where D_{δ_c} denotes the set of products matched to product j available in country c with a mean utility of δ_{jc}, δ_{i-c} is the mean utility of product i available in any country except country c, and r is defined as one standard deviation of δ_{jc}. Hence, all products available in a country different to country c with an estimated mean utility falling within a radius r from δ_{jc} are matched to the product j in country c.

Accordingly, the J_t^{sim} nested-logit demand functions are defined as:

$$q_{jt}(\mathbf{p}_t^{sim}, \hat{\delta}_t) = L_t s_{jt}(\mathbf{p}_t^{sim}, \hat{\delta}_t) s_{j|hg}(\mathbf{p}_t^{sim}, \hat{\delta}_t) s_{h|g}(p_t^{sim}, \hat{\delta}_t) \tag{10}$$

where $\mathbf{p}_t^{sim}$ is the new simulated price vector where the price for product j in country c has been replaced by the price from the cheapest provider, augmented by the parcel cost corresponding to the country pair (c, w), as well as the VAT difference (VATd-VATo) for the country pair (c,w); and augmented by the prices of new available products in country c.

Under this specification, the new first-order conditions are:

$$s(\mathbf{p}_t^{sim}, \hat{\delta}_t) + [\theta^F \cdot \Delta(\mathbf{p}_t^{sim}, \hat{\delta}_t)](\mathbf{p}_t^{sim} - \hat{\mathbf{c}}) = 0 \tag{11}$$

From equation (11), it is possible to determine the equilibrium simulated prices $\mathbf{p}_t^{sim}$ and simulated quantities $q_{jt}(\mathbf{p}_t^{sim})$ by using a Newton algorithm of equations (10) and (11). Using the new equilibrium, we can compute consumer and producer surplus, and compare them with the corresponding welfare measures from the status-quo scenario. This is described in the next sub-section.

2.5. Welfare

Using the specified demand model, it is possible to compute consumer surplus and profits (see McFadden, 1978; or Anderson et al., 1992). In the case of the two-level nested logit model, this can be done using:

$$CS(\mathbf{p}) = \frac{1}{\hat{\alpha}} ln\left(1 + \sum_{g=1}^{g}\left(\sum_{h=1}^{h} D_{h|g}^{\frac{(1-\hat{\sigma}_1)}{(1-\hat{\sigma}_2)}}\right)^{(1-\hat{\sigma}_2)}\right) L \tag{12}$$

where $D_{h|g,t} = \sum_{jt\in h|g} exp\left(\frac{\delta_{jt}}{1-\sigma_1}\right)$. Moreover, the change in the consumer surplus due to the transition to the status quo scenario to the counterfactual scenario is given by:

$$\Delta CS = CS(\mathbf{p}_t^{sim}) - CS(\mathbf{p}) \tag{13}$$

[11] This assumption relies on the belief that both manufacturers and retailers decide their product catalogues to match the idiosyncratic preferences for these products in each country.

In the case of firms, we can estimate variable profits as:

$$VP(\mathbf{p}) = \sum_{j \in F_f} (p_k - c_k) q_k(\mathbf{p}) \quad (14)$$

Similarly, the change in profits from one scenario to the other can be computed as:

$$\Delta VP = VP(\mathbf{p}_t^{sim}) - VP(\mathbf{p}) \quad (15)$$

The change in total welfare is the sum of total consumer surplus and producer surplus. Although we use VAT rates, we do not compute tax revenues. Moreover, the exogenous variables in the model are assumed not to change after removing geo-blocking. In particular, the exogenous part of utility, i.e., $\delta_j = x_{jc}\beta + \xi_{jc}$, and marginal costs remain unchanged for all products j. The focus is thus entirely on the quantification of the allocative effects of removing geo-blocking. A more complete analysis would also incorporate the efficiency effects, which may enter through changes in utility, marginal costs or fixed costs.

3. Data

The data used in this paper comes from three different sources: i) detailed online and offline sales and prices data for four electronics goods in 10 EU Member States, covering the period from January 2012 to March 2015, from the marketing data company GfK; ii) data on price differences and the probability of geo-blocking for other product categories from the 2015 Mystery Shopping Survey; and iii) general e-commerce and retail market data for the EU Member States, from Euromonitor's Passport Database.

3.1. Price and quantity data

The main database used in this paper comes from GfK Retail and Technology and includes information about prices, sales and characteristics on four different consumer-electronics product categories in ten EU countries. The four product categories are: smartphones, tablets, desktop computers and mobile personal computers. The ten EU countries are: Belgium, Denmark, France, Germany, Great Britain, Italy, the Netherlands, Poland, Slovakia and Spain, and together represent around 85% of the EU28 markets for the different product categories considered (Euromonitor International). This source indicates that these 10 countries represented, in 2014, 84.4% of the EU28 market for smartphones, 84.8% for laptops, 85.9% for tablets and 85.0% for desktops. These data have been collected directly from a large number of traditional and online retailers on a monthly basis covering the period between January 2012 and March 2015.

The original data consists of 173,055 observations for tablets, 307,477 observations for smartphones, 609,086 observations for desktops and 865,825 for mobile portable computers, which were sold online and/or offline in ten different EU countries in the period January 2012 to March 2015. Table 1 indicates that the number of brands and the number of models is quite large. In addition, it also shows that a small number of brands represent a very large share of sales. Hence, to avoid biased coefficients in the estimations due to many brands and products with very low shares, we have cleaned the data in several ways. First, we dropped duplicates in terms of all the variables. Second, we dropped some observations with negative prices and negative quantities[12]. Third, since the majority of models have very small sales, we dropped those models with the

[12] Although negative quantities can be conceptualised as product returns, no equivalent concept can be elaborated for negative prices. Hence, we have decided to drop both types of observations.

smallest sales in each product category, which in any case represent less than 1% of sales. Fourth, in the data there is a large price variation and there are many niche products in each category and distribution channel with very low or very high prices. We further removed observations from the top and bottom 5% of the price distribution in each product category, representing around 1% of total sales. The purpose of this trimming is to improve the focus on the brands and products at the core of consumer demand and competition.

As shown in Table 2, the final data set consists of 304,181 observations for smartphones, 169,247 for tablets, 591,423 for desktops and 846,197 for portable computers. An observation is defined as a particular model sold either online or offline in a particular European country in a given month. After cleaning, these observations represent about 95% of sales in terms of sold units in the original data.[13] Some of the models are sold both online and offline, while others are available in only one of the distribution channels[14].However, in the majority of cases, the data reveal that there is no primary channel for retail distribution. Unfortunately, we cannot go beyond the breakdown into online and offline sale channels. A more detailed division of retail channels could shed more light on a richer set of retailing strategies.

In the table, the descriptive statistics of the variables used by product category are shown. We can see that the number of non-price characteristics used in the empirical demand model varies by product, ranging from 11 in the case of computers (both desktops and laptops) to 16for smartphones and tablets. We consider these product characteristics as the most relevant determinants of consumers' indirect utility (in addition to price). The other variables used in the empirical model are, as explained in the previous section, the market shares as a fraction of the whole market and as a fraction of specified market segments[15].

Table 1 gives an impression of the extent of geographical market segmentation in the EU for the four electronic products considered here. Few models are sold in all countries but the models that are widely sold account for a large share of total sales, especially for tablets and smartphones. While average price differences between online and offline prices are rather low, the average difference between the highest and lowest priced product across countries and models can be substantial. These data give an indication of the large potential for price arbitrage and searching for product varieties (models) in a scenario without geo-blocking, as figure 3 confirms.

3.2. Complementary data

In the second half of 2015, the European Commission commissioned a survey to gather evidence on the extent of geo-blocking in the EU from a consumers' perspective. The Mystery Shopping Survey (MSS) was conducted to investigate the different forms geo-blocking takes, the extent to which it is being practiced by sector and product category, and its prevalence by country and type of retailer. The MSS focused on the most relevant sectors from an e-commerce perspective and, within each sector, it was carried out with six specific products or services. A representative sample of websites was selected for investigation, with a minimum of 9 websites per sector. In addition, several country pairs to base the MSS on were also selected, taking into account relevant cross-border flows of visits to commercial websites. For an overview of the MSS and its main results, see GFK (2016) and Cardona (2016).

---

[13] Besides, according to the data provider, the reporting of the original data is around 90% of the market in each country. Hence, the coverage of the market is substantial.

[14] The data do not allow one to identify if the products are available in the catalogues and simply are not chosen by consumers in those channels or alternatively, that the absence of some models in some channels responds to companies' commercial strategies.

[15] We performed some regressions where we have included additional measures of size and volume such as height, weight, width, and depth. However, their inclusion did not improve the fit of the model.

The Mystery Shopping Survey demonstrated that electronic goods are most likely to be subject to geo-blocking. An earlier 2009 Mystery Shopping survey had already come to similar conclusions (Cardona & Martens, 2014). These results validate the decision to use electronic goods as a benchmark for the geo-blocking impact simulations. Geo-blocking is less severe in other product categories.

Some MSS data are useful for the extrapolation of the detailed but restricted results from the four consumer electronics products. We rely on the estimated price differences by sector, and the differences in the incidence of geo-blocking by sector. Table 3 summarizes these data. The table reads as follows. For prices, +4% in clothing means that cross-country price differences in clothing are 4% higher than in consumer electronics. There is more price variation in clothing than in consumer electronics. For geo-blocking, attempts to buy clothing online cross-border are only 82% as likely to get geo-blocked as attempts in consumer electronics. In other words, clothing has more cross-border price variation but less geo-blocking, compared to consumer electronics.

We also relied on Euromonitor International's Passport Database which includes detailed information on retail sales and particularly online retail by sector, at the country level. These data are required to produce an estimation of the impact for all online sales and for all EU28 countries, and is presented in Table 4. In particular, the data used, referred to 2014, indicates that on the aggregate, online retail represented 6.8% of total retail. However, in countries like the United Kingdom and Denmark, this share is above 10%; while in countries like Bulgaria and Croatia it is still below 2%. In terms of the EU28 aggregate, the table also indicates that the UK, Germany and France represent more than two thirds (68.3%) of the whole European e-commerce sector. Adding the Netherlands, Italy and Spain, these six countries represent 80% of the whole EU28 e-commerce industry. Finally, the ten countries for which we have price and sales data represent altogether 88.1% of the European e-commerce sector, a substantial coverage. On average, these countries showed an average share of e-commerce of 7%, with relevant variations as indicated before.

4. Results

In this section, we discuss the empirical results of the demand model for the four categories of consumer electronics products and EU10 countries covered by the data. Extrapolation of the results to all e-commerce products and all EU28 countries is discussed in the next section. From the parameter estimates of demand, it is possible to use equations 3a-3d to calculate price elasticities and to assess the main features of consumer behaviour regarding substitution between online and traditional sales channels. We then simulate the equilibrium prices and sales in the absence of geo-blocking. The counterfactual simulations are used to assess the benefits from the removal of cross-border online trade restrictions to producers and consumers.

4.1 Demand estimation

We estimate the two-level nested logit demand model specified in equation (2). As described before, this model segments products into groups and subgroups at the upper and lower level, respectively. For media tablets, the quality category is referred to the operating system. In the case of smartphones, generation is the variable that defines the group. For desktop and mobile computers, the groups are categories of processor speed (in GHz). Products within a group are allowed to be closer substitutes than products of different groups. In general, the quality variables are one of the main factors which consumers consider when buying the corresponding electronic product, and correspond to a higher price. At the lower level, the groups are further subdivided into subgroups according to whether they are sold online or offline.

Given that the price variable and the within-group market shares (in logarithm) and may be positively correlated with the error term, the corresponding demand equations for the four product categories are estimated using instrumental variables (IV) to account for this potential endogeneity issue. An unobserved positive shock to demand for a given product can result in a higher within-group market share and, at the same time, in a higher price. The instruments used are sums of the characteristics of the other products and counts of the number of products over all of both the firm's products and the competing firms' products; and the sums and counts by groups, as suggested by Berry, Levinsohn and Pakes (1995) and Verboven (1996) for the nested logit[16].

Table 5 reports the estimation results for the four product categories. The table points to several relevant issues. First, a significant and negative price coefficient is found in all product categories, as well as significant and positive nesting coefficients σ_1 and σ_2. Second, the nesting coefficients also satisfy the inequality $1>\sigma_1>\sigma_2>0$ in all four estimations, ensuring consistency with random utility maximization. This result implies that products of the same quality category and distribution channel (same subgroup) are the closest substitutes; products of a different distribution channel but the same quality category (same group) are weaker substitutes, and products of a different quality category are the weakest substitutes. The difference in the substitution between subgroups is greater when the gap between σ_1 and σ_2 is wider. Hence, there is less substitution between subgroups for smartphones and tablets than for desktop and portable computers.

Third, apart from price and within-group market shares, the rest of the explanatory variables are characteristics, and also brand, country and time dummy variables to control for specific fixed effects. The product characteristics are usually significant and with the anticipated signs. For instance, as shown in the first column of Table 5, the utility of a smartphone is higher when it has a high speed and multi-cores processor, Bluetooth, Wi-Fi, GPS, is a 3G of 4G model, accepts more than one SIM card, and incorporates android or iOS operating systems. Utility for consumers decreases if the smartphone has a touchscreen, a built-in-camera and is big in size. The second column shows that the utility of media tablets increases with high RAM memory, a higher speed processor, a built-in-camera, a webcam, has phone function, USB, and android or iOS operating system. The utility of a buying a desktop increases with RAM memory, a fast processor, Bluetooth, and camera. Finally, the utility of a laptop in the fourth column increases with a higher RAM memory, a camera, and the TV-out feature.

Fourth, the dummy variable for the online distribution channel is highly significant and negative for all four product categories. This is an indication that the online sales channel is on average less valued than traditional distribution and therefore has much lower sales. As shown in Figure 2, online sales in the selected EU countries represent on average 17.5% for the four product categories take together in the last month of the period sample, March 2015, up from 13.9% in January 2012.

Finally, the country, brand and time dummies included in the estimation are also significant. In other words, there are significant differences in the utility of particular brands, which may be due to brand perception, quality and other factors which are not controlled by included product characteristics. There are also differences in the valuation of particular product categories across the EU countries. These differences may be due to income effects or other country-specific factors. For instance, there may be more demand for portable PCs in Germany than in Slovakia because of higher income but also because consumers in general in Germany may value the use of computers more. Finally, there are also differences in the valuation of the different products over time. These evolving preferences reflect seasonality in purchases.

The estimated coefficients for α, σ_1 and σ_2 in each equation are used to compute own- and cross-price elasticities at the product level. Own-price elasticities at the product level are in general greater than one in absolute terms. They are on average equal to -3.39

[16] According to a Hausman specification test, the null hypothesis of the exogeneity of prices and within group market shares may be rejected at a significance level of 1%.

for smartphones, -2.06 for tablets, -1.72 for desktops, and -2.16 for portable computers. The cross-price elasticities are the highest for products in the same subgroup, which indicates that there is strong substitutability between products which are in the same segment and channel. The average own-price elasticities at country level differ by product category due to differences in the estimates of the parameters α, σ_1, σ_2, and the level of prices. The differences in the values of own-price elasticities for the same product category across countries are due to a different range of products which are available in particular countries and their price levels.

We use the estimates of demand elasticities to compute marginal costs for profit-maximizing multi-product firms under the assumption of Nash-Bertrand equilibrium using the system of equations (7). Since the prices used in this calculation are the final retail prices, the estimates of marginal costs include both the costs of manufacturing and sales. The imputed marginal costs are used to calculate markups, which on average for all the brands and models sold in the selected EU countries are 40% for smartphones, 45% for tablets, 36% for desktops and 39% for portable computers.

4.2. Simulations

With the help of the demand parameter estimates and the marginal costs obtained from the system of first order conditions which correspond to the status-quo scenario, we estimate the counterfactual scenario in which we assess the welfare impact of the removal of geo-blocking. We simulate new equilibrium prices and sales when the choice set for consumers in c has been altered by the removal of geo-blocking restrictions. We implement this by constructing a new price vector that incorporates the modified prices of those products already available in country c but that, due to removing geo-blocking restrictions, can now be purchased at a lower price from a country of origin o. Indexing these countries allows us to identify bilateral trade flows between the country pairs. Moreover, the new price vector also includes those products not sold in c but which are very similar.

4.2.1. The full removal scenario

We compare consumer and producer surplus in the current status quo (with geo-blocking in place) to a counterfactual situation in which the geo-blocking restrictions are completely removed.

Table 5 shows the changes in consumer surplus and producer surplus (in absolute and relative values) in the selected EU countries altogether, by product category, and for both scenarios (full removal and shop like a local). For all four product categories, consumer surplus and producer surplus increase due to the removal of geo-blocking. In general, the absolute increase in consumer surplus is larger than the increase in profits. However, there are some differences. In the case of smartphones, the change in consumer surplus is four times as large as the change in producer surplus. For tablets it is about 15% larger. For desktops, it is up to ten times larger and for portable computers it is around three times larger. These ratios show that consumers benefit more than firms from the removal of geo-blocking practices. For the 4 electronics products, we estimate that consumers gain about 500 Million € or 0.7% in consumer surplus thanks to lower prices and increased variety of products available. Producers gain 283 Million € or 1.3% in profits from these new trade opportunities - all this compared to a total market size of about 45 Billion €. The gain in total welfare mainly comes from reduced prices due to more competition and, to a lesser extent, from the benefits of increased product differentiation associated with an expanding choice set. The price effects are relevant, as Table 6 shows, due to the possibility of price arbitrage by consumers once geo-blocking restrictions have been removed. Prices decrease across the board in all countries, both online (-1% on average) and offline (-0.5% on average). The decrease is stronger in more highly-priced country markets as competition increases. Offline prices also decrease because there is more competition from online sellers.

Although the main question of interest in this paper is related to welfare, we can also look at the online trade flows derived from lifting geo-blocking restrictions. Trade is not an economic policy objective in its own right; it is a means of increasing the well-being of citizens. The results from all the calculations are brought together in a few tables. Table 7 reports additional cross-border trade in electronics products after the lifting of all geo-blocking restrictions[17]. Trade increases by nearly 630 Million €. This can be broken down into a trade diversion and a trade expansion effect. Trade diversion occurs because consumers shift from buying offline and online in their home market to importing online because some products in foreign markets are cheaper and also offer new varieties of goods. Trade expansion occurs because some electronics products become cheaper on average and consumers buy more as a result. Table 8 shows these substitution and net increase effects. In terms of trade, the UK and Poland gain the most. These two countries are already very competitive markets in e-commerce. The decline in domestic sales hides two opposing forces: domestic consumers who shift to cross-border purchases and foreign consumers who start buying in these countries' markets.

4.2.2. The "shop like a local" policy option

In this scenario, the shop delivers the product to a domestic address in its country of establishment only; and the buyer has to arrange for pick-up, either in person or through an intermediary. In the simulations, this was modelled by a modification of the price vector in which we introduce a fixed fee of 20€ per purchase for intermediary delivery services, on top of VAT differences and the parcel delivery cost. Such intermediary delivery service providers already exist and this scenario could be a reality without a policy initiative. We assume however that the policy initiative would give more visibility to this option and would bring more service providers to this market.

Table 5 shows the changes in consumer surplus and producer surplus. In this scenario, the estimations for the 4 electronics products indicate that consumers gain about 350 Million € or 0.5% in consumer surplus thanks to lower prices and increased variety of products available. Producers gain 184 Million € or 0.8% in profits from new trade opportunities. Because of the higher trade costs implied in this scenario, the trade effect of the alternative option is lower than in the baseline scenario. Table 9 shows the new bilateral online trade matrix. Table 10 shows the new trade expansion and trade diversion effects. These results confirm that this scenario has a lower impact, not only in terms of welfare but also in terms of trade. Moreover, in this case the dynamic price effect is also somewhat lower, with averages of -0.5% for offline prices and -0.6%for online prices on average across the EU28.

5. Extension to all online sales

In order to extend the results from electronics products to all online goods sales, we use a simple linear extrapolation method that proceeds as follows. First, we extend the results from the 4 electronics products to all consumer electronics sales. To do that, we use the share of these products in the aggregated consumer electronics industry. On average, these four products represent about 60% of total consumer electronics retail sales, with differences across countries[18]. We linearly extrapolate our estimated measures of welfare and sales by country to cover the entire electronics sector using the corresponding shares for each of the 10 countries for which we have detailed data, assuming that these 4 products are representative of the entire electronics products sector, and that the share would remain constant in the absence of geo-blocking. Second, we extend geographically from EU10 to EU28. The 10 countries in the sample

---

17 Note that we have no data on trade flows prior to lifting geo-blocking restrictions. The trade flows reported here are estimated increases in trade, whatever the level of trade before lifting restrictions.

18 Other products in the consumer electronics sector are TV's, digital cameras, portable media players, GPS navigation systems, among others.

represent 85% of the EU28 consumer electronics industry. Using information of the share of each of the countries not included in the detailed database from Euromonitor, we can impute a value that corresponds to the observed share in 2014. For this purpose, using the share of electronics in total retail sales by country, and assuming proportionality, we linearly extrapolate to get the corresponding values for each one of the missing countries. We can then also compute the EU28 aggregate for consumer electronics. Third, we extend from electronics to all online goods sales. In a similar procedure, we use the share of electronics in total e-commerce by country (also from Euromonitor), considering that this proportion does not change across countries and linearly extrapolate the results. Thus, it is again possible to compute the EU28 aggregated figure.

Finally, we correct for two indicators that change with respect to our benchmark sector (consumer electronics): price differences between country markets and the extent of geo-blocking. First, we take the ratio of average cross-border price differences between the benchmark product (electronics, as observed in the detailed GfK dataset) and other product categories (as observed in the more aggregated MSS). We weight the figures obtained before by this measure in order to take into consideration that more price arbitrage will occur in sectors with higher online price differences between countries. Second, we take the ratio of the probability that geo-blocking occurs in our benchmark product (electronics) and in the target product (as measured by the MSS) to correct for potential trade expansion in each product category after lifting geo-blocking restrictions. In so doing, the procedure also considers the maximum potential trade creation opportunities derived from online price differences and geo-blocking intensities.

We find that lifting geo-blocking restrictions has a strongly positive impact on consumer and producer surplus in all EU Member States. Figure 4 presents a summary of the overall economic impact of lifting all geo-blocking restrictions for all online e-commerce. Overall, consumer surplus increases by 1.2% in the EU28 and profits by 1.4%. The impact is especially strong in some smaller Member States where consumer choice is currently relatively limited and price competition is less because of limited market size. Consumer gains are stronger than producer gains in these countries. However, for the overall EU28, producers/sellers benefit slightly more than consumers because of economies of scale and cost reductions when online sales increase. The overall result is largely driven by the largest EU economies. Partial lifting of geo-blocking restrictions reduces the magnitude of the benefits but still generates a positive economic impact, as shown in Figure 5 for the case of consumer surplus and Figure 6 for profits.

6. Conclusions

In this paper, we estimated the potential economic impact of removing geo-blocking restrictions, an important component in the European Commission's DSM Strategy. To do so, we relied on a partial-equilibrium structural model using detailed price and quantity data for four consumer electronics product categories. Then, we extrapolated these results to the whole EU28 economy for 2014, the most recent year for which we have complete data.

We simulated two different counterfactual scenarios. The first scenario assumed a full lifting of geo-blocking restrictions. The results indicate that consumers would gain about 500 Million € - an increase of 0.7% in consumer surplus - basically due to lower prices and marginally to increased variety of products available. Firms' profits would also increase by 283 Million € (1.3%) from new trade opportunities. These gains come mainly from reduced prices which decrease in all countries both online (-1%) and offline (-0.5%). The second scenario opened up a “work-around” solution to geo-blocking whereby sellers deliver to a domestic intermediary who ensures onward delivery to the consumer. This scenario produced similar results although smaller in magnitude.

The extrapolation of these results to the entire EU28 online economy indicate that lifting geo-blocking restrictions would have a positive impact on consumer and producer surplus in all EU Member States. Consumer surplus would increase by 1.2% and profits by 1.4%. The effect on smaller Member States seems particularly strong. Sellers would also benefit from economies of scale and cost reductions when online sales increase. A partial lifting of geo-blocking restrictions would reduce the magnitude of the gains, but would still generate a positive welfare impact.

We would like to point out some limitations to this simulation exercise. A first set of limitations is related to the modelling. We already mentioned that the nested logit model can give restrictive substitution patterns. It would be relevant to assess to what extent the results presented here would be consistent with more flexible substitution patterns, by means of a more complex demand model, where products tend to be closer substitutes not only through their discrete dimensions but also in terms of their continuous characteristics. Also, the exogenous variables in the model - particularly in the counterfactual simulations - are assumed not to change after removing geo-blocking. In particular, utility and marginal costs remain unchanged for all products. Hence, we focus exclusively on the quantification of the allocative effects of removing geo-blocking. The incorporation of efficiency effects would obviously give a more complete picture of the impacts studied here.

Additional limitations are due to the nature of the data. First, the original electronics goods dataset does not contain information on cross-border sales. Hence, the model can only capture the absolute increase in online cross-border sales, not the relative change. The absence of official statistics on e-commerce trade makes this issue unsolvable. Second, the extrapolation of results from four electronics products in 10 countries to all e-commerce and EU28 countries necessarily entails some margins of error in the absence of robust extrapolation indicators. Finally, the data do not allow us to distinguish between manufacturers and retailers in terms of marginal cost or profits.

References

Ackerberg, D., L. Lanier Benkard, S. Berry, and A. Pakes (2006), Econometric tools for Analyzing Market Outcomes. In Heckman, J. J. (Ed.), Handbook of Econometrics. Amsterdam: North-Holland.

Anderson, S. P., A. de Palma, and J. F. Thisse (1992), Discrete Choice Theory of Product Differentiation. Cambridge: MIT Press.

Bergemann, D., B. Brooks, and S. Morris (2015), The limits of price discrimination. American Economic Review, 105(3): 921-957.

Berry, S., J. Levinsohn, and A. Pakes (1995), Automobile Prices in Market Equilibrium. Econometrica, 63, pp.841-890.

Berry, S. (1994), Estimating Discrete-Choice Models of Product Differentiation. RAND Journal of Economics, 25(2), pp.242-262.

Brenkers, R., and F. Verboven (2006), Liberalizing a distribution system: the European car market. Journal of the European Economic Association, 4(1): 216-251.

Cardell, S. N. (1997), Variance Components Structures for the Extreme-Value and Logistic Distributions with Application to Models of Heterogeneity. Econometric Theory, 13(02): 185-213.

Cardona, M., and B. Martens (2014), Supply-side Barriers to Cross-border eCommerce. JRC/IPTS Digital Economy Working Paper 2014/13.

Cardona, M., and B. Martens (2016), Geo-blocking of services and tangible goods in the EU 2015. JRC/IPTS Digital Economy Working Paper

Cardona, M., N. Duch-Brown, and B. Martens (2015), Consumer Perceptions of (Cross-Border) E-Commerce in the EU Digital Single Market. JRC/IPTS Digital Economy Working Paper 2015-06.

Cavallo, A. (2016), Are Online and Offline prices similar? Evidence from large multi-channel retailers. NBER Working Paper 22142.

Cavallo, A. and R. Rigobon (2016), The billion prices project: Using online prices for measurement and research. NBER Working Paper 22111.

Dubé, J-P., J. T. Fox, and C.-L. Su (2012), Improving the Numerical Performance of Static and Dynamic Aggregate Discrete Choice Random Coefficients Demand Estimation. Econometrica, 80(5), 2231-2267.

Duch-Brown, N. (2016), The diffusion of e-commerce among consumers in the EU. JRC/IPTS Digital Economy working Paper forthcoming.

Duch-Brown, N., and B. Martens (2015a), Barriers to Cross-border eCommerce in the EU Digital Single Market. JRC/IPTS Digital Economy Working Paper 2015-07.

Duch-Brown, N., and B. Martens (2015b),The European Digital Single Market. Its Role in Economic Activity in the EU. JRC/IPTS Digital Economy Working Paper 2015-17.

Duch-Brown, N., L. Grzybowski and F. Verboven (2015), The Impact of Online Sales on Consumers and Firms: Evidence from Household Appliances. JRC/IPTS Digital Economy Working Paper 2015-15.

Duso, T., A. Herr, and M. Suppliet (2014), The Welfare impact of parallel imports: A structural approach applied to the German market for oral anti-diabetics. Health Economics 23(9): 1036-1057.

Gomez, E., B. Martens, and G. Turlea (2014), The Drivers and Impediments to Online Cross-Border Trade in the EU. Information Economics and Policy, 27.

GfK (2016), Provision of a Mystery Shopping survey on Territorial Restrictions and geo-blocking in the European Digital Single market.

Grigolon, L., and F. Vervoben (2014), Nested logit or random coefficients logit? A comparison of alternative discrete choice models of product differentiation. The Review of Economics and Statistics 96(5), 916-935.

Judd, K. L., and B. Skrainka (2011), High performance quadrature rules: how numerical integration affects a popular model of product differentiation. CeMMAP working papers CWP03/11.

Knittel, C., and K. Metaxoglou, (2008), Estimation of Random Coefficient Demand Models: Challenges, Difficulties and Warnings. NBER Working Paper 14080.

McFadden, D. (1978), Modelling the Choice of Residential Location. In Karlquist, A., L. Lundquist, F. Snickers, and J. Weibull (eds.), Spatial Interaction Theory and Planning Models. Amsterdam: North Holland.

Meschi, M., T. Irving, and M. Gillespie (2011), Intra-Community Cross-Border Parcel Delivery. FTI Consulting, London.

Sudhir, K. (2001), Structural Analysis of Manufacturer Pricing in the Presence of a Strategic Retailer. Marketing Science, 20(3): 244–264.

Verboven, F. (1996), International Price Discrimination in the European Car Market. RAND Journal of Economics, 27 (2): 240-268.

Villas-Boas, S. (2007), Vertical relationships between manufacturers and retailers: inference with limited data. The Review of Economic Studies 74(2): 625-652.

List of Figures

Figure 1: Online sales as a proportion of total sales 31

Figure 2: Evolution of e-commerce as a share of total retail 31

Figure 3: Potential gains from price arbitrage across EU countries. 32

Figure 4: Impact of the baseline scenario (EU28, all online products), in % 32

Figure 5: Impact of the baseline scenario (EU28, all online products), Billion € 33

Figure 6: Impact of the "shop like a local" scenario (EU28, all online products) (in %) 33

Figure 7: Impact of the "shop like a local" scenario (EU28, all online products), (in Million €) 34

List of Tables

Table 1: Indicators of market segmentation in the EU[1] 23

Table 2: Summary statistics 24

Table 3: Price and geo-blocking differences, by sector 25

Table 4: Market shares of e-commerce, 2014 26

Table 5: Estimation results – nested logit.. 27

Table 6: Welfare effects under different scenarios 28

Table 7: Additional online cross-border trade in the full lifting geo-blocking restrictions scenario (Million €) 28

Table 8: Changes in sales volumes between online and offline channels, net trade effect (in Million € and %) 29

Table 9: Impact on prices (% change) 29

Table 10: Additional online cross-border trade in the shop like a local scenario.......... 30

Table 11: Changes in sales volumes between online and offline channels, net trade effect in the shop like a local scenario (in Million € and %) 30

Table 1: Indicators of market segmentation in the EU[1]

Product category	Brands	Brands sold in				Models	Models sold in				Average price differentials[2] (in %)		
		All countries		Only 1 country			All countries		Only 1 country				
		n	%*	n	%*		n	%*	n	%*	Offline vs. Online	Offline[3]	Online[3]
Desktops	555	23	79.4	378	8.6	33253	186	18.9	25017	20.8	2	42	30
Tablets	534	26	75.9	281	2.7	6398	194	64.3	3875	11.7	3	31	38
Smartphones	457	23	95	241	0.8	6136	417	77.4	2937	2.8	2	47	57
Laptops	249	16	97.6	165	0.6	66473	256	16.4	49956	34.3	9	31	26

1 Calculated with data covering 4 product categories and ten countries for the period January 2012 to march 2015. The data is at the product level.
2 Only for those products sold through both channels (online and offline).
3 Average price difference between the highest and the lowest price for the same product.
* The percentage is calculated over total EU sales

Source: JRC/IPTS calculations with data from GfK.

Table 2: Summary statistics

Description	Obs.	Mean	Std.	Min	Max
Smartphones					
Price (€)	304,181	136.4	129.1	15	2226
Quantity (000)	304,181	1.1	5.8	0.001	276.0
Online sales dummy	304,181	0.396	0.489	0	1
RAM (MB)	304,181	782.0	8635.6	1	4096
Speed (GHz)	304,181	1.1	0.3	0.2	2.5
Display size (	304,181	82.3	28.4	1	135
Android Operating System dummy	304,181	0.450	0.498	0	1
iOS Operating System dummy	304,181	0.028	0.165	0	1
Touchscreen dummy	304,181	0.675	0.469	0	1
Bluetooth dummy	304,181	0.899	0.301	0	1
Wifi dummy	304,181	0.654	0.476	0	1
Camera dummy	304,181	0.901	0.299	0	1
GPS dummy	304,181	0.605	0.489	0	1
3G/4G dummy	304,181	0.661	0.473	0	1
Block design dummy	304,181	0.869	0.337	0	1
NFC dummy	304,181	0.176	0.381	0	1
SIM dummy	304,181	0.166	0.372	0	1
CORES dummy	304,181	0.304	0.460	0	1
Tablets					
Price (€)	169,247	228.6	165.1	45	1244
Quantity (000)	169,247	0.5	2.4	0.001	193.8
Online sales dummy	169,247	0.417	0.493	0	1
RAM (MB)	169,247	1031.0	519.6	0	4096
Speed (GHz)	169,247	1.2	0.3	0.3	2.5
Display size	169,247	8.5	1.8	0	15.6
Android Operating System dummy	169,247	0.856	0.351	0	1
iOS Operating System dummy	169,247	0.120	0.325	0	1
External Keyboard dummy	169,247	0.979	0.144	0	1
Bluetooth dummy	169,247	0.655	0.475	0	1
Webcam dummy	169,247	0.953	0.211	0	1
Camera dummy	169,247	0.947	0.224	0	1
High Resolution dummy	169,247	0.119	0.324	0	1
Hyper-threading dummy	169,247	0.016	0.125	0	1
Phone function dummy	169,247	0.076	0.265	0	1
USB dummy	169,247	0.839	0.367	0	1
3G/4G dummy	169,247	0.246	0.431	0	1
Flash memory dummy	169,247	0.958	0.201	0	1

Table 2: Summary statistics (continued)

Description	Obs.	Mean	Std.	Min	Max
Desktop computers					
Price (€)	591,423	953.9	1012.8	208	30360
Quantity (000)	591,423	0.05	0.21	0.001	26.9
Online sales dummy	591,423	0.333	0.471	0	1
RAM (MB)	591,423	7632.7	19004.0	0	65536
Speed (GHz)	591,423	3.0	0.7	0.3	5
Bluetooth dummy	591,423	0.145	0.352	0	1
Wifi dummy	591,423	0.305	0.461	0	1
Camera dummy	591,423	0.093	0.290	0	1
Flash memory dummy	591,423	0.106	0.308	0	1
DVD writer dummy	591,423	0.761	0.426	0	1
TV card dummy	591,423	0.029	0.167	0	1
TV out dummy	591,423	0.916	0.278	0	1
High Resolution dummy	591,423	0.160	0.367	0	1
Mobile computers					
Price (€)	846,197	859.4	825.3	221	11015
Quantity (000)	846,197	0.05	0.2	0.001	26.9
Online sales dummy	846,197	0.534	0.499	0	1
RAM (MB)	846,197	6683.7	13681.9	0	32768
Speed (GHz)	846,197	2.7	0.7	0.3	5
Bluetooth dummy	846,197	0.481	0.500	0	1
Wifi dummy	846,197	0.656	0.475	0	1
Camera dummy	846,197	0.106	0.308	0	1
Flash memory dummy	846,197	0.165	0.371	0	1
DVD writer dummy	846,197	0.714	0.452	0	1
TV card dummy	846,197	0.012	0.111	0	1
TV out dummy	846,197	0.944	0.230	0	1
High Resolution dummy	846,197	0.602	0.490	0	1

Summary statistics for the attributes of unique brands and models which are used in the demand and pricing.

Table 3: Price and geo-blocking differences, by sector

Sector	Price	Geo-blocking
Clothing, shoes and accessories	+4%	0.823
Cosmetics and healthcare products	+13%	0.797
Books	+20%	0.759
Computer games and software	+11%	0.924
Electrical household appliances	+8%	1.089

Source: MSS.

Table 4: Market shares of e-commerce, 2014

Country	Share of e-commerce on total retail per country	Country shares in EU e-commerce
Austria	5.2	1.8
Belgium	5.7	2.4
Bulgaria	1.3	0.1
Croatia	1.5	0.1
Cyprus	3.5	0.1
Czech Republic	6.9	1.1
Denmark	11.0	2.5
Estonia	5.5	0.1
Finland	9.0	1.9
France	6.2	15.1
Germany	7.2	18.9
Greece	3.3	0.7
Hungary	3.2	0.5
Ireland	8.1	1.4
Italy	2.3	3.8
Latvia	2.7	0.1
Lithuania	4.0	0.2
Luxembourg	4.3	0.2
Malta	5.9	0.0
Netherlands	8.1	4.5
Poland	5.8	2.8
Portugal	2.6	0.6
Romania	2.4	0.4
Slovakia	4.6	0.4
Slovenia	2.6	0.1
Spain	3.1	3.4
Sweden	7.1	2.7
United Kingdom	12.2	34.3
EU28	**6.8**	**100.0**

Source: Euromonitor

Table 5: Estimation results – nested logit

Smartphones		Tablets		Desktops		Laptops	
price	-0.0056***	price	-0.0052***	price	-0.0003***	price	-0.0077***
	(0.000683)		(0.0011)		(2.71e-05)		(0.00115)
lsj_sg	0.685***	lsj_sg	0.818***	lsj_sg	0.875***	lsj_sg	0.628***
	(0.0135)		(0.0120)		(0.00436)		(0.0421)
lssg_g	0.658***	lssg_g	0.747***	lssg_g	0.725***	lssg_g	0.490***
	(0.0317)		(0.0182)		(0.0130)		(0.0217)
online	-0.026***	online	-0.0899***	online	-0.105***	online	-0.00635*
	(0.00511)		(0.00962)		(0.00584)		(0.00383)
RAM	-2.72e-07**	RAM	0.000119***	RAM	6.66e-07***	RAM	1.44e-06***
	(1.15e-07)		(6.59e-06)		(6.14e-08)		(6.98e-08)
Speed	0.227***	Speed	0.221***	Speed	0.0869***	Speed	-0.0616***
	(0.005)		(0.00899)		(0.00165)		(0.00125)
Bluetooth	0.0145**	Bluetooth	-0.00215	Bluetooth	0.0109***	Bluetooth	-0.0108***
	(0.00607)		(0.00539)		(0.00376)		(0.00214)
Camera	-0.0499***	Camera	0.213***	Camera	0.0274***	Camera	0.0755***
	(0.00610)		(0.0108)		(0.00480)		(0.00262)
Wifi	0.0767***	Keyboard	0.217***	Flash	-0.0653***	Flash	-0.0529***
	(0.00476)		(0.0126)		(0.00327)		(0.00232)
Gps	0.0261***	Webcam	0.0257**	Dvd	-0.0471***	Dvd	-0.0192***
	(0.00551)		(0.0108)		(0.00274)		(0.00216)
3G/4G	0.548***	Res	-0.0203**	Tv	-0.128***	Tv	-0.155***
	(0.00469)		(0.00861)		(0.00595)		(0.00670)
Block	0.0336***	Hyper	0.136***	Tv out	0.0508***	Tv out	0.0612***
	(0.00427)		(0.0138)		(0.00344)		(0.00319)
Nfc	0.126***	Phone	0.0394***	Resol	-0.038***	Resol	-0.0532***
	(0.00363)		(0.00769)		(0.00474)		(0.00432)
Sim	0.0413***	Usb	0.149***	Wifi	-0.0864***	wifi_d	-0.115***
	(0.00302)		(0.00904)		(0.00279)		(0.00303)
Cores	0.197***	3G/4G	-0.0841***				
	(0.00421)		(0.00628)				
Size	-0.0002**	Android	2.611***				
	(7.15e-05)		(0.0183)				
Touch	-0.0282***	iOS	2.602***				
	(0.00431)		(0.0203)				
Android	0.0807***	Size	-0.00311**				
	(0.00449)		(0.00152)				
iOS	0.640***	Flash	-0.0529***				
	(0.00905)		(0.00232)				
Constant	-3.479***	Constant	-6.883***	Constant	-4.976***	Constant	-4.492***
	(0.0159)		(0.0359)		(0.0162)		(0.0159)
Observations	304,181	Observ-ations	169,247	Observ-ations	591,423	Observ-ations	846,197

Note: all regressions include country, time and brand fixed effects. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 6: Welfare effects under different scenarios

		Smartphones	Tablets	Desktops	Laptops	Total
				Consumer surplus		
Full removal	M€	144	250	39	69	501
	%	0.8	1.4	0.1	0.6	0.7
Shop like a local	M€	95	152	42	59	348
	%	0.5	0.9	0.2	0.5	0.5
				Producer surplus		
Full removal	M€	35	222	4	23	283
	%	0.6	3.9	0.1	0.4	1.3
Shop like a local	M€	24	131	3	26	184
	%	0.4	2.4	0.1	0.5	0.8

Table 7: Additional online cross-border trade in the full lifting geo-blocking restrictions scenario (Million €)

	BE	DK	FR	DE	GB	IT	NL	PL	SK	ES	Imports
BE		0.1	0.4	1.6	18.8	0.0	0.2	23.1	0.1	0.1	**44.4**
DK	0.0		2.2	5.5	21.2	0.1	1.8	100.6	1.7	1.9	**134.8**
FR	0.1	-0.2		1.0	45.3	0.2	1.3	43.7	0.3	0.6	**92.2**
DE	0.9	10.1	7.9		49.4	2.5	6.6	75.5	1.5	1.2	**155.6**
GB	0.2	0.0	0.7	1.5		0.0	2.2	7.6	0.1	0.1	**12.5**
IT	18.8	0.4	4.7	2.2	25.4		0.7	46.4	0.3	3.3	**102.3**
NL	0.0	0.4	1.0	1.0	23.9	0.1		45.1	0.2	0.4	**72.1**
PL	0.0	0.8	0.6	0.2	2.0	0.0	1.2		0.1	0.2	**5.1**
SK	0.0	0.0	0.2	0.3	0.6	0.0	0.1	4.2		0.4	**5.8**
ES	0.0	0.0	0.2	0.0	-3.8	0.0	0.1	7.1	0.0		**3.8**
Exports	**19.9**	**11.7**	**17.8**	**13.3**	**182.9**	**3.0**	**14.1**	**353.4**	**4.4**	**8.2**	**628.6**

Table 8: Changes in sales volumes between online and offline channels, net trade effect (in Million € and %)

		Change in volume				Percentage change			
			Online						
	Market size	Offline	Domestic	Cross-border	Net effect	Total	Offline	Imports	Exports
BE	1,569	-23.4	-0.3	19.9	-3.8	-0.2	-1.5	2.8	1.3
DK	1,759	-89.6	-0.7	11.7	-78.6	-4.5	-5.1	7.7	0.7
FR	6,448	-101.1	-7.6	17.8	-90.8	-1.4	-1.6	1.4	0.3
DE	14,033	-213.8	67.2	13.3	-133.3	-0.9	-1.5	1.1	0.1
GB	6,816	-15.9	-4.0	182.9	163.0	2.4	-0.2	0.2	2.7
IT	5,663	-78.9	4.1	3.0	-71.8	-1.3	-1.4	1.8	0.1
NL	3,007	-74.2	7.1	14.1	-53.0	-1.8	-2.5	2.4	0.5
PL	1,679	-1.4	-0.8	353.4	351.1	20.9	-0.1	0.3	21.1
SK	232	-3.4	-0.1	4.4	0.8	0.4	-1.5	2.5	1.9
ES	3,649	-5.6	8.4	8.2	10.9	0.3	-0.2	0.1	0.2
Total	**44,854**	**-607.5**	**73.4**	**628.6**	**94.5**	**0.2**	**-1.4**	**1.4**	**1.4**

Table 9: Impact on prices (% change)

	Full removal		Shop like a local	
	Offline	**Online**	**Offline**	**Online**
BE	-0.7	-1.2	-0.7	-0.7
DK	-0.5	-2.2	-0.5	-1.4
FR	-0.6	-0.6	-0.6	-0.3
DE	-0.5	-0.8	-0.5	-0.3
UK	-0.2	-0.2	-0.2	-0.1
IT	-0.7	-1.1	-0.7	-0.6
NL	-0.5	-0.8	-0.5	-0.4
PL	-0.5	-0.6	-0.6	-0.3
SK	-0.5	-2.9	-0.5	-1.9
ES	-0.8	-0.5	-0.8	-0.2

Source: JRC/IPTS calculations

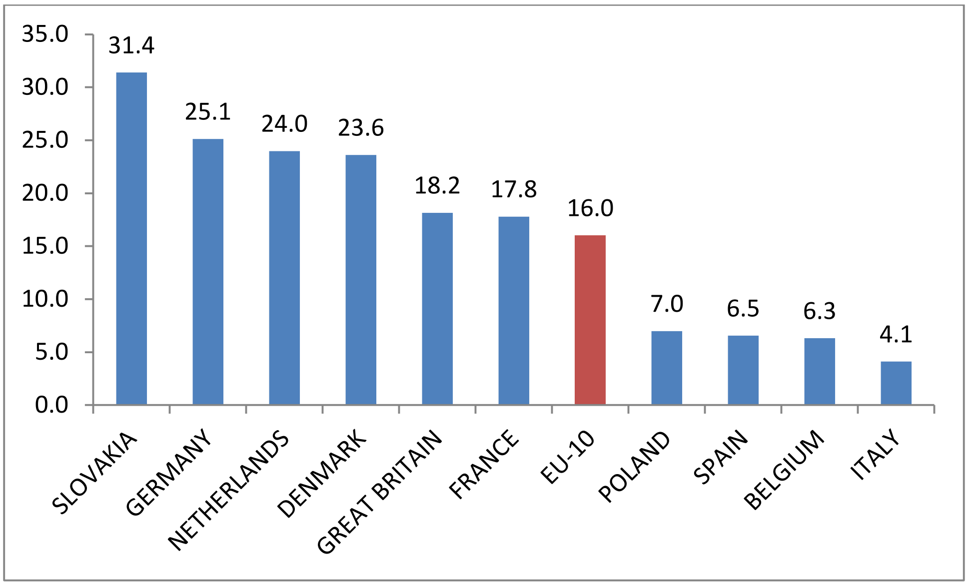
Table 10: Additional online cross-border trade in the shop like a local scenario (Million €)

	BE	DK	FR	DE	GB	IT	NL	PL	SK	ES	Imports
BE		0.5	0.3	1.2	15.8	0.1	0.1	17.4	0.1	0.1	**35.6**
DK	0.0		1.4	4.7	15.2	0.0	1.1	80.7	1.2	1.3	**105.6**
FR	0.3	5.7		0.4	21.0	0.1	2.2	27.7	0.3	0.2	**57.8**
DE	0.9	6.5	6.5		43.7	3.6	6.5	39.2	3.4	1.0	**111.2**
GB	0.0	4.6	0.1	0.4		0.0	0.7	2.7	0.2	0.0	**8.8**
IT	15.8	1.0	3.2	1.4	30.1		0.9	31.1	0.4	2.4	**86.4**
NL	0.0	0.5	0.4	0.9	22.1	0.2		33.9	0.2	0.3	**58.5**
PL	0.0	1.9	0.3	0.3	4.6	0.0	1.0		0.1	0.1	**8.3**
SK	0.0	0.0	0.1	0.2	0.8	0.0	0.1	3.5		0.4	**5.1**
ES	0.0	0.0	0.0	0.0	0.3	0.2	0.1	3.6	0.0		**4.3**
Exports	**17.0**	**20.7**	**12.4**	**9.7**	**153.5**	**4.2**	**12.7**	**239.9**	**5.8**	**5.6**	**481.5**

Table 11: Changes in sales volumes between online and offline channels, net trade effect in the shop like a local scenario (in Million € and %)

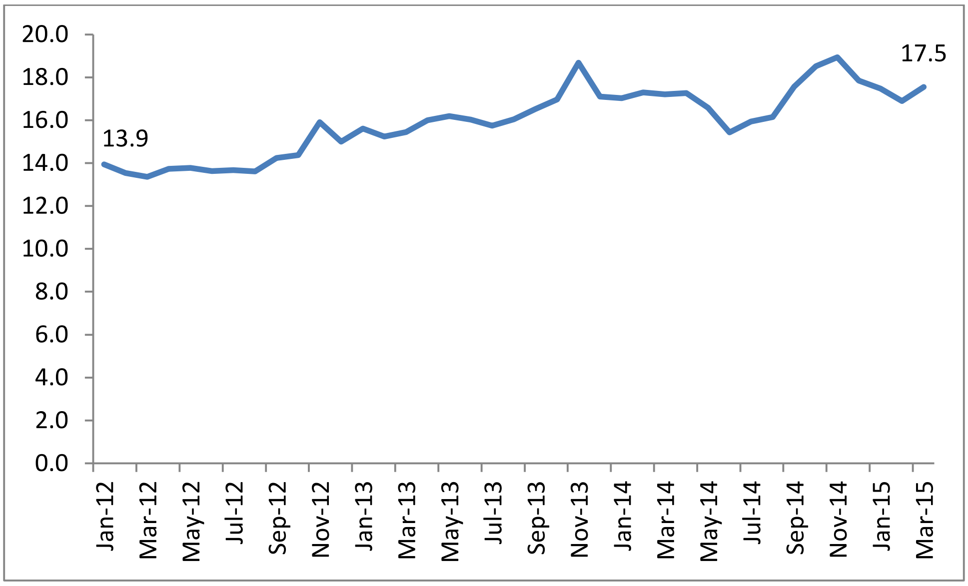
		Change in volume				Percentage change			
			Online						
	Market size	Offline	Domestic	Cross-border	Net effect	Total	Offline	Imports	Exports
BE	1,569	-16.1	-0.2	17.0	0.7	0.0	-1.0	2.3	1.1
DK	1,759	-63.0	-0.3	20.7	-42.6	-2.4	-3.6	6.0	1.2
FR	6,448	-72.3	17.2	12.4	-42.7	-0.7	-1.1	0.9	0.2
DE	14,033	-143.9	69.2	9.7	-65.1	-0.5	-1.0	0.8	0.1
GB	6,816	-6.7	-1.4	153.5	145.4	2.1	-0.1	0.1	2.3
IT	5,663	-57.7	-1.4	4.2	-54.9	-1.0	-1.0	1.5	0.1
NL	3,007	-45.9	1.4	12.7	-31.8	-1.1	-1.5	1.9	0.4
PL	1,679	-1.6	-0.5	239.9	237.8	14.2	-0.1	0.5	14.3
SK	232	-2.7	0.0	5.8	3.1	1.3	-1.2	2.2	2.5
ES	3,649	2.4	2.2	5.6	10.2	0.3	0.1	0.1	0.2
Total	**44,854**	**-407.5**	**86.1**	**481.5**	**160.1**	**0.4**	**-0.9**	**1.1**	**1.1**

Figure 1: Online sales as a proportion of total sales



Note: Data covering 4 product categories and ten countries for the period January 2012 to march 2015. The data is at the product level. *Source*: JRC/IPTS calculations with data from GfK.

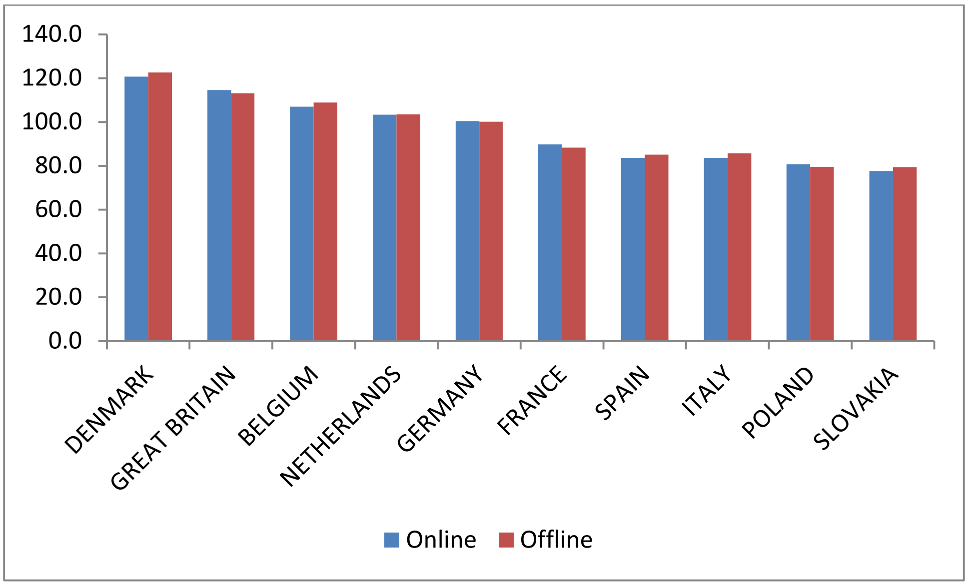
Figure 2: Evolution of e-commerce as a share of total retail



Note: Data covering 4 product categories and ten countries for the period January 2012 to march 2015. The data is at the product level. The aggregate figure for the whole EU economy in 2014 was 7% (Duch-Brown and Martens, 2015).

Source: JRC/IPTS calculations with data from GfK

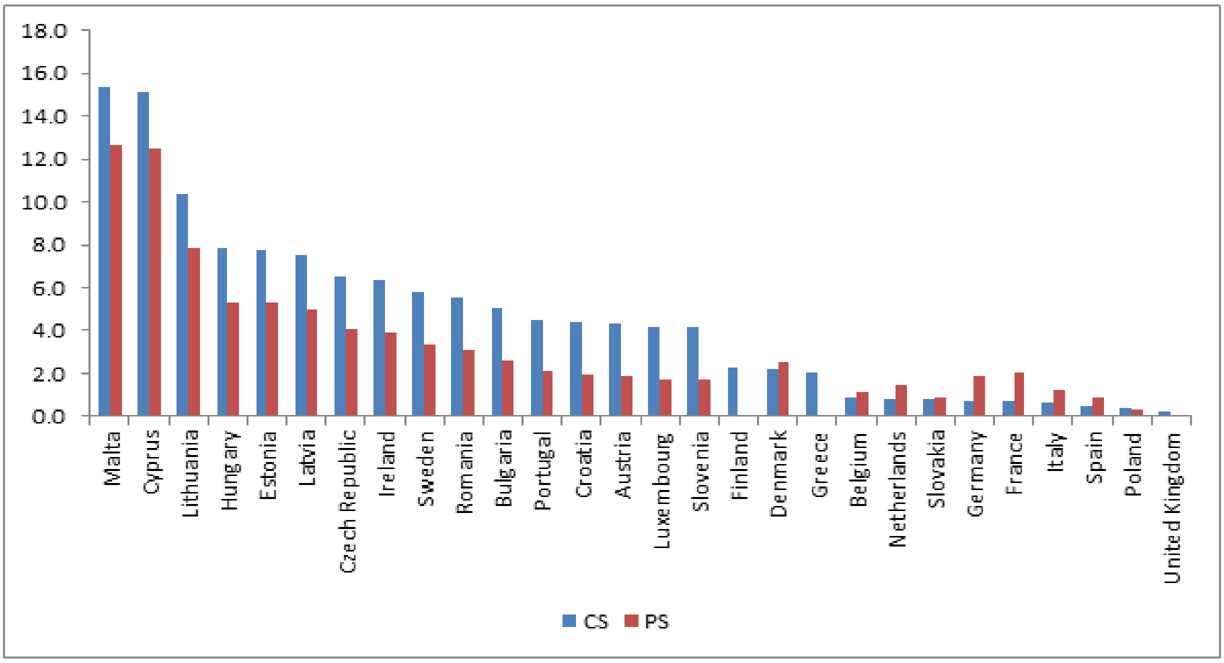
Figure 3: Potential gains from price arbitrage across EU countries.



Note: Data covering 4 product categories and ten countries for the period January 2012 to march 2015. The data is at the product level. EU-10=100 in each channel.

Source: JRC/IPTS calculations with data from GfK.

Figure 4: Impact of the baseline scenario (EU28, all online products), in %



Source: JRC/IPTS calculations. CS = consumer surplus; PS = producer surplus.

Figure 5: Impact of the baseline scenario (EU28, all online products), Billion €

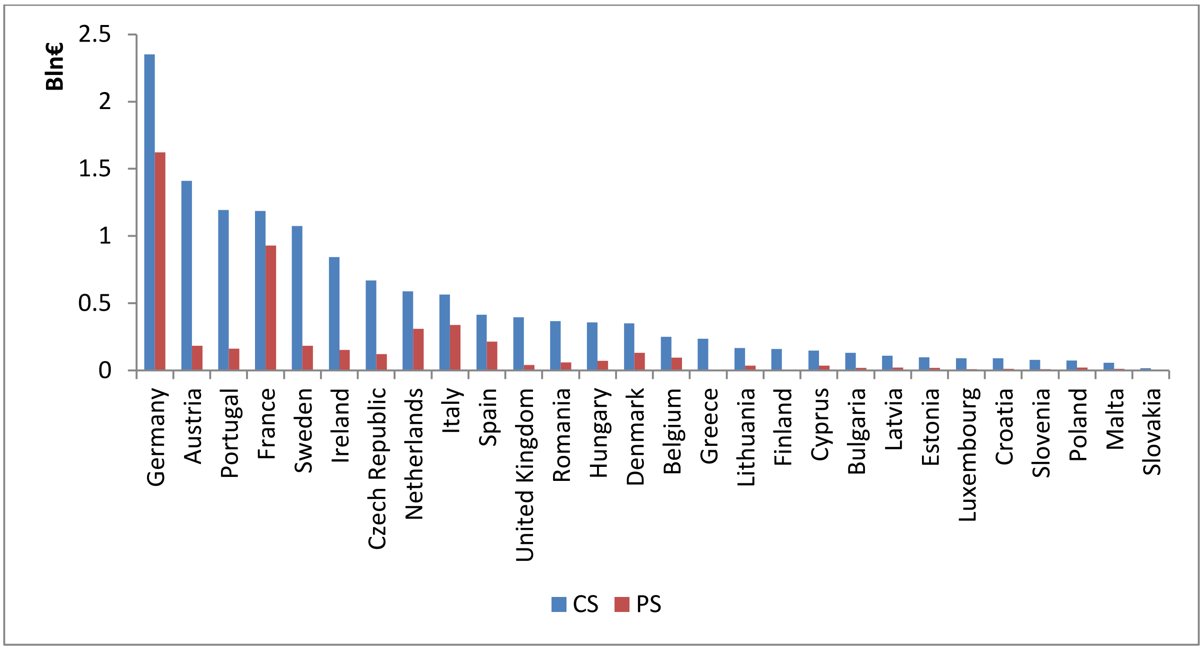
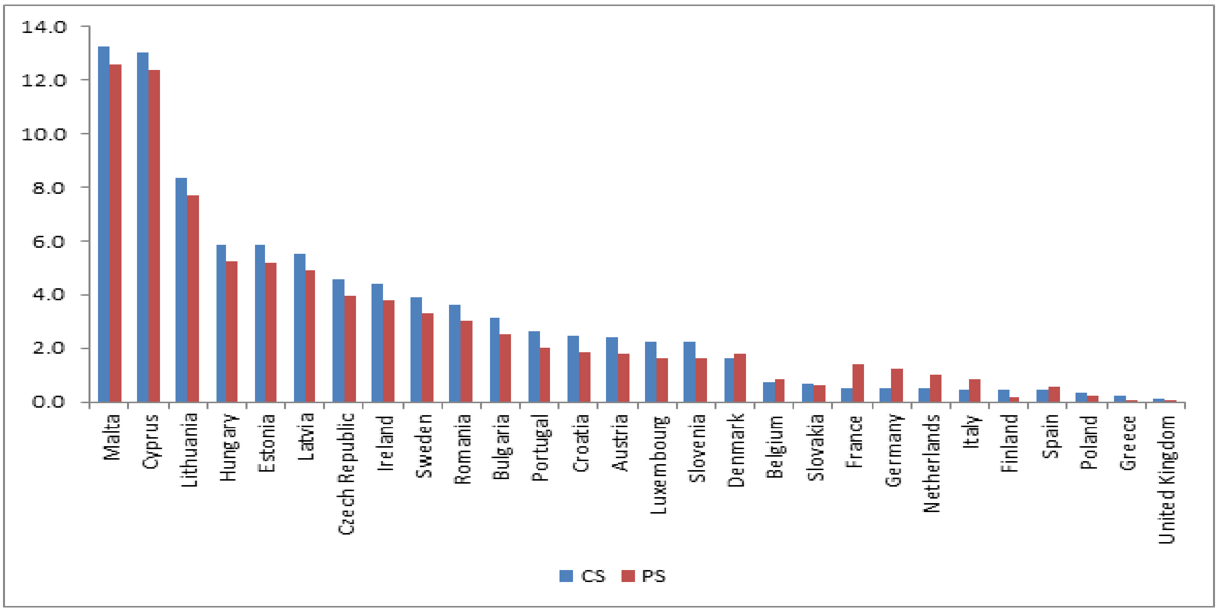
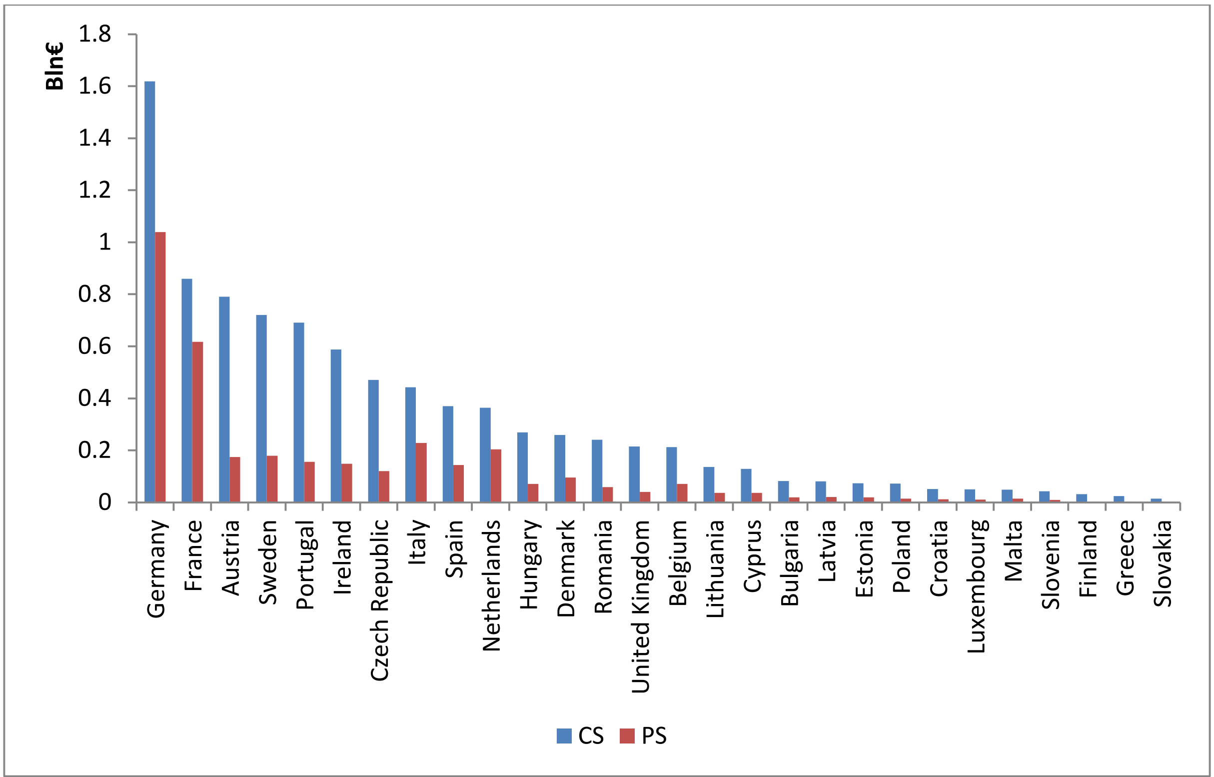


Figure 6: Impact of the "shop like a local" scenario (EU28, all online products) (in %)



Source: JRC/IPTS calculations. CS = consumer surplus; PS = producer surplus.

Figure 7: Impact of the "shop like a local" scenario (EU28, all online products), (in Billion €)



JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

Serving society
Stimulating innovation
Supporting legislation