The regional costs of market size losses in a EU dismembering process

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Abstract

Brexit has revamped the debate on EU dismembering costs, without a last word on the magnitude and spatial distribution of the ensuing losses. This paper measures regional GDP growth losses that a smaller market size, due to the reintroduction of legal and administrative barriers, would cause. We model augmented barriers in a Keynesian framework, pointing at four effects: a *border effect*, stronger for regions close to borders; an *exposure effect*, stronger for regions open to trade; a *centrality effect*, affecting areas close to the economic core; an *income agglomeration effect*, stronger for regions close to trading partners. The model is estimated with data on EU NUTS3 regions; simulations show the regional distribution of the four effects .

Keywords: Brexit, Market access, Demand spillovers, Border effects

JEL classification codes: R11, R22

1. Introduction

The recent choice of the United Kingdom to leave the European Union has revamped the debate on the potential costs of Brexit for both the UK and for other EU member states. An empirical verification of the magnitude of such costs would implicitly confirm the relevance of the EU Common Market, thus minimising the risk of a domino effect, with other countries in their turn receding from EU membership.

The sheer existence of economic losses due to leaving the EU is not criticized; such losses have been recently indirectly measured, by showing that GDP losses affect EU member states because of an imperfect implementation of the Single Market. Based on the celebrated Cecchini report (Cecchini, 1988), several studies measured the costs of the incomplete Single Market, which on average are found to be still relevant, with estimates ranging from 2.2 per cent (Ilzkovitz et al., 2007) to 12 per cent of EU GDP (Campos et al., 2014), depending on the methodology used and the types of barriers analysed. In Dunne (2015) the losses of non-Europe were assessed at 1.6 trillion Euros, with, among the many determinants, 400 billion Euros being due to the absence of a joint digital market, and 615 billion Euros due to the absence of a single market for consumers and citizens. Along the same lines, the removal of barriers in the area of e-commerce alone would engender benefits equal to 748 Billion Euros (Goidel et al., 2016).

This paper contributes to the debate on the costs of EU dismembering by focusing on a specific effect that EU disintegration would engender, i.e. the missed access to a large and integrated market for intermediate and final goods. We leave aside all other macroeconomic effects that the EU dismembering would cause, thereby focusing on pure demand-side effects. The collapse of the Single Market would reintroduce a high number of legal and administrative barriers among EU countries, hampering international trade and the free movement of goods, and theoretically causing a slowdown in economic growth.

More in detail, the paper measures *the spatial distribution of these GDP growth losses*. Ex-ante, it is difficult to speculate whether the GDP slowdown due to the dismembering of the Single Market would be higher in rich areas, where most economic activities are located, or in weaker regions, suffering from the loss of growth spillovers due to a generally more dynamic economic activity in an integrated national economy.

The structure of the paper is as follows. In the next section, a brief review of the literature discussing the theoretical advantages of Single Market is presented; were the Single Market to collapse, such integration advantages would turn into costs (i.e. missed growth opportunities). Section 3 presents our logical approach by setting out a theoretical model, based on a Keynesian framework, which models the impact of the increase in trade barriers on regional GDP growth. In Section 4 the model is empirically tested, and the data are discussed, with a particular focus on how we measure legal and administrative barriers. Section 5 presents the simulation and the empirical results. Section 6 concludes.

2. Advantages of market integration: regional effects

International economics has devoted many efforts to demonstrate the advantages gained in trade through integration.[1] One branch of international economics dedicated to such effort is customs unions theory. This literature emphasises how the creation of a customs union entails the abolition of economic and institutional barriers to international trade through several channels:

- the elimination of customs tariffs and duties;
- the harmonization of technical standards in production;
- the adoption of rules on the (possibly, certified) quality of products, on their safety and transport;
- the abolition of disparities in the indirect taxation of consumption goods;
- the adoption of common regulations of capital markets.

Custom unions eventually cause an expansion of the final markets for goods and services with the emergence of large integrated markets, bearing substantial advantages (Capello, 2016):

- an increase in competition. Each region purchases from the most efficient supplier in the European market;
- greater economies of scale in manufacturing due to larger market size;
- the stimulation of trade in final and intermediate goods because local markets can be replaced by newly accessible more distant ones;
- increased investment prompted by forecasts of greater competition: an effect which comes about even before the creation of single market, as a result of market expectations to which firms quickly adjust;
- demand for a greater variety of goods because of increased per capita income (income effect);
- a shift of demand towards goods produced with more efficient techniques guaranteeing lower prices for the same quality;
- technology and knowledge transfers from strong to weak regions.

All these channels are expected to have different spatial impacts. With the exception of the last effect, all such channels tend to favor rich and more advanced regions; the latter in fact possess the financial, productive and knowledge resources needed for coping with increased competition, for meeting a more diversified demand schedule, for exploiting increased scale economies, and for making substantial, focused, and timely investment as the creation of a Single Market proceeds.

The only source of advantages in the integration process that seems to favour lagging regions is the expected technology transfer from the 'centre' to the 'periphery'. However, this is clearly a rather complex process, which requires substantial local know-how (not necessarily available in weaker regions) to lubricate the exploitation of new technologies for reaching local growth targets. These expectations have been indirectly verified in the first period of the Single Market, when regional disparities increased, suggesting that advantages were concentrating in richer areas (CEC, 2001; Petrakos et al., 2005).

[1] On the effects of creation of the European Common Market see Thirlwall, 1974; Balassa, 1975; Scitovski, 1958. On those of the creation of the Single Market see Cecchini et al, 1988; Quévit, 1992; Camagni, 1992.

Another interesting spatially differentiated effect of the Single Market has been observed when formerly socialist countries entered the EU. As the result of this new (2004-2007) wave of enlargement, intra-national disparities increased because of the centripetal forces of economic development in the metropolitan and core areas of these Countries. Economic activity in these countries, in fact, concentrated in areas closer to the old members of the EU, as demonstrated in many studies (Bachtler and Downes, 1999; Petrakos, 2000; Resmini, 2007; Traistaru et al., 2003).

Regional disparities increased as a result of economic integration also at the micro-territorial level. This is for instance the case of spatial disparities between strong and weak areas within countries after the creation of the single European market in 1993; in the Italian case, for instance, positive effects were mostly registered in large cities such as Milan, Rome and Naples while small and medium cities benefitted much less from the institutional framework (Camagni and Pompili, 1990; Capello, 2002).

The natural question stemming from this literature is whether we could expect specular (i.e., negative) effects as a consequence of a potential European dismembering process. Exactly as the creation of the single market has generated positive and spatially heterogeneous effects, its dismembering is expected to slow down regional growth; moreover, these losses are expected to be spatially heterogeneous.

Various effects of the dismembering process are logically to be foreseen. Losses may be stronger in:

- advanced regions, where advanced manufacturing and services activities are concentrated;
- regions closer to the institutional borders, that would be particularly hit by augmenting legal and administrative barriers that would drastically reduce the size of border regions' local markets;
- less advanced regions, that would suffer from the loss of a pull effect generated by growing national economies.

The existing literature on Brexit, and more in general on the potential consequences of EU dismembering (Dhingra et al., 2016a and 2016b; van Reenen, 2016; Jensen and Snaith, 2016) does not explicitly take the regional dimension into account. Neither is this dimension accounted for in the literature on the costs of non-Europe (Boltho and Eichgreen, 2008; Campos et al., 2014; Ilzkovitz et al., 2007). This literature agrees on the fact that many international barriers still exist among European countries; that these barriers cut across different fields; that they hamper the full achievement of integration advantages. However, none of the aforementioned works is interested in the regional dimension of these effects.[2]

One of the major limits generated by the presence of barriers, in particular by legal and administrative ones, that are more directly linked to trade, is the limitation of market size. In its turn, this causes a decrease in scale economies for firms, a loss of competition, and, because local markets become sheltered, a decrease in average productivity. In what follows, the main emphasis of our approach is on a specific effect that EU dismembering would cause, i.e. the loss of a large and integrated market for intermediate and final goods. This would come with the reintroduction of duties and tariffs, while also increasing differences in legal and administrative procedures.

[2] A recent study has been run at regional level on the "quantification of the costs of legal and administrative barriers for land border regions". See Camagni et al., 2017.

We focus on this issue because this is arguably most directly affected by EU dismembering. In fact, effects may be felt even in the very short run, through the rational expectations channel. In order to make the case for the relevance of this channel, in the next section we model in a Keynesian framework the loss of market size due to higher legal and administrative barriers and the ensuing GDP growth slowdown. The model is meant to formalise the cause-effect mechanism that paves the way for the empirical application in Section 5.

3. Modelling the impact of new institutional barriers on regional growth

In order to assess the regional impact of EU dismembering within a demand-side framework, we can think of the impact of an increase of new barriers to trade between regions on regional growth. Let us start by thinking of exports of region i (X_i) as being by definition identical to the sum of the imports of all other trading partner regions j from region i (M_{ji}):

$$X_i = \sum_j X_{ij} = \sum_j M_{ji} \tag{1}$$

Imports of the various trading partner regions j depend on their income levels and on their propensity to import goods and services from other regions. Moreover, total imports are the sum of the imports from all trading partners, each of them having a different share of these imports. Let us define m_j as the propensity to import of trading partner region j, and m_{jk} as the propensity to import from a generic region k. Thus, total imports of region j (M_j) are defined as:

$$M_j = m_j * Y_j = \sum_k M_{jk} = \sum_k m_{jk} * Y_j \tag{2}$$

Let us now assume, consistently with the gravity literature, that any region j tends to import more from regions that are larger (because they have a larger variety of goods and services to buy); from regions that are closer (because there are lower transport costs in buying their goods), and from regions specialized in exporting sectors (because they account for a larger share of trade). This can be analytically represented as follows:

$$m_{jk} = \vartheta_k \frac{Y_k}{d_{jk}} \tag{3}$$

where d_{jk} is distance between regions k and j, Y_k is the economic size of the trade partner region k; and ϑ_k measures the specialization of region k in exporting sectors or, in other words, the exposure of the local economy to international trade.

Imports of the generic trading partner region j from region i are therefore equal to:

$$M_{ji} = m_{ji} * Y_j = \vartheta_i \frac{Y_i}{d_{ij}} * Y_j \tag{4}$$

Total exports of region i are obtained by plugging Eq. (4.) in Eq. (1):

$$X_i = \sum_j \vartheta_i \frac{Y_i}{d_{ij}} Y_j \tag{5}$$

Let us now assume, consistently with an extended version of a Keynesian macroeconomic model, that region i's income depends on several endogenous factors as well as on its ability to export,

which is reflected in its degree of openness. In particular, let us assume that exports impact income through the μ_i multiplier; then we can restate regional income as a function of the endogenous factors (Z_i) and exports as defined in Eq. (5):

$$Y_i = G_i + \mu_i * X_i = Z_i + \mu_i * \sum_j \vartheta_i \frac{Y_i}{d_{ij}} Y_j = Z_i + \mu_i \vartheta_i Y_i * \sum_j \frac{Y_j}{d_{ij}} \quad (6)$$

where G_i represents the endogenous component of a region's income. If a barrier arises between region i and any of its trading partners j, this hampers trade between the two regions by factor b_{ij}. This barrier can be assumed to be specific to the couples of regions; in other words, this allows to model barriers arising specifically only between specific region couples and not others. In the case of this paper, we assume that as a consequence of the EU dismembering, higher barriers will arise between regions belonging to countries currently belonging to the EU.

When a new barrier arises, at time $t + 1$, Eq. (5) modifies and the new amount of exports from region i towards its trading partner regions decreases to:

$$X_i = \sum_j (1 - b_{ij}) \vartheta_i \frac{Y_i}{d_{ij}} Y_j \quad (7)$$

The impact of the increased trade barrier on regional growth between times t and $t + 1$ is simply proportional to the ratio of the difference between the two trade-induced parts of income and the initial income level. Regional income growth (y_i) still depends on all other, especially endogenous, factors (z_i), but faces a decrease because of the new barrier ($\mu_i \vartheta_i * \sum_j b_{ij} \frac{Y_j}{d_{ij}}$) as follows:

$$y_i = \frac{Y_i^{t+1} - Y_i^t}{Y_i^t} = \mathrm{g}_i - \mu_i \vartheta_i * \sum_j b_{ij} \frac{Y_j}{d_{ij}} \quad (8)$$

Eq. (8) can be econometrically estimated to detect the impact of the *b* barrier.

In order to better visualise the implications of this model, we can graphically show the impact of exports towards other regions *j* on region *i*'s income. This is basically a demand spillover, which from Eq. (6) is equal to:

$$income\_spill_i = \mu_i \vartheta_i Y_i * \sum_j \frac{Y_j}{d_{ij}} \quad (9)$$

In order to simplify this graphical representation, we assume that all trading partners *j* have the same size ($Y_j = \bar{Y}$). In this case, the impact of demand spillovers on region *i*'s income decreases with distance. This demand spillover can be represented with an asymptotically decreasing line, as in Fig. 1.

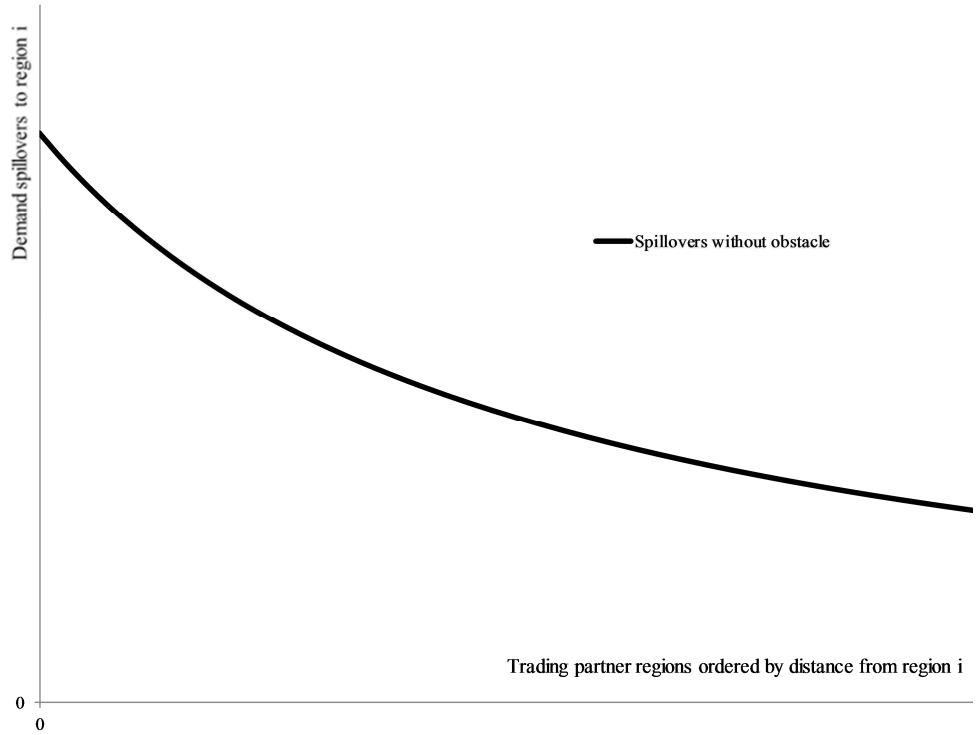


Figure 1. Demand spillovers from other regions in the absence of obstacles

Figure 2 represents demand spillovers when we assume that an obstacle arises between region i and all trading partner regions j. Once again for the sake of clarity this obstacle is assumed to be the same for all regions $(b_{ij} = \bar{b})$; as a consequence, growth spillovers decrease by the same amount for all trading partners. In Figure 2, this in represented by a decrease in the spillover from the dotted line (representing demand spillovers without the obstacle) to the dashed line (representing demand spillovers in the presence of the obstacle), where all values of the blue line are a fixed proportion $(1 - b)$ of the values of the dotted line.

The case in which the obstacle arises only for the trading partners which are above a given threshold distance $\bar{d}$ from region i is more interesting. This is the case in which, for instance, the obstacle only arises in regions belonging to different countries, and $\bar{d}$ is the distance between region i and the border. In this case, the demand spillovers line decreases only above a threshold distance, and its functional form resembles the shape of the black continuous line in Fig. 2.

Figure 2 also allows to measure the loss of income due to the presence of the new barrier. This loss is equal to the integral of the difference between the two spillovers curves, with and without the obstacle, beyond distance $\bar{d}$. Thus, Figure 2 illustrates why regions closer to the border are expected to suffer more from the augmented barrier.

This model has several implications for regional growth when new barriers arise between countries. In particular, according to the model, four effects are expected to be at play and hamper regional growth through demand spillover's decrease between regions:

1. the distance of the region from the border (through parameter d), as in regions closer to the border international trade is relatively more relevant. In fact, these regions are closer to regions in other countries, thereby suffering more from the new barrier. We define this first effect a *border effect*;

2. the openness of regions, depending on their specialization in open exporting sectors (through parameter ϑ_i). The income of regions open to trade, in fact, depends more heavily on trade itself; therefore, they will suffer more from the increase in the barrier between them
3. the distance of a region from other potentially trading partners. Regions closer to the geographical centre of Europe (i.e. having on average smaller d_{ij}) will suffer more from the presence of new barriers, as they gained more in the periods of increased integration. This effect is termed *centrality effect*;
4. the distance of regions to trading partners that are comparatively large in economic terms (large Y_j). Larger trading partners are in fact expected to import, ceteris paribus, more goods and services with respect to smaller ones. This effect is called an *income agglomeration effect*.

In the European case, the two location effects are self-reinforcing, because the European economic core, i.e. the area with maximum agglomeration of economic activities, overlaps with the geographical core. As a consequence, regions closer to the centre of Europe will simultaneously be characterised by substantial centrality effects and income agglomeration effects.

1. and their trading partners. This is called an *exposure effect*;

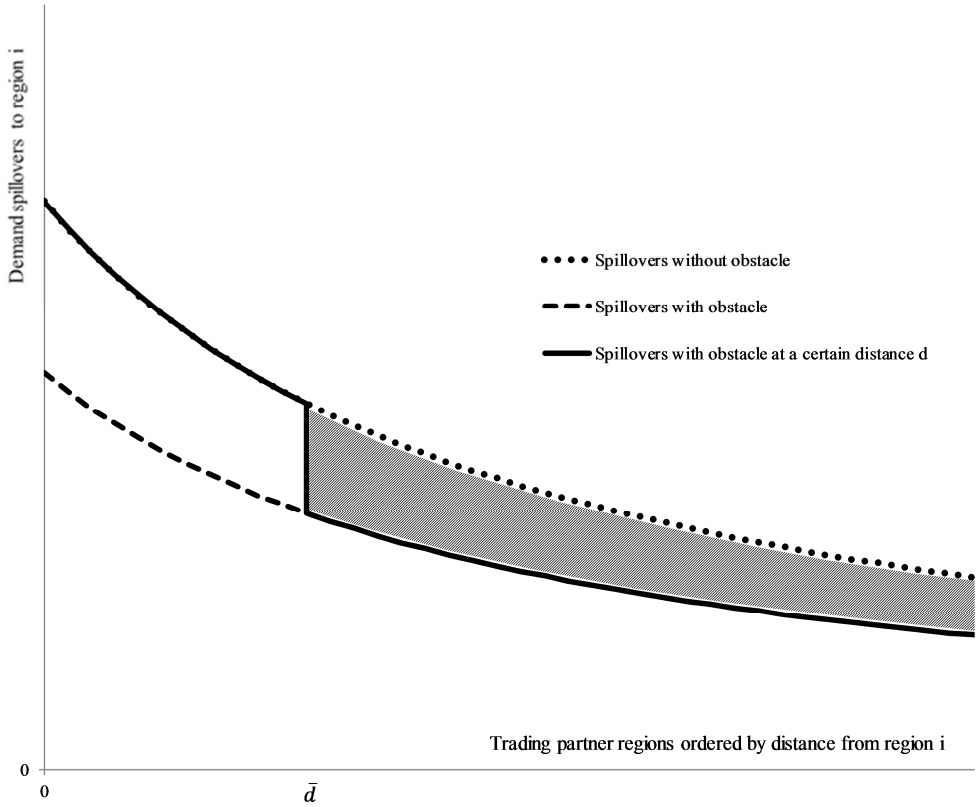


Figure 2. Loss of GDP growth due to a decrease in demand spillovers as a result of a barrier's increase

4. Market size, GDP growth and legal and administrative barriers: an empirical estimation

4.1 Empirical methodology

This section provides and empirical validation of the model discussed in Section 3. Eq. (8.) can be rewritten in a reduced form as:

$$y_{T-t} = \alpha + \beta Z + \gamma S + \varepsilon \tag{10}$$

where y_{T-t} measures GDP growth between t and T (in this case, respectively equal to 2008 and 2013). This is regressed against a matrix Z of regional growth factors, including a NUTS3 region's settlement structure, its urbanisation economies, accessibility, saving propensity, level of trust, human capital, intensity of knowledge and product innovation activities, and spare productive capacity. Matrix S measures the demand spillovers' effects due to the presence of a barrier B, estimating the difference between demand spillover effects ($WY * Openness$) and the same effects when a barrier is present ($WY * Openness * B$):

$$S = \phi(WY * Openness) + \psi(WY * Openness * B) \tag{11}$$

where Eq. (11.) , translating Eq. (7.) in empirical terms, assumes, as in the theoretical model, that demand spillovers are mediated by a region's degree of openness (ϑ_k in the theoretical model), by distance (W) and by the economic size of the trade partners (Y). In its turn, WY is defined as:

$$WY = \sum_{J=1, j \neq i}^{n} w_{ij} Yj \tag{12}$$

where w_{ij} is an entry in the geographical distance matrix W, while i and j indicate two generic regions. In this paper, the W matrix is based on a standard great circle distance between the regions' centroids.

As for the degree of openness, the second component of Eq. (11), it formalizes the degree to which each region is potentially exposed to the positive effect of the existence of a wider external market. In this paper, in the absence of accurate interregional trade at this very detailed spatial level, we proxy openness with the specialization in manufacturing activities;[3] given the limited size of the spatial units (European NUTS3 regions) here analysed, it is reasonable to assume that most manufactured goods will not be consumed locally and will therefore be shipped at least beyond regional borders. While this choice clearly presents the potential limitation of underestimating trade openness for regions specialized in advanced services, it must be recognized that most high value added services tend to be consumed locally despite the undeniable trend of internationalization in their consumption (Roberts, 1989).[4]

Lastly, a word must be spent on the B matrix in Eq. (11). Within all possible (cultural, linguistic, social) international barriers we could discuss, our choice was to focus on legal and administrative barriers, which are expected to influence trade flows more directly. Were these barriers to increase as a consequence of EU dismembering, they would cause a reduction in the free circulation of

[3] The issue of trade data availability at the regional level is discussed in Brakman and Van Marrewijk (2017).

[4] Technically, this potential bias should translate into a low impact of raising legal barriers as a consequence of the EU dismembering in areas specialized in internationally open advanced services, such as South-Eastern England. Fortunately, results demonstrate this is not the case.

freight, through higher tariffs on international goods shipments and through price differences, menu costs, and reinstated currency risk (Obstfeld and Rogoff, 2000).

For this reason, *B* is a bilateral matrix measuring the intensity of legal and administrative barriers between regions' couples, measured through the perception that people have of such barriers.[5] This is a very broad indicator, that does not delve into a detailed definition of such barriers. While this may provide an imperfect picture of the intensity of these barriers, it certainly provides a broad assessment that would be impossible were more detailed indicators chosen. Moreover, in a simulation exercises, having the perception that people have of such barriers as a variable can be useful to interpret expectations about the problems caused by augmented legal and administrative barriers; without waiting for barriers to actually increase, effects will be felt simply because of the expectations that people form about the *future* increase in these barriers.

4.2 Measuring the intensity of legal barriers in European regions

The data base assembled for the empirical verification of the framework discussed above includes the regional growth factors listed in Section 4.1. Table 1 below provides a detailed account of the main indicators, data and sources for each control variable of the *Z* endogenous factors.

A more detailed account of the way legal barriers have been measured is instead needed. Among the many possible ways to capture the intensity of interregional legal barrier, we resorted to the use of survey data. In particular, the intensity of legal and administrative barriers is captured by the average regional score in the question "*Thinking about the cooperation between your Country and [COUNTRY FROM PROGRAMME XX], to what extent are legal or administrative differences a problem?*" asked within the Eurobarometer 422 flash survey on interregional cooperation. Possible answers to this question range from "A major problem" (encoded as 1) through "A minor problem (2)" to "Not a problem at all (encoded as 3)". Questionnaires have been administered in September 2015 and include a grand total of 40,619 individual observations distributed across the EU28 countries plus Norway and Switzerland. In fact, this is the geographical sample of countries participating in EU cross-border cooperation (henceforth, CBC) programmes (EC, 2016).

While absolute numbers of interviewees are relatively limited, ranging from 300 in Portugal to 4,410 in Germany, it is worth stressing that the interviewed sample has been selected only among citizens of border areas directly involved in CBC activities, and therefore knowledgeable about the possible limitations and obstacles associated to this type of actions. As mentioned above, the main advantage of the use of a broad measure is to allow our analyses to account for all possible legal and administrative barriers hampering regional growth, without entering into a detailed definition of such barriers. On the other hand, limitations are those typical of survey data, with a particular word of caution related to the difficulty in quantifying the strength of such barriers for the average interviewee.

Since data are classified per country couple, we obtain a matrix of legal barrier where an average score ranging from 1 to 3 represents the average perceived legal and administrative barrier for a country couple. This prompts the generation of a pairwise asymmetric country blocks-matrix where each country couple (for instance, AT-DE) has constant values that can (and typically do) differ from the symmetric country couple (say, DE-AT).

[5] See Section 4.2 for a detailed description of the way in which matrix B is built.

4.3 Estimation results

Table 2 shows the results of empirically estimating Eq. (10.). Results are organised along three columns, each based on heteroskedastic-robust OLS estimates of a specification including Country Fixed Effects. 2008-2013 value added growth is regressed against initial value added, the region's settlement structure, and the regional growth factors described in Section 4, and used also in Capello et al. (2016). Columns differ in that while the first presents the estimation of Eq. (10) with geographical spillovers alone, the second and third columns also include the interactions of the latter with the degree of openness, and the degree of openness and legal barriers, respectively.

Table 1. Indicators, data and sources

Category	Indicator	Data	Source	Year
Dependent variable	Regional growth	Growth of Gross Value Added	EUROSTAT	2008-2013
Knowledge and innovation	Knowledge	Number of patent applications to the European Patent Office (EPO) per million inhabitants	EUROSTAT	2006
	Product innovation	Number of trademarks applications to the EPO per million inhabitants	EUROSTAT	2006
Knowledge and innovation generating assets	Accessibility	Location quotient of multimodal accessibility standardized with EU27 mean =1	ESPON	2006
	Urbanization economies	Population density	EUROSTAT	2006
	Human capital	Share of working age population with ISCED 5 and 6 degrees.	EUROSTAT	2006
Regional industrial structure	Industrial activities	Share of GVA in manufacturing over total GVA	EUROSTAT	2006
	Productive capacity	Ratio between employed persons and working age (25-64) population	EUROSTAT	2006
Long run local economic resources	Saving propensity	Share of persons that in the European Value Study consider it important or very important to teach children the importance of thrift[a]	European Value Study	2008-2009
Regional settlement structure	Settlement structure	Dummy identifying agglomerated, urban and rural regions[b,]	ESPON project 1.1.1	2005
Intangible assets	Trust	Share of EVS respondents stating that they trust fellow citizens[c]	European value study	2008-2009

Source. Capello et al. (2016), own elaboration
Legend:
a. Share of respondents "Important" or "Very Important" to the EVS question "*Here is a list of qualities which children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please choose up to five": the importance of thrift*"
b. agglomerated regions are defined as those regions hosting a city of more than 300,000 inhabitants and a population density higher than 300 inhabitants/km sq. or with a a population density between 150− and 300 inhabitants/km sq. Urban regions are defined as hosting a city between 150,000 and 300,000 inhabitants and a population density between 150 and 300 inhabitants/km sq. (or a smaller population density – between 100 and 150 inh./km but with a bigger centre, with more than 300,000 inh.) or a population

density between 100 and 150 inh./kms sq. Finally, rural regions are those areas with a population density lower than 100 inh./ sq. km. and a centre with more than 125,000 inh., or a population density lower than 100 inh./sq. kms. with a centre smaller than 125,000 inhabitants. See also Capello and Chizzolini (2008).
c. Share of respondents to the following questions have been applied: "Most people can be trusted" to the EVS question "*Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?*"

Table 2. Empirical estimates of Eq. 1

Dependent variable: growth of added 2008-2013			
Model	(1.)	(2.)	(3.)
Constant term	0.10	0.19**	0.20**
	(0.13)	(0.09)	(0.09)
Initial value added (log)	-0.02	-0.02	-0.03
	(0.00)	(0.00)	(0.00)
Agglomerated regions	-0.08*	-0.07**	-0.07*
	(0.01)	(0.01)	(0.01)
Urban regions	-0.06**	-0.06**	-0.06**
	(0.01)	(0.01)	(0.01)
Urbanisation economies	0.02	0.04	0.04
	(0.00)	(0.00)	(0.00)
Accessibility	-0.14***	-0.16***	-0.17***
	(0.01)	(0.01)	(0.01)
Saving propensity	-0.02	-0.01	-0.01
	(0.01)	(0.01)	(0.01)
Trust	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Human capital	0.13***	0.15***	0.15***
	(0.05)	(0.05)	(0.05)
Knowledge	0.00	-0.01	-0.01
	(0.00)	(0.01)	(0.00)
Product innovation	0.04*	0.05**	0.05*
	(0.00)	(0.00)	(0.00)
Productive capacity	-0.04*	-0.05*	-0.05**
	(0.02)	(0.02)	(0.02)
Demand spillovers	0.08	-	-
	(0.00)		
Demand spillovers * Degree of openness (Share of manufacturing)	-	0.13**	0.25***
		(0.00)	(0.00)
Demand spillovers * Degree of openness * Legal barrier	-	-	-0.20***
			(0.00)
Heteroskedasticity-robust standard errors	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of obs.	1069	1068	1068
R^2	0.57	0.58	0.58
Joint F-test of significance	33.76***	26.83***	24.71***

Note: Heteroskedasticity-robust standard errors in brackets.
, **, and * imply significance at the 90%, 95%, and 99% confidence level, respectively.*

Across all models, some control variables are found to be always positively and significantly associated to regional growth, such as human capital and product innovation, while others negatively affect regional economic performance (such as a more urbanized settlement structure – not surprisingly, since cities have been most directly affected by the economic contraction taking place over the observed time frame; see e.g. Capello et al., 2015).

As for demand spillovers, they are always correlated with regional growth, although in the first specification statistical significance is only marginally below the usual 10 per cent threshold.

The main result of these estimates is shown in Columns 2 and 3. While in Column 2 demand spillovers interacted with the openness indicator are found to be positively and significantly associated to regional economic growth, their interaction with the legal barrier is negatively and significantly correlated with regional performance. All in all, results hint at a hampering role played by institutional barriers in European regional growth.

5. Spatial effects of increased legal and administrative barriers

The previous section empirically verified the model set out in Section 3, and provided an assessment of the intensity of the impact of legal and administrative barriers on regional growth through a demand effect linked the reduction of export spillovers. On the basis of these findings, this Section presents an analysis of the impact of new barriers arising between European Countries. In particular, we focus on the possible increase in legal and administrative barriers, as measured in Section 4.

The aim of this section is to present a simulation of what the regional demand-side costs of dismembering the EU due to new legal and administrative barriers between countries could be. This simulation requires some assumptions on what could happen once these barriers increase to the maximum level between each country couple. This implies testing what happens in case regions belonging to different countries, rather than having the current intensity of legal and administrative barriers, face an increase to the maximum possible level.

The impact of the newly increase barriers on each European region i is calculated, consistently with Eq. (8), as in Eq. (13). Eq. (13) shows that the impact is a positive function of parameter μ (whose estimate has been presented in Section 4), of the regional degree of openness ϑ_i (proxied by regional manufacturing specialization), of the distance-weighted income of other regions ($\frac{Y_j}{d_{ij}}$), discounted by the arising of a new bilateral barrier (Δb_{ij}):

$$Barrier\ impact_i = \mu\ \vartheta_i * \sum_j \Delta b_{ij} \frac{Y_j}{d_{ij}} \qquad (13.)$$

The new legal and administrative barrier, in this simulation, will be the difference between the maximum possible level on the variable scale and the actual level of the barrier. With this approach, all EU regions will experience an increase of legal and administrative barriers with respect to other countries; however, this increase will be larger in absolute terms for those regions currently benefitting from relatively low barriers. By increasing barriers in all countries, we actually simulate the effects of EU dismembering, in the case that Brexit is followed up by other countries, rather than working out the Brexit effect alone.

Results of this simulation are presented in two maps which show the impact in terms of *losses of GDP growth* due to an increase of legal and administrative barriers which forcedly limit demand spillovers (Figure 3). In particular, Figure 3a presents the GDP growth losses in absolute terms,

while Figure 3b displays the same result in relative terms, i.e. with the colour of each region representing the impact with respect to the Country average. Using both maps, it is easier to detect which EU NUTS3 regions would be more affected in the case of the EU dismembering, and separatist policies would be implemented in each country.

Figure 3a shows that impacts would not be homogeneous among countries and regions, and the expected four spatial effects conceptualised by the theoretical model emerge with evidence. In particular, countries more affected would be those in central Europe, especially those among the original six EU members which also had more time to strengthen their relationships (notably, France and Germany). However, results also show that the UK would also be negatively affected by this scenario, because of its proximity to, and its close relations with, the European core. More geographically peripheral countries, in particular Scandinavian and Iberian ones, and the Balkans, are in absolute terms less directly affected by GDP losses due to a reduction of demand spillovers.

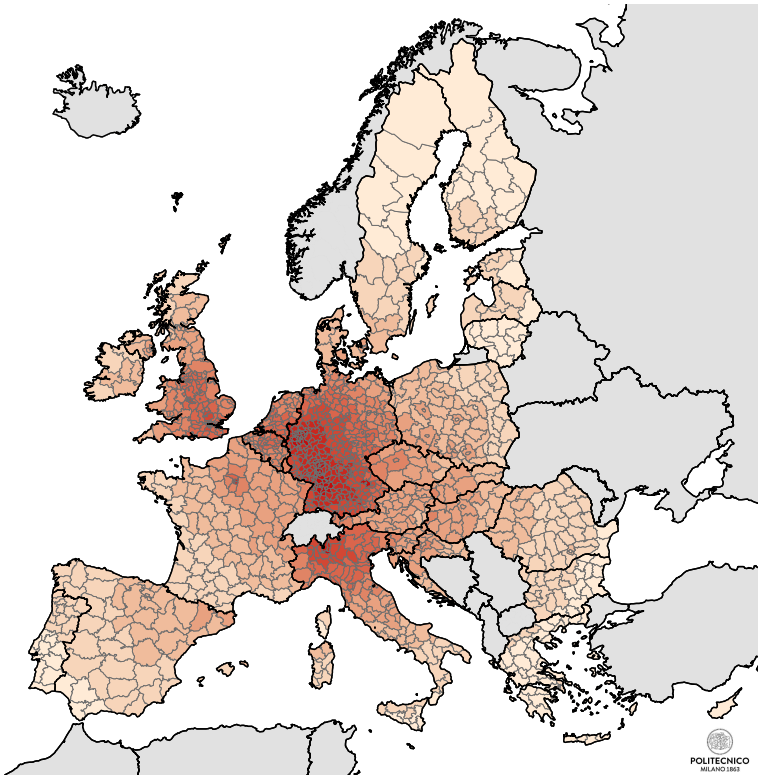
At the regional scale, some features of the processes are clearly identifiable, especially with the joint use of the two maps showing the absolute and the relative effects, respectively, at the left and right –hand side of Figure 3). As expected, regions closer to the border are ceteris paribus more affected. This is evident in most countries, for instance France and Italy, but is not a deterministic feature as in other countries, such as Germany and the UK, this effect is in fact overcome by other effects, so that border regions are not necessarily the most affected ones in absolute terms. On the contrary, the *border effect* is especially strong in Central and Eastern European countries, such as Poland, Czeck Republic, Slovakia and Hungary. In these countries, increased barriers will be detrimental especially for regions which benefited more in the past from their EU accession because of their proximity to the EU borders.

The effects of new legal and administrative barriers also show an agglomeration pattern. Ceteris paribus, more peripheral regions and less dense areas are less affected than central and dense ones. This suggests the relevance of the *centrality effect* and the *income agglomeration effect*. This is evident in both Fig. 3a and 3b for most countries, for example in France around Paris; in Germany, along the Rhine Valley; in the UK around the axis going from London to Liverpool through Birmingham and Manchester; but also in Greece, around Athens or Bulgaria and Romania around Sofia and Bucharest, respectively.

Finally, the degree of openness also matters, as evidenced by the higher values estimated for regions belonging to traditionally export-oriented manufacturing areas, such as the third Italy or the Ruhr valley in Germany (*exposure effect*).

All in all, it looks like the newly augmented legal and administrative barriers will be damaging mostly regions in Western Germany, an area where all effects suggested by the model (and here empirically estimated) are simultaneously at play. In fact, these areas are highly accessible due to their centrality; are highly agglomerated as each region is very dense and close to other dense areas; are highly specialized in export manufacturing; and, finally, are very close to the border with France, Belgium and the Netherlands. The demand impact of dismembering the EU will on the contrary be lower for Bulgaria and Greece, two countries that are geographically peripheral and whose economies depend less from exports with respect to other EU countries.

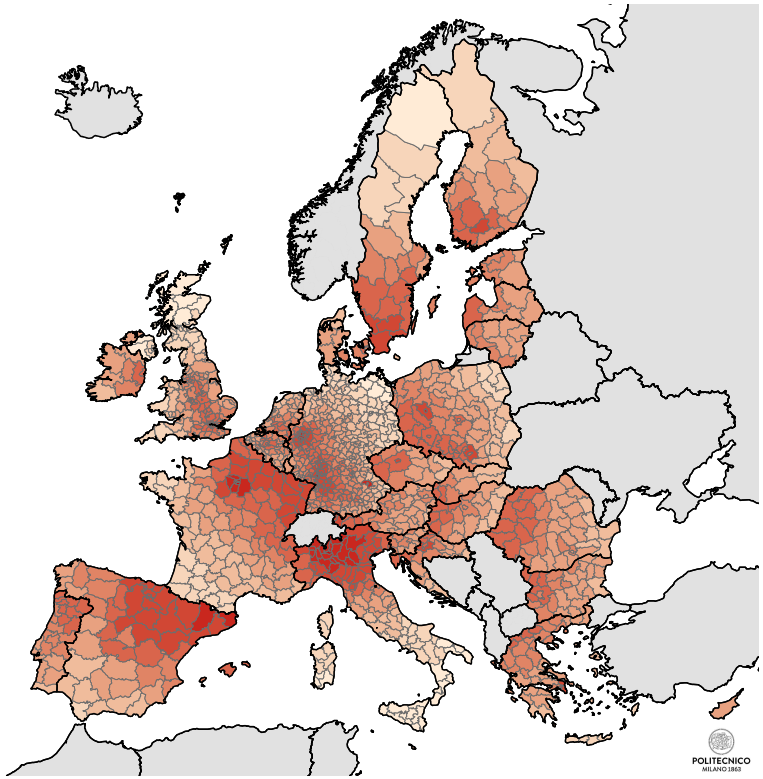
a) Absolute values



Impact in absolute terms

	-0.433 - -0.306
	-0.305 - -0.262
	-0.261 - -0.227
	-0.226 - -0.196
	-0.195 - -0.166
	-0.165 - -0.135
	-0.134 - -0.108
	-0.107 - -0.085
	-0.084 - -0.037

b) Relative values (each region with respect to its nation)



Impact in relative terms

	38.5 - 62.3
	62.4 - 78.0
	78.1 - 89.1
	89.2 - 100.0
	100.1 - 107.9
	108.0 - 119.3
	119.4 - 135.3
	135.4 - 172.5
	172.6 - 251.8

Figure 3 Loss of GDP growth due to the increase in legal and administrative barriers between European countries

6. Conclusions

This paper highlighted the spatial effects that could occur in case other EU countries would follow the UK example, and decide to leave the EU, leading to its dismembering. Within all possible effects that may take place, the paper focused on the impacts that market size restrictions would have on trade flows, in their turn due to the reinstatement of substantial legal and administrative barriers.

We theoretically modelled within a Keynesian framework the impact of such barriers on trade. Because these barriers would hamper demand spillovers that regions benefit from by being part of the Single Market, augmented legal and administrative barriers would cause four spatial effects: a *centrality* effect, an *exposure* effect, an *income agglomeration* effect, and a *centrality* effect. Within the theoretical model set out in this paper, none of these effects is ex-ante expected to prevail.

The paper then econometrically tested this theoretical model. Empirical results show that existing legal and administrative barriers between EU countries do generate demand spillover losses, which result in slower GDP growth.

Next, a simulation exercise was carried out, where barriers are strongly augmented between all EU countries. Results of this simulation show that demand spillovers decrease with different intensity in different regions. The centrality effect tends to prevail over all others, because in Europe the geographic core and the most agglomerated areas tend to coincide; however, once this point is taken into account by measuring losses with respect to the country mean (thereby making the distance of each region with respect to the EU economic core more homogeneous), other effects emerge more clearly.

Simulations suggest that the spatial impacts would be strongly heterogeneous among EU regions. Some rich areas in West Germany would in particular face the highest losses, because of the cumulative negative impacts due to the four different spatial effects. Europe's engine would therefore face stronger negative consequences, which would probably cause in the medium and long run an additional growth slowdown in the rest of Europe.

Our findings hint at a very relevant role played by inherently space-specific effects in shaping the impact of a EU dismembering, well beyond macroeconomic factors that are at a first sight first expected to channel such impacts. The creation of the Common Market and the EU has in fact enacted a number of changes in the way EU national economies interact with one another. National economies are now strongly interconnected, and our findings suggest that any attempt to break these linkages could not come without a cost, part of which is spatially very heterogeneous. In fact, these impacts occurs well beyond areas where legal and administrative barriers are already relatively high, to impact also regions that so far gained the most from the creation of the EU.

Moreover, although presently at a merely speculative level, it can be argued that these effects could be at play even in the very short run, right after possible decisions to exit the EU would be made by countries other than the UK. The rational expectation channel (captured by a subjective nature of our variable "barrier") could in fact rapidly transfer such negative beliefs to firms and consumers, instantaneously decreasing trade flows, thus ultimately slowing down GDP growth.

Our research presents potential promising extensions along many directions. One line of research could be to address the impact of augmenting barriers within a regional macro-econometric regional

growth model, which allows to formally take account of the likely interactions between these newly augmented barriers and other regional growth factors, and to estimate the feed-back effects that the decrease in demand spillovers would generate on the supply side elements behind GDP growth. Another line of research relates to the possibility of analyse the spatial heterogeneity of macroeconomic effects caused by dismembering process, in general treated and analysed as space invariant.

This rich agenda needs to be quickly undertaken so that sound and evidence-based policy suggestions can follow, and political decisions can be fed with a clearer picture of what the likely consequences in the various scenarios could be.

References

Bachtler J. and Downes R. (1999), "Regional policy in the transition countries: a comparative assessment", *European Planning Studies*, 7 (6): 793–808.

Balassa B. (1975). "Trade creation and diversion in the European Common Market: an appraisal of the evidence", in Balassa B. (ed.), "*European economic integration*", North-Holland, Amsterdam, pp. 79-118.

Boltho A. and Eichengreen B. (2008), "The Economic Impact of European Integration", CEPR Discussion paper, n. 6820.

Brakman S. and Van Marrewijk C. (2017), "A closer look at revealed comparative advantage: Gross-versus value-added trade flows", *Papers in Regional Science*, 96 (1): 61–92.

Camagni R. (1992), "Development scenarios and policy guidelines for the lagging regions in the 1990's", *Regional Studies,* 26 (4): 361–374.

Camagni R., Capello R., Caragliu A, and Toppeta A. (2017), "Quantification of the effects of legal and administrative border obstacles in land border regions", Expert contract number 2016CE160AT091, DGRegio

Camagni R. and Pompili T. (1990), Competence, power and waves of urban development in the Italian city system, in Nijkamp P. (ed.), "*Sustainability of urban systems: a cross-national evolutionary analysis of urban innovation*", Aldershot (UK): Avebury, pp. 37–86.

Campos N., Corricelli F. and Moretti L. (2014), "*Economic growth and political integration: synthetic counterfactual evidence from Europe*", mimeo.

Capello R. (2002), "Urban Rent and Urban Dynamics: The Determinants of Urban Development in Italy", *The Annals of Regional Science*, vol. 36, n. 4, pp. 593-611.

Capello R. (2016), *Regional Economics*, 2nd edition, Routledge, London.

Capello, R., Caragliu, A. and Fratesi, U. (2016). "New insights in the measurement of border effects: Endowment and efficiency needs in European Cross-Border Regions", *Paper presented at the 63rd Annual North American Meeting of the Regional Science Association International*, Minneapolis (MN), November 9-12.

Capello, R., Caragliu, A., and Fratesi, U. (2015). "Spatial heterogeneity in the costs of the economic crisis in Europe: are cities sources of regional resilience?", *Journal of Economic Geography*, 15 (5): 951–972.

CEC (2001), *Unity, solidarity, diversity for Europe, its people and its territory*, Second report on economic and social cohesion, Brussels

Cecchini P. Jacquemin. A. P., Robinson, J., and Catinat, M. (1988). "*The European Challenge: 1992*", Aldershot (UK): Wildwood House.

European Commission (2016). "*Cross Border Cooperation*", retrieved on line on May 3, 2017 at the URL https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/cross-border-cooperation_en.

Jensen, M. D. and Snaith H. (2016). "When politics prevails: the political economy of a Brexit", *Journal of European Public Policy*, 23 (9): 1302–1310.

Dhingra S, Ottaviano G., Sampson T. and Van Reenen J. (2016a), "The consequences of Brexit for UK trade and living standards", " in Van Reenen J. (ed.), *BREXIT 2016 - Policy analysis from the Centre for Economic Performance*, on line, 12-23.

Dhingra S, Ottaviano G., Sampson T. and Van Reenen J. (2016b), "The impact of Brexit on foreign investment in the UK" in Van Reenen J. (ed.), *BREXIT 2016 - Policy analysis from the Centre for Economic Performance*, on line, pp. 24-33.

Obstfeld, M., and Rogoff, K. (2000). "The six major puzzles in international macroeconomics: is there a common cause?", *NBER Macroeconomics Annual*, Vol. 15: 339–390.

Petrakos G. (2000), "The spatial impact of East-West integration in Europe", in Petrakos G., Maier G. and Gorzelak G. (eds), *Integration and Transition in Europe*, London (UK): Routledge, pp. 38–68.

Petrakos G., Rodriguez-Pos A., and Rovolis A., (2005), "Growth, integration, and regional disparities in the European Union", *Environment and Planning A*, 37 (10): 1837–1855.

Quévit M. (1992), "The Regional Impact of the Internal Market: a Comparative Analysis of Traditional Industrial Regions and Lagging Regions", *Regional Studies*, vol. 26, n. 4, pp. 349-360.

Resmini L. (2007), "Regional Patterns of Industry Location in Transition Countries: Does the Economic Integration with the EU Matter?", *Regional Studies*, 41 (6): 747–764.

Roberts, J. (1989). "The internationalisation of business service firms: a stages approach", *The Service Industries Journal*, (4): 68-88.

Scitovski T. (1958), *Economic Theory and Western Europe Integration*, Allen and Unwin, London.

Thirlwall A.P. (1974), "Regional economic disparities and regional policy in the Common Market", *Urban Studies*, 11: 1–12.

Traistaru I., Nijkamp P. and Resmini L. (eds) (2003) *The Emerging Economic Geography in EU Accession Countries*, Aldershot (UK):Ashgate.

Van Reenen J. (ed), *BREXIT 2016 - Policy analysis from the Centre for Economic Performance*, retrieved online on May 10, 2017 at the URL http://cep.lse.ac.uk/pubs/download/brexit08_book.pdf.