



Estimating the impact of Brexit on European countries and regions

Policy Paper

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Imprint

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Estimating the impact of Brexit on European countries and regions*

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March 2019

Abstract

In this paper we provide quantitative insights into the economic impact of Brexit on European countries and regions. More specifically, we evaluate the impact of a soft and a hard Brexit on productivity, markups, product variety, welfare and the distribution of population across European countries and regions. We employ a model characterized by costly trade, love of variety, heterogeneous firms, labour mobility as well as endogenous markups and productivity. We quantify the model using goods and services trade data as well as GDP and population for EEA countries/regions plus BRIC countries and other OECD countries. We finally compute, starting from the observed initial situation in the year 2016, counterfactual economic changes stemming from changes in trade costs related to the implementation of both a soft and a hard Brexit. We find that Brexit would have a significant impact on the UK and EU economies. A hard Brexit could lead to annual welfare losses of 57 billion euros in the UK and about 40 billion euros in other EU countries. A soft Brexit would strongly mitigate these losses. Productivity losses and markup increases drive the simulated effects.

Keywords: EEA; Single Market; Brexit; firm heterogeneity; endogenous markups; gravity equation; labour mobility; Europe; regions.

JEL Classification: F12; R12; F15; F17

*We thank Kristian Behrens for helpful comments and suggestions. We also thank Katharina Gnath, Christian Kastrop and Julia Schmidt for insightful comments.

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1 Introduction

In this paper we provide quantitative insights into the economic impact of Brexit for European countries and regions. More specifically, we evaluate the impacts of Brexit (both a soft and a hard version) on productivity, markups, product variety, welfare and the distribution of population across European countries and regions. In order to achieve this, we employ a model characterized by costly trade, love of variety, heterogeneous firms, labour mobility as well as endogenous markups and productivity. We subsequently quantify the model using goods and services trade data as well as GDP and population data for European Economic Area (EEA) countries/regions plus BRIC countries (Brazil, Russia, India and China) and other OECD countries. We finally compute, starting from the observed initial situation in the year 2016, counterfactual economic changes stemming from changes in trade costs related to the implementation of Brexit.

We first develop a model, drawing upon Behrens et al. (2014) and Behrens et al. (2017), characterized by costly trade, love of variety, heterogeneous firms, labour mobility as well as endogenous markups and productivity. We subsequently quantify the model using goods and services trade data as well as GDP and population for EEA regions/countries plus other OECD and BRIC countries.¹ In the first part of our analysis we quantify our model and run counterfactual analyses at the country-level for both EEA and non-EEA countries. In the second part of our analysis, we break down EEA countries into the corresponding NUTS2 regions. We finally assess the impact of Brexit (both a soft and a hard version) by performing a series of counterfactual experiments. We model the impact of Brexit based on the estimation of a trade gravity equation from which we recover a parameter measuring the amount of additional trade EEA countries do with each other once discounted for other determinants of bilateral trade flows (distance, language, adjacency, past colonial ties). Such a parameter is an indicator of the trade-boosting effects of the EEA agreement and the Single Market and is the key to our counterfactual Brexit analysis. In the hard Brexit scenario we set this parameter to zero for trade between the UK and other members of the EEA and compute the new counterfactual equilibrium. In the soft Brexit scenario we instead set this parameter to half of the estimated value and compute the new counterfactual equilibrium. In what follows costs are expressed

¹Specifically, these are Australia, Brazil, Canada, Chile, China, India, Israel, Japan, Korea, Mexico, New Zealand, Russia, Turkey and the US.

on a yearly basis and so, if one wants to translate such yearly costs into a one-off cost, a proper time-discounting procedure needs to be applied.

As far as the hard Brexit scenario is concerned we find, unsurprisingly, that the country that would lose out the most is the UK. Welfare would go down by 2.39% which translates into 873 euros per capita and an aggregate cost – computed as cost per capita times population – of more than 57 billion euros. In this respect it is important to keep in mind that these are yearly costs because the welfare of the UK will be 2.39% lower than what it would have been in any year following a hard Brexit. Therefore, the one-off cost equivalent to a hard Brexit would be considerably higher than the 2.39% figure for welfare, 873 euros per capita and 57 billion euros in aggregate. The same applies to costs and gains for other countries.

Coming back to our results, the decline of UK welfare will materialize as a consequence of a reduction in productivity (and product variety) of 2.20% and an increase in markups of 2.25%. The simulations suggest that this would cause more than 750,000 people to leave the UK for better prospects elsewhere. At the same time, however, all EEA countries will be negatively affected by Brexit. Some countries close to the UK, like Ireland, would lose considerably (1.24% reduction in welfare meaning more than 700 euros per capita) while some other countries far away from the UK, like Austria, would only be marginally affected (0.20% reduction in welfare meaning about 80 euros per capita). The aggregate cost, computed as per capita cost times population, of Brexit for EEA countries (not including the UK) would sum up to 43 billion euros. Again, these figures are on a yearly basis and so the one-off equivalent cost would be much higher. Finally, countries outside the EEA are actually expected to experience some small gains from Brexit. For example, the US would experience a 0.08% increase in welfare corresponding to 41 euros per capita and summing up to a total of 13.2 billion euros.

Moving from countries to regions unveils rich and very heterogeneous patterns. Such patterns are actually quite straightforward to interpret as the size of changes being largely dictated by distance to the UK: Regions closer (further away) to (from) the UK experiencing larger (smaller) relative changes. At the same time, analyzing the data in more detail using a linear regression also reveals that smaller and more productive regions lose more than larger and less productive ones. As far as UK regions are concerned, welfare losses would be larger for regions closer to the continent like East Anglia (2.54% loss), Kent (2.53% loss), Essex (2.48% loss) and Cornwall (2.48% loss). Interestingly enough, London would be among the regions

loosing the least in percentage terms (1.66% loss) but the one loosing the most in absolute terms (about 1,700 euros per capita) owing to its large GDP per capita.

As far as the soft Brexit scenario is concerned, the effects are similar to those of the hard Brexit scenario, but lower in magnitude. Welfare would go down in the UK by 1.34%, equivalent to 491 euros per capita. The aggregate cost for the UK would be more than 32 billion euros. This will materialize as a consequence of a reduction in productivity and product variety of 1.24% and in increase in markups of 1.26%. In a soft Brexit scenario, this would cause more than 400,000 people to leave the UK. Once again, all EEA countries will be negatively affected by Brexit. As outlined above, countries close to the UK would lose considerably (e.g., Ireland with a 0.68% reduction in welfare meaning almost 400 euros per capita) while some other countries further away from the UK, like Greece, would only be marginally affected (0.1% reduction in welfare meaning about 20 euros per capita). The aggregate cost of a soft Brexit for EEA countries (not including the UK) would sum up to 23.8 billion euros. Again, countries outside the EEA could benefit to a small extent from Brexit. For example, the US would experience a 0.04% increase in welfare corresponding to 22 euros per capita and summing up to a total of 7.3 billion euros.

The regional effects of a soft Brexit resemble the patterns we observe in the hard Brexit scenario: the magnitude of losses are decreasing in the distance from the UK. Again, smaller and more productive EU regions lose out more relative to larger and less productive ones. Moreover, London would be one of the regions in which the relative welfare loss is among the lowest (a 0.94% loss), but the loss in absolute terms would be among the highest (about 960 euros per capita), reflecting its high GDP per capita.

The building blocks of our analysis are the models developed in Behrens et al. (2014) and Behrens et al. (2017). Many general equilibrium models of international trade yield equivalent results about the aggregate impacts of trade liberalization for welfare and trade flows as captured by the gravity equation (Arkolakis et al., 2012). However, models differ in their specific predictions along which margins an economy adjusts to freer trade. Recent workhorse frameworks have focused on combinations of wages, productivity, and consumption diversity as adjustment mechanisms, triggered by firm selection and market share reallocations. Yet, those models do not come to grips with the fact that trade integration also changes firms' price-cost margins.

In this respect there has been vastly growing empirical interest in markups re-

cently, and important contributions by De Loecker (2011), De Loecker et al. (2016), Feenstra and Weinstein (2017), Simonovska (2015), and others, have established some basic facts: (i) markups differ substantially across firms even within industries, and firms with lower marginal costs tend to charge higher markups; (ii) firms apply different markups across different markets; and (iii) trade integration affects price-cost margins. The main contribution of Behrens et al. (2014) is to develop a general equilibrium quantifiable model of trade under monopolistic competition with variable demand elasticity, heterogeneous firms, and multiple asymmetric countries. Wages, productivity, and consumption diversity are all endogenously determined, and in line with the facts (i)–(iii), markups differ across firms and across markets, and respond to trade integration. We use this model in our analysis and further allow for mobility of workers across space along the lines of Behrens et al. (2017). Finally, we use the concept of equivalent variation to measure changes in welfare drawing upon the results laid down in Arkolakis et al. (2018).

2 Method and approach

In this section, we provide a non-technical outline of the model used for the analyses throughout this study.² To estimate the effect of Brexit on EU countries' and regions' productivity, markups, welfare and population we use a modern quantitative trade model of the global economy based on Behrens et al. (2014) and Behrens et al. (2017). Quantitative trade models incorporate the channels through which trade affects consumers, firms and workers, and provide a mapping from trade data to welfare. The model provides numbers for how much countries and regions are affected by different trade policies, using readily available data on trade volumes, GDP and potential trade barriers. The trade data we use are from the COMTRADE (ITS) database provided by the United Nations (Eurostat) for the period 2010-2016. We also consider data from a set of relevant factors to be used in our gravity regression, provided by the Centre d'Etude Prospectives et d'Informations Internationales (CEPII). Using data on trade costs and based on a gravity regression, we derive a measure of "freeness of trade" that mirrors the trade boosting effect of the Single Market. For the analysis here, we derive a counterfactual freeness of trade-parameter that reflects, all else equal, the weakened projected trade between the UK and other countries in

²The full derivation and all technical details of the model are available on request.

the Single Market as a result of Brexit. In the soft Brexit scenario, the trade boosting effect of the Single Market for trade with the UK would be reduced (but still be existent). In the hard Brexit scenario, the trade boosting effect of the Single Market would be set to zero.

The model used in our analysis builds upon the tradition of so-called "gravity models of trade", i.e., models where a key feature of trade is that its volume is increasing in the size of the exporting and importing countries/regions and inversely related to the distance and trade costs between the two countries/regions. In this respect, abundant research and empirical evidence have demonstrated the robustness and accuracy of these models that represent nowadays a standard in international trade. These models are also very versatile and modern versions like ours incorporate several channels via which trade affects the economy.

For example, our model features countries/regions that are more or less competitive depending on the productivity of their firms and/or the cost of their labour force as well as consumers buying differentiated varieties of products and services produced anywhere in the world. It also allows for firms in each country/region to be heterogeneous in their productivity and size and to be differentially affected by trade exposure while at the same time incorporating the impacts of trade on the degree of competition among firms and so ultimately on markups and prices. Finally, it allows for entry and exit of firms to affect and be affected by trade and for country size to be a determinant of trade patterns. Countries and regions in our model trade with each other and trade is subject to trade costs. Any change in trade barriers affects all countries/regions in a general equilibrium fashion via the above channels and our model pins down these interdependencies and quantifies the impacts of change in trade barriers on key economic outcomes: productivity, markups, welfare and population. Our analysis of welfare changes is based on the concept of equivalent variation as in Arkolakis et al. (2018). More specifically, we compute the change in income that, given initial prices, would allow the representative consumer to reach the same utility level corresponding to the counterfactual equilibrium. Loosely speaking, this corresponds to the income reduction/increase equivalent of the counterfactual Brexit scenario.

However, despite being rich and versatile our model, like any modern quantitative trade model, is based upon assumptions that limit its capacity to be able to speak about other important aspects. For example, our model has nothing to say about how countries'/regions' trade balances would be affected by Brexit because

we assume that trade is balanced. At the same time, our model does not feature growth and so the impact of trade on the speed of innovation is not accounted for. In the same vein, the positive effects that European integration has on "soft" determinants of integration (i.e., culture, education and national security, to name a few) are not part of our analysis either. Finally, our model also abstracts from the distribution of welfare gains and losses due to changes in trade costs. Indeed, our model provides insights into overall gains and losses at the country/region level but has nothing to say about *who* will be positively and/or negatively affected within a country/region.

3 The economic costs of a hard Brexit

3.1 Results

In our Brexit analysis, we present two series of results. First, we work at the country level and, contrary to models used in most previous analyses, we allow for mobility of labor across countries. Second, we work at the regional level, and allow for labor mobility across both countries and regions. We also take a more detailed look at two countries, the UK and Germany, to uncover more heterogeneity in regional welfare effects. Note that the counterfactual simulations for countries and regions are separate simulations – that is, the country simulations treat EEA countries as country units, while the region-wide quantification treats the same set of countries as a collection of their respective regions.³

3.1.1 Countries

Table 1 summarizes our key results on economic outcomes at the country level.⁴

It reveals, unsurprisingly, that the country that would lose the most in our hard Brexit scenario is the UK. Welfare would go down by 2.39% which means 873 euros per capita and an aggregate cost, computed as cost per capita times population, of more than 57 billion euros. In this respect it is important to note that these are

³Thus, the estimated economic impact for the same country can slightly differ across the simulations. Whenever we refer to losses at the country level, we refer to the country-wide simulations. When we refer to regional losses, we base our analysis on the region-wide simulations.

⁴Note that within our model, percentage changes in productivity and consumption diversity will be the same.

yearly costs because the welfare of the UK will be 2.39% lower than what it would have been in any year following a hard Brexit. Therefore, the one-off cost equivalent to a hard Brexit would be considerably higher than the 2.39% loss of welfare, 873 euros per capita and 57 billion euros in aggregate. The same applies to costs and gains for other countries.

The decline of UK welfare will materialize as a consequence of a reduction in productivity and product variety of 2.20% and an increase in markups of 2.25%. Furthermore, this would cause more than 750,000 people to leave the UK for better prospects elsewhere. At the same time, however, all EEA countries will be negatively affected by Brexit. Some countries close to the UK, like Ireland, would lose considerably (1.24% reduction in welfare meaning more than 700 euros per capita) while some other countries far away from the UK, like Austria, would only be marginally affected (0.20% reduction in welfare meaning about 80 euros per capita). The aggregate cost, computed as per capita cost times population, of Brexit for EEA countries (not including the UK) would sum up to 43 billion euros. Again, these figures are on a yearly basis and so the one-off equivalent cost would be much higher. Countries outside the EEA are actually expected to experience some small gains from Brexit. For example, the US would experience a 0.08% increase in welfare corresponding to 41 euros per capita and summing up to a total of 13.2 billion euros.

Table 1

Economic costs of a hard Brexit (country level)

Country	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in EUR (per capita)	Aggregate Welfare Change (Million EUR)
AUS	0.216	-0.216	0.074	34	840
AUT	-0.062	0.062	-0.205	-83	-724
BEL	-0.255	0.255	-0.400	-149	-1,691
BRA	0.236	-0.235	0.105	8	1,702
BGR	-0.083	0.083	-0.231	-16	-111
CAN	0.197	-0.197	0.056	21	774
CHL	0.221	-0.220	0.088	11	199
CHN	0.185	-0.185	0.052	4	5,257
HRV	-0.115	0.115	-0.264	-29	-122
CYP	-0.084	0.084	-0.229	-49	-42
CZE	-0.093	0.094	-0.240	-40	-424
DNK	-0.183	0.184	-0.325	-158	-902
EST	-0.121	0.121	-0.269	-43	-57
FIN	-0.113	0.113	-0.257	-101	-554
FRA	-0.201	0.202	-0.347	-120	-7,732
DEU	-0.158	0.159	-0.302	-115	-9,504
GRC	-0.081	0.081	-0.228	-37	-397
HUN	-0.101	0.101	-0.248	-29	-290
ISL	-0.176	0.176	-0.317	-173	-58
IND	0.233	-0.233	0.105	2	2,156
IRL	-1.114	1.127	-1.240	-726	-3,412
ISR	0.306	-0.305	0.167	56	480
ITA	-0.099	0.099	-0.245	-68	-4,110
JPN	0.180	-0.180	0.039	14	1,762
KOR	0.181	-0.181	0.043	11	546
LVA	-0.126	0.126	-0.274	-35	-68
LTU	-0.120	0.120	-0.269	-36	-104
LUX	-0.199	0.200	-0.336	-220	-127
MLT	-0.158	0.158	-0.306	-69	-31
MEX	0.166	-0.165	0.031	2	306
NLD	-0.306	0.307	-0.450	-186	-3,162
NZL	0.212	-0.211	0.072	25	121
NOR	-0.208	0.208	-0.345	-220	-1,157
POL	-0.098	0.098	-0.246	-28	-1,045
PRT	-0.154	0.154	-0.303	-54	-562
ROM	-0.095	0.095	-0.243	-21	-413
RUS	0.157	-0.157	0.023	2	262
SVK	-0.100	0.100	-0.247	-37	-200
SVN	-0.096	0.096	-0.242	-47	-98
ESP	-0.132	0.132	-0.279	-67	-3,115
SWE	-0.166	0.166	-0.308	-143	-1,432
CHE	-0.082	0.082	-0.221	-160	-1,336
TUR	0.174	-0.174	0.040	4	309
GBR	-2.197	2.247	-2.386	-873	-57,340
USA	0.223	-0.223	0.079	41	13,237

Notes: Columns 2 to 6 provide counterfactual changes in productivity and product diversity (column 2: % changes), markups (column 3: % changes), welfare (columns 4, 5 and 6: % changes, per capita changes in euros and aggregate changes in Million euros, respectively). Productivity corresponds to value added per worker. Welfare corresponds to the change in income that, given initial prices, would allow consumers to reach the same utility level corresponding to the counterfactual equilibrium. Markups (as defined in the model) are equivalent to price over marginal cost.

3.1.2 Regions

While Table 1 shows our key results at the country level, it also masks a substantial amount of within-country heterogeneity. We now present results for our counterfactual scenario by breaking down EEA countries into their NUTS2 regions. Together with the rest-of-the-world countries we hence run the model for 297 regions in total (283 NUTS2 regions, and 14 other OECD and BRIC trading partners).

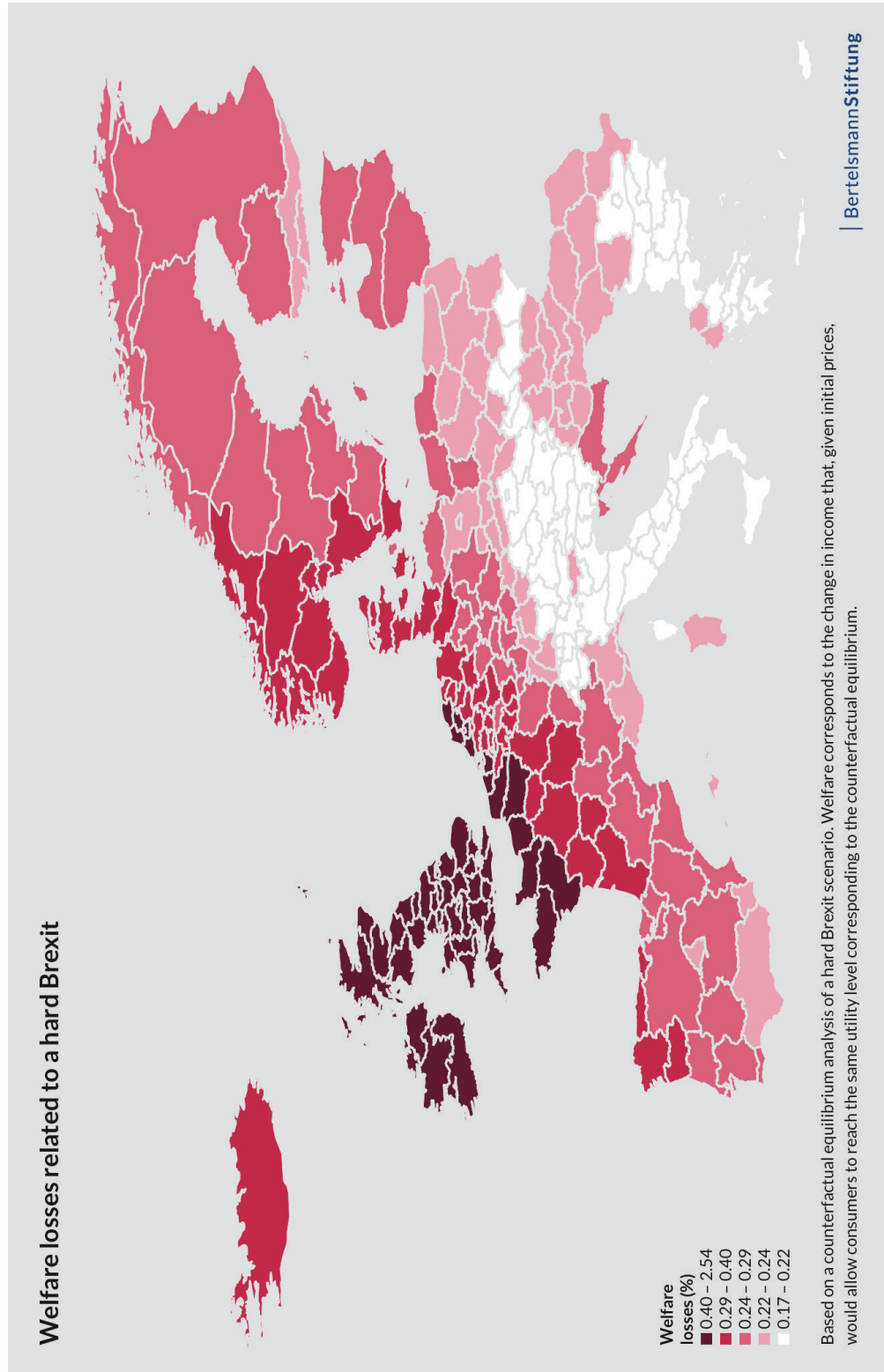
Figure 1 displays relative welfare losses (in %) across NUTS2 regions as a result of a hard Brexit scenario. Such figures highlight the richness of detail and heterogeneity that our analysis can capture. The patterns in Figure 1 can be interpreted as the size of relative changes being largely determined by distance to the UK: Again, regions closer to the UK would see larger changes as a result of a hard Brexit. At the same time, analyzing the data further by means of a linear regression also reveals that smaller and more productive regions lose more than larger and less productive ones. Importantly, note that such welfare losses reflect the size of the losses relative to the GDP levels across region – the darker the shading, the higher the relative income loss due to a hard Brexit. However, in terms of *absolute* welfare losses, the picture looks quite differently and much more scattered than in Figure 1. We further highlight the differences between absolute and relative welfare losses below, as we examine regional heterogeneity within individual countries.

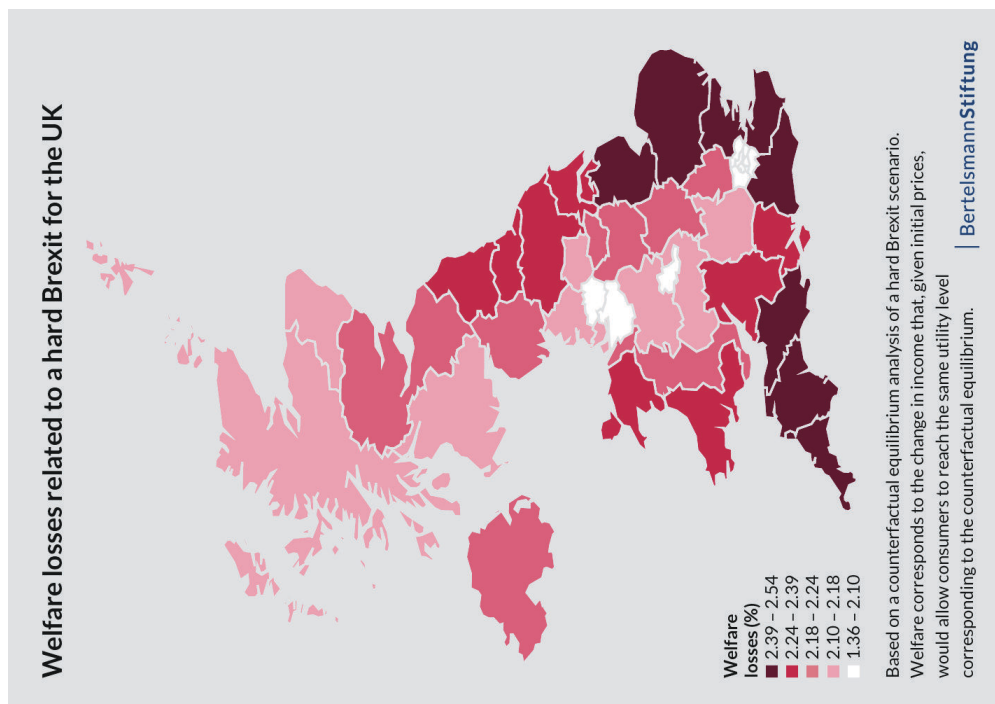
As far as UK regions are concerned relative welfare losses – as displayed in detail in the left panel of Figure 2 – would be larger for regions closer to the continent like East Anglia (2.54% loss), Kent (2.53% loss), Essex (2.48% loss) and Cornwall (2.48% loss). London would be among the regions losing the least in % terms (1.66% loss) but the one losing the most in absolute terms (about 1,700 euros per capita) owing to its large GDP per capita. Table 3 (in the appendix) provides detailed information on hard Brexit effects for all regions. Looking at aggregate absolute losses by region (right panel of Figure 2), on the other hand, reveals more insights. Again, London is a case in point: given its high population, the incidence of aggregate welfare losses (by region and *not* per capita) suggests that London would lose out the most – with central London alone incurring a welfare loss of more than 5.5 billion euros annually. However, relative income losses are quite low given the city's high GDP level. There are also regions in which relative welfare losses are high, but the aggregate regional loss appears to be fairly low. For instance, in Devon the percentage loss in welfare is relatively high (2.43%), as is the corresponding per capita welfare loss (about 700

euros). However, due to its moderate population size, aggregate income losses are relatively low, at less than 800 million euros.

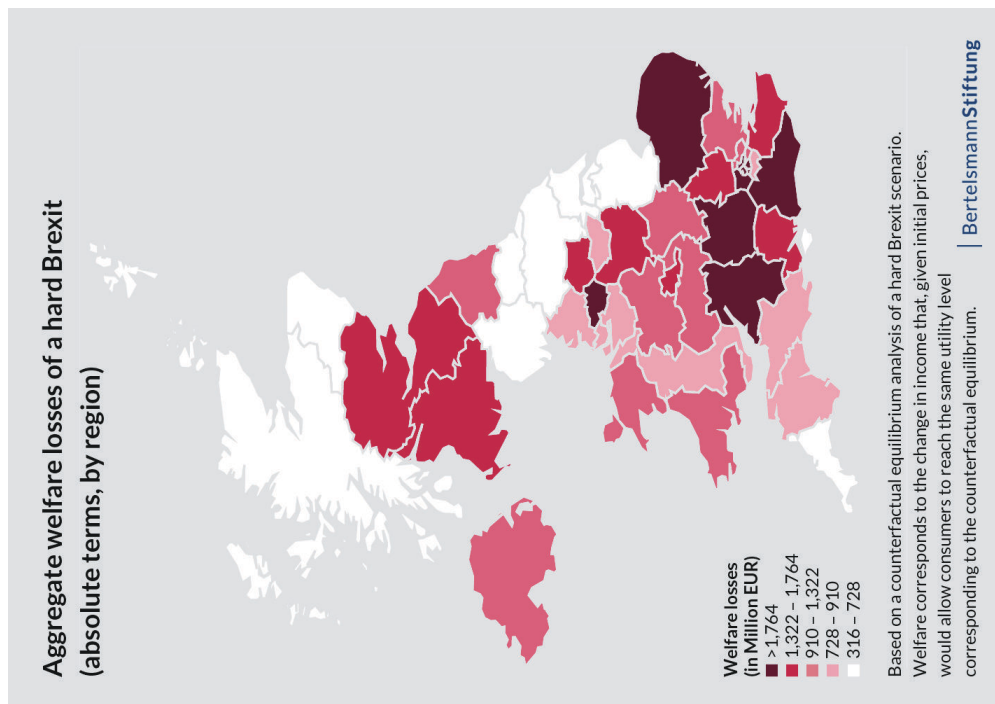
As another exemplary country, we now turn to regional welfare effects in Germany. The left panel in Figure 3 displays relative welfare losses (in %) across Germany. The right panel depicts simulated absolute welfare losses by German region. As can be seen, regions in which major cities are located, such as Cologne, Düsseldorf and Hamburg would be hit quite strongly by a hard Brexit, both in absolute terms (aggregate welfare losses across its population) and in terms of relative welfare losses. Moreover, it can be noted that regions closer to the UK tend to suffer the most in relative terms – for example, the Weser-Ems region and the region of Schleswig-Holstein lose out the most in relative terms (about 0.3%). Strikingly, economically particularly strong regions like Oberbayern (which includes the city of Munich) show just a moderate level of relative income losses, owing to the region's high initial GDP level. But the region indicates a per capita welfare loss of 115 euros annually (among the top 20% regions). And given its strong population, the region's overall welfare losses in absolute terms come third in Germany at more than half a billion euros per year.

Figure 1



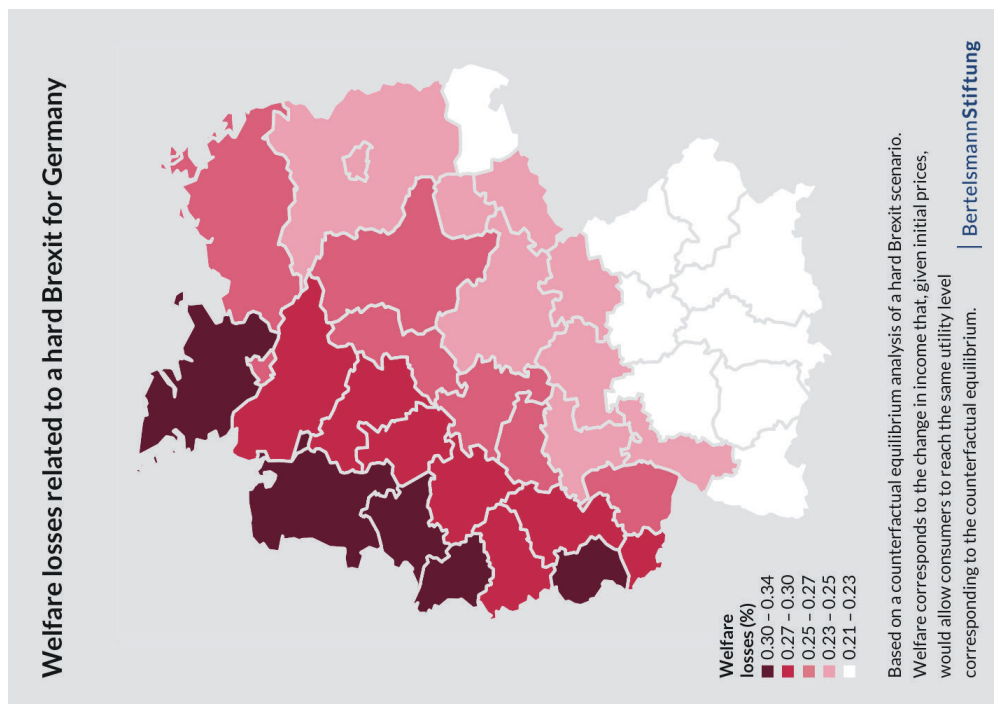


(a)

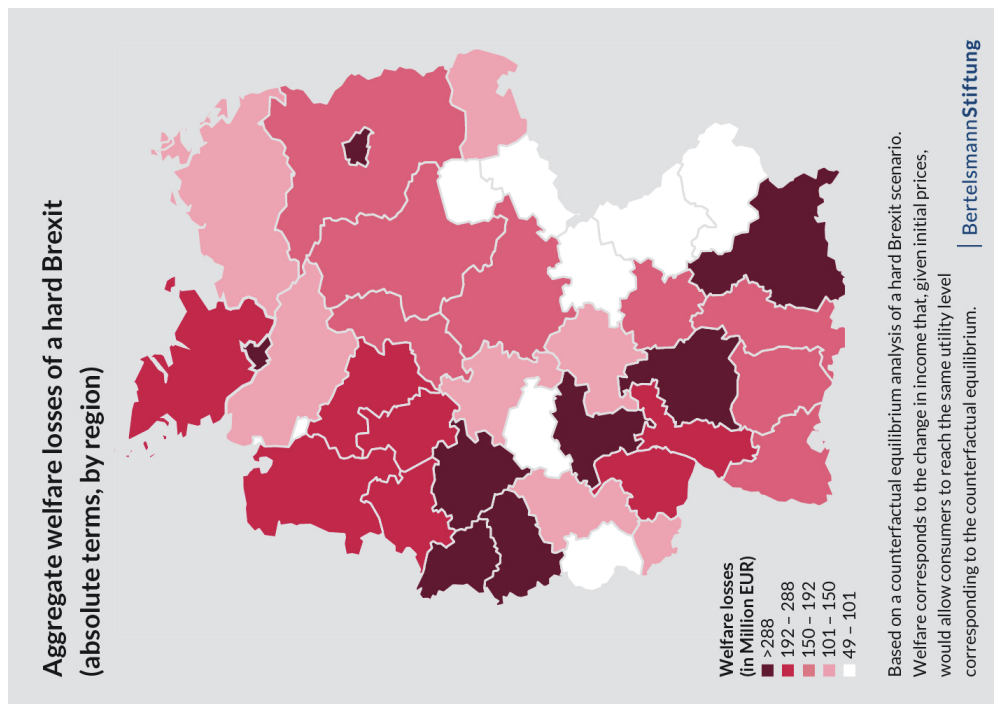


(b)

Figure 2



(a)



(b)

Figure 3

4 The economic costs of a soft Brexit

4.1 Results

Akin to the hard Brexit scenario, we again present two sets of analyses, separately for countries and regions while allowing for mobility of labor across countries. We also take a more detailed view on regions in the UK and Germany – however, soft and hard Brexit scenarios mainly differ in the magnitude of the costs incurred by countries and regions; the relative strengths in the costs across regions are broadly unaffected.

4.1.1 Countries

We start with a view at country level effects. Table 2 summarizes our key results at the country level. As in the hard Brexit scenario, Table 2 indicates that the country losing out the most in the soft Brexit scenario is, again, the UK. Welfare would go down by 1.34% which implies a loss of 491 euros per capita. The aggregate cost for the UK would be more than 32 billion euros. Again, the reduction in welfare would be accompanied by a loss in productivity of 1.24% and an increase in markups of 1.26%. According to the simulations, the soft Brexit scenario would cause more than 400,000 people to leave the UK for better prospects elsewhere. As for other countries, we observe patterns that resemble the soft Brexit scenario: all EEA countries will be affected. Being close to the UK, Ireland would be hit relatively hard (0.68% reduction in welfare implying almost 400 euros per capita) while some other countries far away from the UK, like Austria, would only be marginally affected in relative terms (0.11% reduction in welfare meaning about 45 euros per capita). We note that the aggregate cost of a soft Brexit for EEA countries (not including the UK) would sum up to 23.8 billion euros.

Akin to our findings from analyzing the hard Brexit scenario, countries outside the EEA are expected to experience some small gains from a soft Brexit. For example, the US would experience a 0.04% increase in welfare corresponding to 22.5 euros per capita and summing up to a total of 7.3 billion euros.

Table 2

Economic costs of soft Brexit (country level)

Country	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in EUR (per capita)	Aggregate Welfare Change (Million EUR)
AUS	0.121	-0.121	0.041	19	463
AUT	-0.033	0.033	-0.114	-46	-402
BEL	-0.140	0.140	-0.222	-83	-938
BRA	0.132	-0.132	0.058	5	940
BGR	-0.045	0.045	-0.128	-9	-61
CAN	0.111	-0.111	0.031	12	427
CHL	0.124	-0.123	0.049	6	110
CHN	0.104	-0.104	0.029	2	2,901
HRV	-0.062	0.062	-0.146	-16	-68
CYP	-0.046	0.046	-0.128	-27	-23
CZE	-0.050	0.050	-0.133	-22	-235
DNK	-0.100	0.100	-0.180	-88	-500
EST	-0.065	0.065	-0.149	-24	-31
FIN	-0.061	0.061	-0.142	-56	-307
FRA	-0.110	0.110	-0.192	-66	-4,286
DEU	-0.086	0.086	-0.168	-64	-5,273
GRC	-0.044	0.044	-0.126	-20	-220
HUN	-0.054	0.054	-0.138	-16	-161
ISL	-0.096	0.096	-0.175	-96	-32
IND	0.130	-0.130	0.058	1	1,190
IRL	-0.609	0.613	-0.679	-398	-1,868
ISR	0.170	-0.170	0.092	31	265
ITA	-0.054	0.054	-0.136	-38	-2,279
JPN	0.101	-0.101	0.022	8	970
KOR	0.102	-0.101	0.024	6	301
LVA	-0.068	0.068	-0.152	-19	-38
LTU	-0.065	0.065	-0.149	-20	-58
LUX	-0.109	0.109	-0.186	-122	-70
MLT	-0.087	0.087	-0.171	-39	-17
MEX	0.093	-0.093	0.017	1	169
NLD	-0.168	0.169	-0.249	-103	-1,752
NZL	0.119	-0.118	0.040	14	67
NOR	-0.113	0.114	-0.191	-122	-641
POL	-0.053	0.053	-0.136	-15	-580
PRT	-0.084	0.084	-0.168	-30	-311
ROM	-0.051	0.051	-0.135	-12	-228
RUS	0.089	-0.089	0.013	1	145
SVK	-0.054	0.054	-0.137	-20	-111
SVN	-0.052	0.052	-0.134	-26	-54
ESP	-0.072	0.072	-0.154	-37	-1,726
SWE	-0.090	0.090	-0.171	-79	-793
CHE	-0.044	0.044	-0.123	-89	-743
TUR	0.098	-0.098	0.022	2	171
GBR	-1.242	1.258	-1.342	-491	-32,264
USA	0.125	-0.125	0.043	23	7,295

Notes: Columns 2 to 6 provide counterfactual changes in productivity and product diversity (column 2: % changes), markups (column 3: % changes), welfare (columns 4, 5 and 6: % changes, per capita changes in euros and aggregate changes in Million euros, respectively). Productivity corresponds to value added per worker. Welfare corresponds to the change in income that, given initial prices, would allow consumers to reach the same utility level corresponding to the counterfactual equilibrium. Markups (as defined in the model) are equivalent to price over marginal cost.

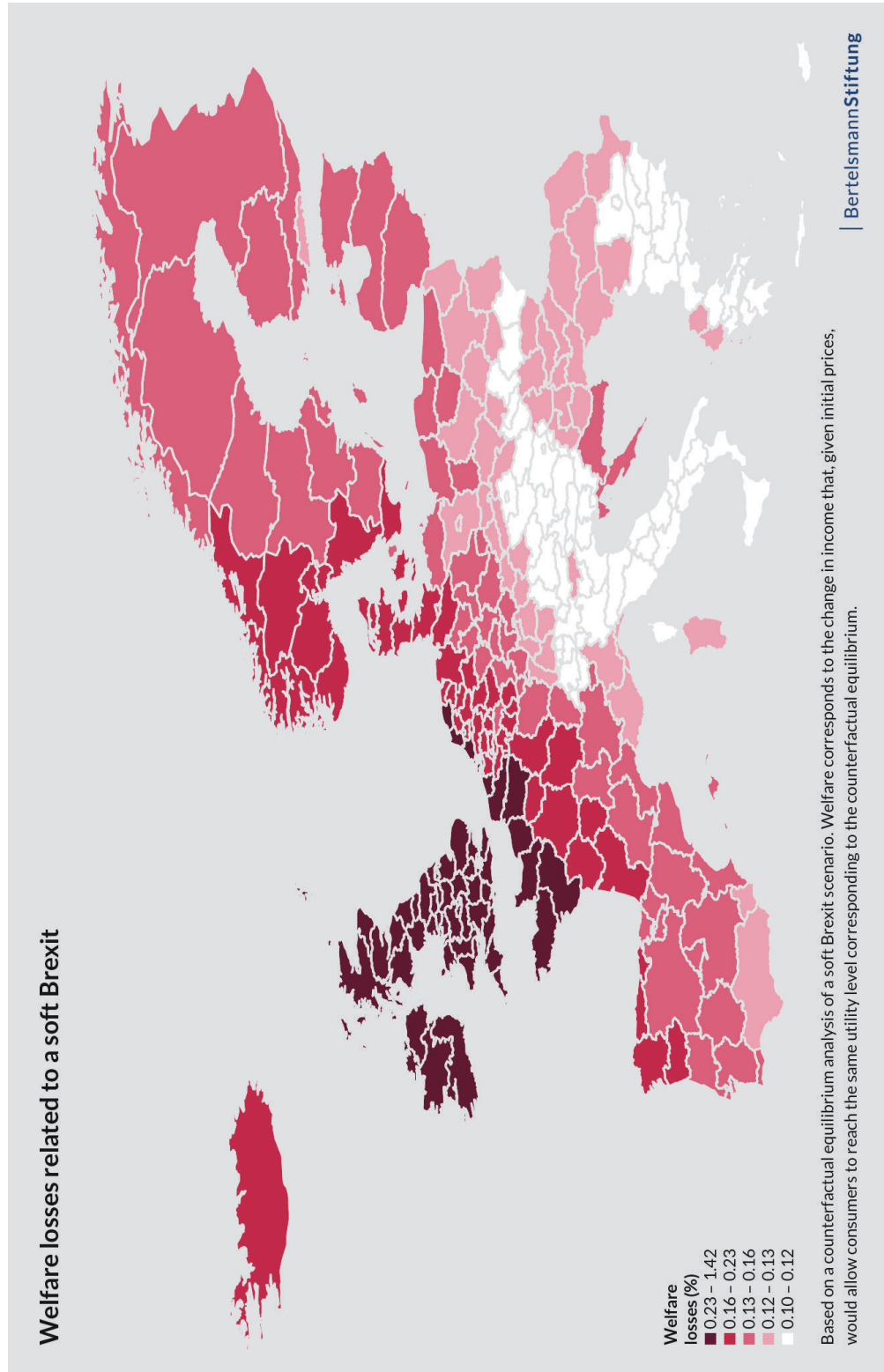
4.1.2 Regions

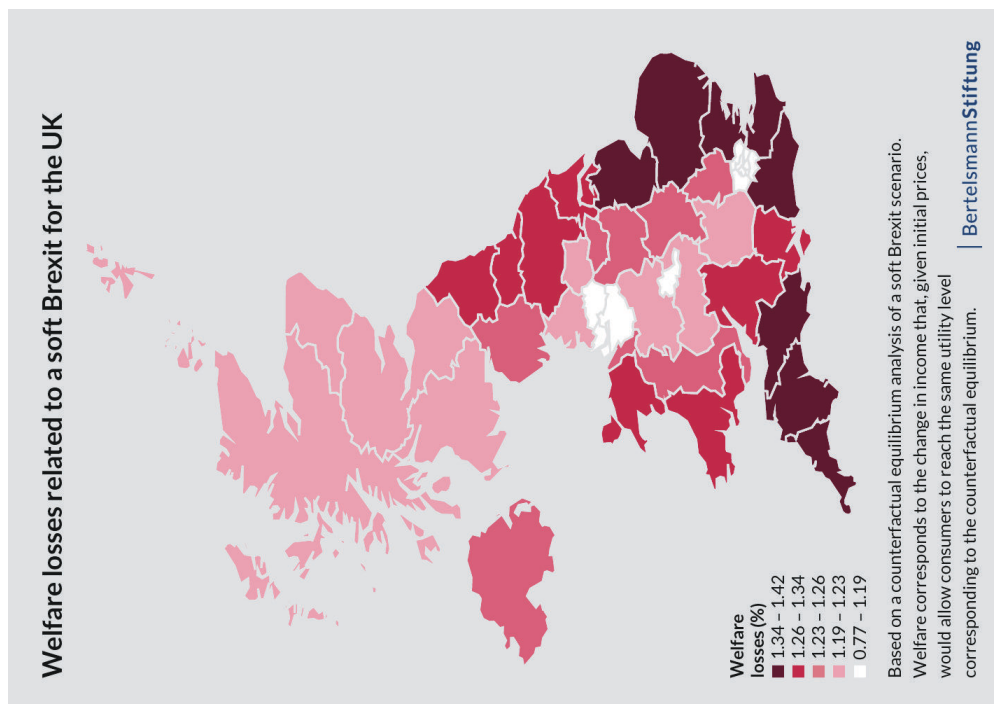
As in the previous section, we now present results for our counterfactual scenario by breaking down EEA countries into their NUTS2 regions and now examine the likely impact of a soft Brexit on regional welfare. Figure 4 presents relative welfare losses (in % of regional incomes) across NUTS2 regions. Again, this figure uncovers the regional (within-country) heterogeneity in terms of relative welfare losses. The patterns we observe are broadly similar to those of the hard Brexit scenario, yet the magnitude of the shock would be smaller. Consequently, Figure 4 can be interpreted such that the size of changes are largely determined by distance to the UK with regions closer (further away) to (from) the UK experiencing larger (smaller) changes. Using multivariate regression, we reveal that smaller and more productive regions lose more than larger and less productive ones as a result of the soft Brexit scenario.

To examine within-country heterogeneity in more detail, we now turn to individual countries and analyse the effects of Brexit for regions in the UK and Germany. Note that Table 4 (in the appendix) lists soft Brexit effects for all regions in our data. The left and right panels of Figure 5 present relative and absolute welfare losses across UK regions, respectively. As for relative welfare losses, we observe that these would be larger for regions closer to the continent like East Anglia (1.42% loss), Kent (1.42% loss), Essex (1.40% loss) and Cornwall (1.38% loss). As in the hard Brexit case, we observe a slightly altered pattern when looking at absolute welfare losses. For instance, we document that London would be among the regions losing the least in percentage terms (0.94% loss) from a soft Brexit, but the one losing the most in absolute terms (about 3.5 billion euros) owing to its large GDP per capita. This, yet again, highlights the importance to distinguish between relative and absolute changes across regions due to Brexit.

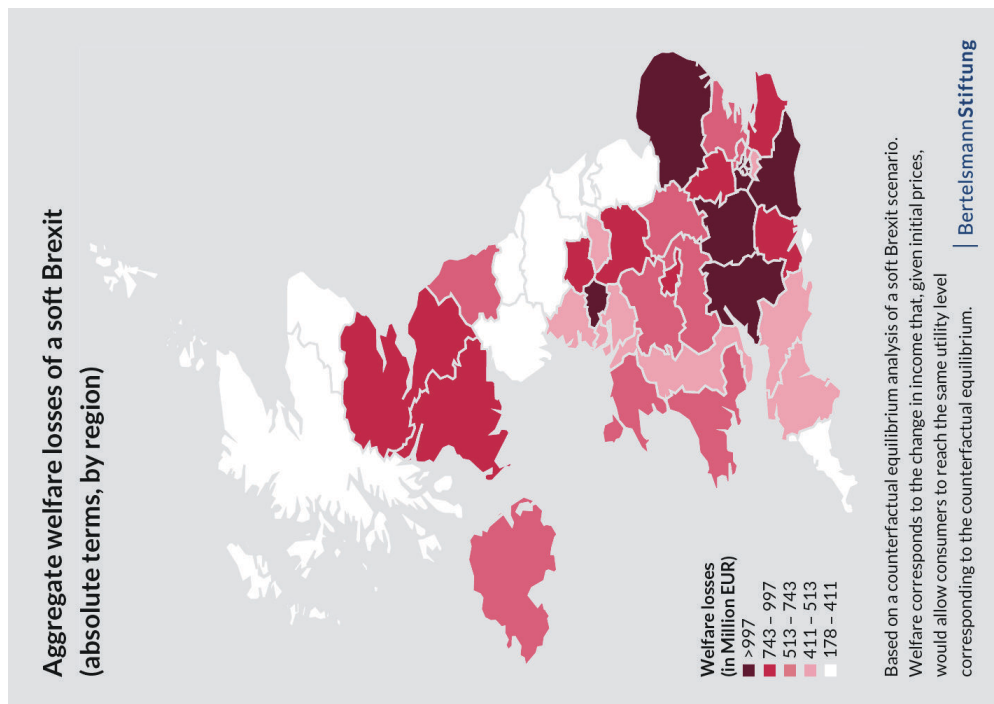
In Figure 6, we present the effects of a soft Brexit on welfare in German regions. The relative impact would resemble the patterns we observe in the hard Brexit scenario; yet, the magnitudes of the effects would be lower. Aggregate welfare losses would be highest in Oberbayern, Dusseldorf und Cologne, ranging from 300 to 350 million euros annually. Relative to current income levels, the impact would be strongest in regions in the north of the country: Hamburg, Bremen and the Weser-Ems regions would lose out the most, with about 0.17% of welfare losses. Strikingly, this percentage loss also corresponds to what Dusseldorf and Cologne would forego – which are thus regions that lose out strongly *both* in relative and in absolute terms.

Figure 4



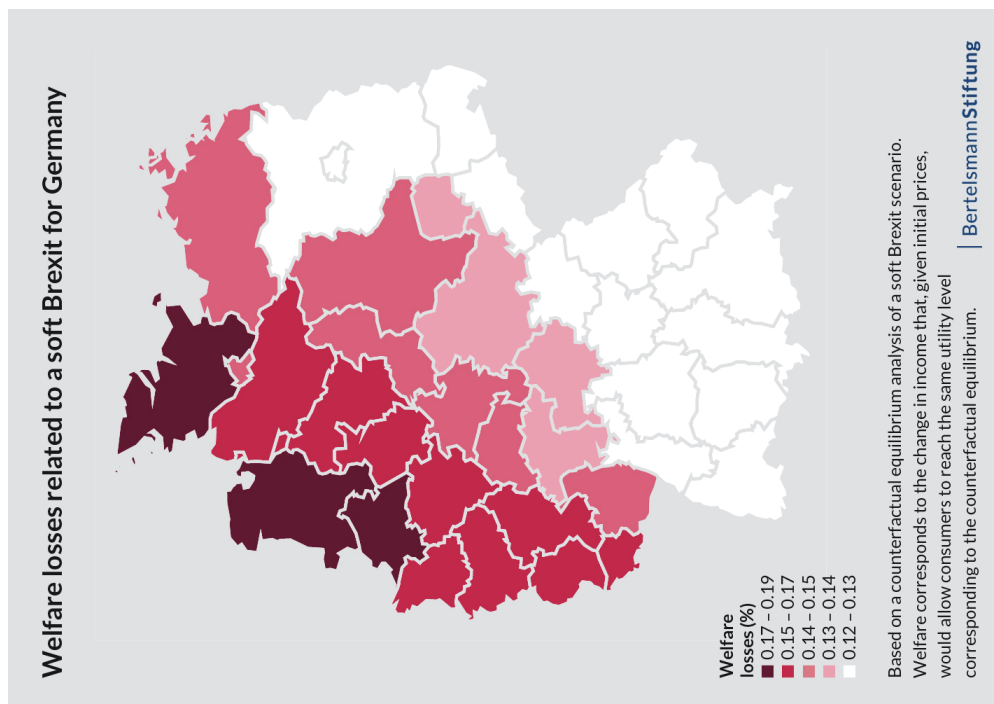


(a)

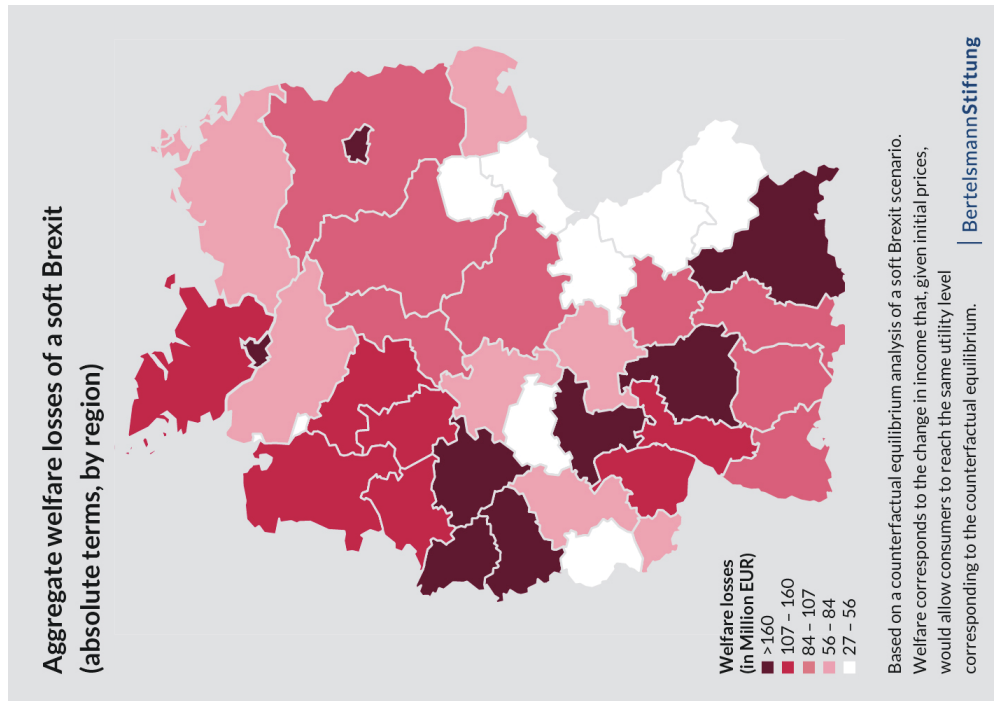


(b)

Figure 5



(a)



(b)

Figure 6

5 Conclusion

This paper estimates conceivable economic costs of Brexit. Its main focus is on how the trade shock of Brexit affects citizens' welfare, with the analysis also documenting the effects at the regional (NUTS2) level within countries. The estimation is based on counterfactual simulations of increasing trade costs as a result of a hard and a soft Brexit scenario, respectively. These simulations are making use of a quantitative (general equilibrium) trade model which builds upon modern gravity models of trade – that is, trade is characterized by its volume increasing in the size of the exporting and importing countries/regions and inversely related to the distance and trade costs between countries/regions.

The analysis primarily shows that Brexit – hard or soft – is likely to have a significant, yet regionally varying, impact on welfare. We find that, unsurprisingly, the UK would lose out the most from Brexit. The aggregate welfare losses of a hard Brexit would amount to 57 billion euros annually, which translates into an average yearly loss of 873 euros per capita. In a soft Brexit scenario, the aggregate welfare loss would amount to 32 billion euros for the UK, with a per capita welfare loss of about 500 euros.

As for other countries, the relative welfare losses are stronger the nearer a country is to the UK. Ireland, for instance, would be projected to lose about 720 euros of income (per capita) in a hard Brexit and about 400 euros in a soft Brexit scenario, both annually. In absolute aggregate terms, welfare losses are also severe elsewhere: Germany would incur welfare losses of about 10 billion euros annually and France would see a loss of about 8 billion euros. Given these countries' relatively high population figures, the per capita losses for both countries would be in the range of 115-120 euros per year.

A key feature of our analysis is a look at the regional level. Again, closeness to the UK and regional trade volumes are key to the projected welfare losses based on our model. However, there is considerable regional heterogeneity in the impact of Brexit. For instance, in a hard Brexit scenario relative welfare losses in the UK can be as high as 2.5% percent in East Anglia, while London – due to its high GDP – would incur just about half of the percentage loss. However, cities like London would see a strong absolute welfare loss, of more than 5 billion euros annually. At the same time, regions like Lincolnshire would only lose about 450 million euros annually.

As for German regions, absolute losses due to a hard Brexit also vary signif-

icantly across the country. Regions with high economic activity like Oberbayern, Dusseldorf and Cologne are likely to incur the highest welfare losses, with about 500-650 million euros of welfare losses each. However, in terms of relative welfare losses, southern Germany is affected to a lesser degree given its somewhat lower dependence on trade with the UK. Northern parts of the country like Schleswig-Holstein and Bremen are among the regions that would suffer the strongest relative welfare losses, amounting to more than 0.3%. These patterns also hold for a soft Brexit scenario, but the losses are lower in magnitude.

The economic costs of Brexit documented in this study mainly play out through losses in productivity and increased markups. That is, Brexit – hard or soft – is likely to affect key sources of growth as well as competition, thereby exerting negative costs on economies in Europe. Moreover, the analysis suggests that smaller, more productive regions tend to lose out the most as a result of Brexit. Partly, these regions might be less capable of easily shifting trade (and economic activity more generally) to other countries and regions. This particular consequence demonstrates that Brexit notably dampens growth potential not just in the UK but across the EU.

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Appendix: Brexit effects on all NUTS2 regions

Table 3

Economic costs of a hard Brexit, NUTS 2 regions

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
AUT	Burgenland	-0.039	0.039	-0.186	-52	-15
AUT	Niederösterreich	-0.039	0.039	-0.187	-62	-103
AUT	Wien	-0.027	0.027	-0.173	-85	-156
AUT	Kärnten	-0.037	0.037	-0.184	-63	-36
AUT	Steiermark	-0.039	0.039	-0.186	-67	-83
AUT	Oberösterreich	-0.040	0.040	-0.187	-77	-112
AUT	Salzburg	-0.037	0.037	-0.184	-90	-49
AUT	Tirol	-0.036	0.036	-0.183	-80	-59
AUT	Vorarlberg	-0.041	0.042	-0.188	-85	-32
BEL	Brussels	-0.191	0.191	-0.332	-210	-252
BEL	Prov. Antwerpen	-0.194	0.194	-0.340	-151	-275
BEL	Prov. Limburg (BE)	-0.154	0.154	-0.303	-93	-81
BEL	Prov. Oost-Vlaanderen	-0.267	0.268	-0.417	-146	-217
BEL	Prov. Vlaams-Brabant	-0.195	0.196	-0.343	-139	-156
BEL	Prov. West-Vlaanderen	-0.337	0.338	-0.487	-179	-212
BEL	Prov. Brabant Wallon	-0.199	0.199	-0.346	-146	-58
BEL	Prov. Hainaut	-0.251	0.252	-0.405	-97	-131
BEL	Prov. Liège	-0.142	0.142	-0.292	-79	-87
BEL	Prov. Luxembourg (BE)	-0.148	0.148	-0.299	-71	-20
BEL	Prov. Namur	-0.181	0.181	-0.332	-86	-42
BGR	Severozapaden	-0.070	0.070	-0.221	-9	-7
BGR	Severen tsentralen	-0.065	0.065	-0.216	-10	-8
BGR	Severoiztochen	-0.065	0.065	-0.215	-12	-11
BGR	Yugoiztochen	-0.065	0.065	-0.215	-13	-13
BGR	Yugozapaden	-0.067	0.067	-0.218	-24	-50
BGR	Yuzhen tsentralen	-0.065	0.065	-0.216	-10	-15
CHE	Région lémanique	-0.051	0.051	-0.196	-136	-216
CHE	Espace Mittelland	-0.051	0.051	-0.196	-134	-246
CHE	Nordwestschweiz	-0.043	0.043	-0.188	-144	-162
CHE	Zürich	-0.029	0.029	-0.174	-157	-231
CHE	Ostschweiz	-0.026	0.026	-0.172	-112	-129
CHE	Zentralschweiz	-0.034	0.034	-0.179	-131	-103
CHE	Ticino	-0.025	0.025	-0.171	-132	-47
CYP	Kypros	-0.067	0.067	-0.216	-46	-39
CZE	Praha	-0.060	0.060	-0.208	-72	-92
CZE	Střední Čechy	-0.055	0.055	-0.204	-31	-42
CZE	Jihozápad	-0.074	0.074	-0.224	-33	-40
CZE	Severozápad	-0.083	0.083	-0.233	-28	-31
CZE	Severovýchod	-0.077	0.077	-0.227	-31	-47
CZE	Jihovýchod	-0.067	0.067	-0.217	-34	-56
CZE	Střední Morava	-0.067	0.068	-0.217	-30	-36
CZE	Moravskoslezsko	-0.067	0.067	-0.217	-31	-37
DEU	Stuttgart	-0.085	0.085	-0.231	-116	-473
DEU	Karlsruhe	-0.094	0.094	-0.241	-102	-283
DEU	Freiburg	-0.085	0.085	-0.232	-85	-190
DEU	Tübingen	-0.077	0.077	-0.224	-92	-168
DEU	Oberbayern	-0.063	0.063	-0.209	-115	-526
DEU	Niederbayern	-0.068	0.068	-0.215	-80	-98
DEU	Oberpfalz	-0.077	0.077	-0.224	-90	-98
DEU	Oberfranken	-0.091	0.091	-0.239	-85	-90
DEU	Mittelfranken	-0.082	0.082	-0.229	-95	-165
DEU	Unterfranken	-0.098	0.098	-0.245	-93	-122
DEU	Schwaben	-0.071	0.071	-0.218	-83	-153
DEU	Berlin	-0.076	0.076	-0.223	-82	-290
DEU	Brandenburg	-0.087	0.087	-0.236	-65	-162

Continuation of Table 3

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
DEU	Bremen	-0.165	0.165	-0.311	-150	-101
DEU	Hamburg	-0.131	0.131	-0.274	-170	-305
DEU	Darmstadt	-0.108	0.108	-0.254	-126	-493
DEU	Gießen	-0.120	0.121	-0.269	-87	-90
DEU	Kassel	-0.122	0.122	-0.270	-95	-115
DEU	Mecklenburg-Vorpommern	-0.122	0.122	-0.272	-70	-113
DEU	Braunschweig	-0.126	0.126	-0.274	-101	-161
DEU	Hannover	-0.142	0.142	-0.291	-104	-221
DEU	Lüneburg	-0.147	0.148	-0.298	-81	-138
DEU	Weser-Ems	-0.186	0.186	-0.335	-113	-281
DEU	Düsseldorf	-0.163	0.163	-0.311	-126	-650
DEU	Köln	-0.157	0.157	-0.304	-126	-558
DEU	Münster	-0.166	0.166	-0.315	-101	-265
DEU	Detmold	-0.141	0.141	-0.289	-105	-217
DEU	Arnsberg	-0.143	0.143	-0.292	-98	-352
DEU	Koblenz	-0.137	0.137	-0.286	-95	-141
DEU	Trier	-0.156	0.156	-0.306	-92	-49
DEU	Rheinessen-Pfalz	-0.118	0.118	-0.266	-98	-198
DEU	Saarland	-0.138	0.138	-0.286	-101	-101
DEU	Dresden	-0.084	0.084	-0.232	-69	-111
DEU	Chemnitz	-0.088	0.088	-0.237	-65	-95
DEU	Leipzig	-0.094	0.094	-0.243	-75	-76
DEU	Sachsen-Anhalt	-0.111	0.111	-0.260	-69	-155
DEU	Schleswig-Holstein	-0.167	0.168	-0.317	-99	-284
DEU	Thüringen	-0.104	0.104	-0.253	-71	-155
DNK	Hovedstaden	-0.134	0.135	-0.278	-174	-311
DNK	Sjælland	-0.154	0.154	-0.303	-103	-85
DNK	Syddanmark	-0.184	0.185	-0.331	-146	-177
DNK	Midtjylland	-0.198	0.198	-0.345	-151	-195
DNK	Nordjylland	-0.197	0.198	-0.345	-140	-82
EST	Eesti	-0.108	0.108	-0.259	-42	-55
GRC	Attiki	-0.055	0.055	-0.204	-45	-170
GRC	Voreio Aigaio	-0.068	0.068	-0.218	-27	-5
GRC	Notio Aigaio	-0.065	0.065	-0.214	-38	-13
GRC	Kriti	-0.064	0.064	-0.214	-29	-18
GRC	Anatoliki Makedonia, Thraki	-0.072	0.072	-0.222	-25	-15
GRC	Kentriki Makedonia	-0.072	0.072	-0.223	-28	-53
GRC	Dytiki Makedonia	-0.076	0.076	-0.226	-32	-9
GRC	Ipeiros	-0.076	0.076	-0.226	-26	-9
GRC	Thessalia	-0.071	0.071	-0.221	-27	-20
GRC	Ionia Nisia	-0.075	0.075	-0.225	-33	-7
GRC	Dytiki Ellada	-0.072	0.072	-0.222	-26	-17
GRC	Stereia Ellada	-0.067	0.068	-0.217	-31	-17
GRC	Peloponnisos	-0.066	0.066	-0.216	-29	-17
ESP	Galicia	-0.155	0.155	-0.307	-66	-179
ESP	Principado de Asturias	-0.166	0.167	-0.319	-66	-69
ESP	Cantabria	-0.159	0.159	-0.311	-67	-39
ESP	Pais Vasco	-0.145	0.146	-0.295	-94	-203
ESP	Comunidad Foral de Navarra	-0.138	0.138	-0.288	-86	-55
ESP	La Rioja	-0.134	0.134	-0.285	-72	-23
ESP	Aragón	-0.118	0.118	-0.268	-70	-92
ESP	Comunidad de Madrid	-0.096	0.096	-0.245	-81	-518
ESP	Castilla y León	-0.133	0.134	-0.284	-64	-158
ESP	Castilla-la Mancha	-0.102	0.102	-0.252	-47	-97
ESP	Extremadura	-0.105	0.105	-0.256	-42	-46
ESP	Cataluña	-0.107	0.107	-0.256	-74	-547
ESP	Comunidad Valenciana	-0.096	0.096	-0.246	-52	-258
ESP	Illes Balears	-0.094	0.094	-0.243	-61	-70

Continuation of Table 3

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
ESP	Andalucía	-0.090	0.091	-0.241	-43	-360
ESP	Región de Murcia	-0.091	0.091	-0.241	-48	-70
ESP	Ciudad Autónoma de Ceuta (ES)	-0.085	0.085	-0.235	-45	-4
ESP	Ciudad Autónoma de Melilla (ES)	-0.083	0.083	-0.233	-41	-3
FIN	Länsi-Suomi	-0.103	0.103	-0.252	-88	-121
FIN	Helsinki-Uusimaa	-0.088	0.088	-0.234	-121	-197
FIN	Etelä-Suomi	-0.095	0.095	-0.243	-84	-98
FIN	Pohjois- ja Itä-Suomi	-0.097	0.097	-0.246	-79	-103
FIN	Åland	-0.105	0.106	-0.252	-119	-3
FRA	Île de France	-0.234	0.235	-0.377	-211	-2565
FRA	Champagne-Ardenne	-0.187	0.188	-0.339	-91	-121
FRA	Picardie	-0.333	0.334	-0.489	-122	-237
FRA	Haute-Normandie	-0.401	0.403	-0.557	-159	-297
FRA	Centre (FR)	-0.236	0.236	-0.388	-107	-275
FRA	Basse-Normandie	-0.444	0.446	-0.602	-159	-235
FRA	Bourgogne	-0.157	0.157	-0.308	-83	-136
FRA	Nord - Pas-de-Calais	-0.401	0.402	-0.558	-148	-606
FRA	Lorraine	-0.136	0.136	-0.286	-74	-172
FRA	Alsace	-0.093	0.093	-0.242	-73	-138
FRA	Franche-Comté	-0.111	0.111	-0.261	-68	-80
FRA	Pays de la Loire	-0.274	0.275	-0.427	-127	-474
FRA	Bretagne	-0.347	0.348	-0.502	-143	-473
FRA	Poitou-Charentes	-0.208	0.208	-0.360	-94	-170
FRA	Aquitaine	-0.149	0.149	-0.299	-89	-301
FRA	Midi-Pyrénées	-0.120	0.121	-0.269	-83	-250
FRA	Limousin	-0.169	0.169	-0.320	-86	-63
FRA	Rhône-Alpes	-0.098	0.098	-0.247	-81	-534
FRA	Auvergne	-0.139	0.140	-0.289	-82	-112
FRA	Languedoc-Roussillon	-0.102	0.102	-0.251	-61	-172
FRA	Provence-Alpes-Côte d'Azur	-0.077	0.077	-0.225	-70	-350
FRA	Corse	-0.054	0.054	-0.202	-56	-18
HRV	Jadranska Hrvatska	-0.094	0.094	-0.246	-26	-36
HRV	Kontinentalna Hrvatska	-0.094	0.094	-0.245	-28	-78
HUN	Közép-Magyarország	-0.080	0.080	-0.230	-40	-121
HUN	Közép-Dunántúl	-0.083	0.084	-0.234	-26	-27
HUN	Nyugat-Dunántúl	-0.085	0.085	-0.236	-30	-29
HUN	Dél-Dunántúl	-0.084	0.084	-0.235	-18	-16
HUN	Észak-Magyarország	-0.084	0.084	-0.235	-18	-21
HUN	Észak-Alföld	-0.082	0.082	-0.234	-17	-25
HUN	Dél-Alföld	-0.082	0.082	-0.233	-19	-24
IRL	Border, Midland and Western	-0.990	1.000	-1.165	-312	-394
IRL	Southern and Eastern	-0.943	0.952	-1.061	-740	-2565
ISL	Ísland	-0.156	0.157	-0.301	-164	-55
ITA	Piemonte	-0.092	0.093	-0.241	-71	-312
ITA	Valle d'Aosta/Vallée d'Aoste	-0.101	0.101	-0.249	-87	-11
ITA	Liguria	-0.085	0.085	-0.234	-72	-113
ITA	Lombardia	-0.075	0.075	-0.222	-81	-814
ITA	Abruzzo	-0.065	0.066	-0.214	-52	-68
ITA	Molise	-0.066	0.066	-0.215	-43	-13
ITA	Campania	-0.062	0.062	-0.211	-39	-226
ITA	Puglia	-0.063	0.063	-0.213	-38	-154
ITA	Basilicata	-0.064	0.064	-0.213	-44	-25
ITA	Calabria	-0.064	0.064	-0.214	-36	-71
ITA	Sicilia	-0.066	0.066	-0.216	-37	-188
ITA	Sardegna	-0.089	0.089	-0.239	-48	-80
ITA	Provincia Autonoma di Bolzano/Bozen	-0.079	0.079	-0.226	-97	-50
ITA	Provincia Autonoma di Trento	-0.076	0.076	-0.224	-78	-42
ITA	Veneto	-0.071	0.071	-0.219	-69	-340

Continuation of Table 3

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
ITA	Friuli-Venezia Giulia	-0.073	0.073	-0.221	-67	-82
ITA	Emilia-Romagna	-0.072	0.072	-0.219	-76	-338
ITA	Toscana	-0.074	0.074	-0.222	-67	-250
ITA	Umbria	-0.068	0.068	-0.217	-52	-46
ITA	Marche	-0.069	0.069	-0.218	-58	-89
ITA	Lazio	-0.064	0.064	-0.212	-67	-394
LTU	Lietuva	-0.105	0.105	-0.256	-34	-99
LUX	Luxembourg	-0.162	0.162	-0.303	-279	-161
LVA	Latvija	-0.107	0.107	-0.259	-33	-65
MLT	Malta	-0.138	0.138	-0.289	-64	-29
NLD	Groningen	-0.237	0.238	-0.385	-159	-93
NLD	Friesland (NL)	-0.281	0.282	-0.434	-125	-81
NLD	Drenthe	-0.232	0.233	-0.384	-111	-54
NLD	Overijssel	-0.227	0.228	-0.377	-129	-147
NLD	Gelderland	-0.227	0.228	-0.377	-131	-267
NLD	Flevoland	-0.266	0.266	-0.417	-134	-54
NLD	Utrecht	-0.263	0.264	-0.408	-197	-251
NLD	Noord-Holland	-0.304	0.305	-0.446	-238	-662
NLD	Zuid-Holland	-0.311	0.312	-0.459	-191	-691
NLD	Zeeland	-0.353	0.354	-0.506	-162	-62
NLD	Noord-Brabant	-0.247	0.247	-0.393	-170	-425
NLD	Limburg (NL)	-0.196	0.196	-0.345	-121	-136
NOR	Oslo og Akershus	-0.163	0.163	-0.303	-227	-284
NOR	Hedmark og Oppland	-0.174	0.175	-0.322	-136	-52
NOR	Sør-Østlandet	-0.184	0.185	-0.331	-144	-142
NOR	Agder og Rogaland	-0.246	0.246	-0.388	-228	-175
NOR	Vestlandet	-0.209	0.210	-0.353	-202	-180
NOR	Trøndelag	-0.155	0.155	-0.301	-155	-70
NOR	Nord-Norge	-0.109	0.109	-0.255	-124	-60
POL	Łódzkie	-0.080	0.080	-0.230	-24	-59
POL	Mazowieckie	-0.080	0.080	-0.230	-41	-217
POL	Małopolskie	-0.070	0.070	-0.220	-22	-75
POL	Śląskie	-0.072	0.072	-0.222	-26	-117
POL	Lubelskie	-0.076	0.076	-0.227	-17	-37
POL	Podkarpackie	-0.072	0.072	-0.222	-18	-37
POL	Świętokrzyskie	-0.075	0.075	-0.226	-18	-22
POL	Podlaskie	-0.084	0.085	-0.236	-19	-22
POL	Wielkopolskie	-0.090	0.090	-0.242	-29	-102
POL	Zachodniopomorskie	-0.110	0.110	-0.263	-25	-42
POL	Lubuskie	-0.094	0.094	-0.245	-23	-23
POL	Dolnośląskie	-0.082	0.082	-0.233	-29	-83
POL	Opolskie	-0.077	0.077	-0.228	-21	-20
POL	Kujawsko-Pomorskie	-0.093	0.093	-0.244	-22	-46
POL	Warmińsko-Mazurskie	-0.092	0.092	-0.244	-20	-28
POL	Pomorskie	-0.102	0.102	-0.254	-28	-63
PRT	Norte	-0.155	0.156	-0.309	-47	-168
PRT	Algarve	-0.118	0.118	-0.269	-51	-22
PRT	Centro (PT)	-0.138	0.139	-0.291	-46	-103
PRT	Área Metropolitana de Lisboa	-0.117	0.117	-0.267	-63	-178
PRT	Alentejo	-0.124	0.124	-0.276	-46	-34
ROM	Nord-Vest	-0.086	0.086	-0.237	-18	-46
ROM	Centru	-0.081	0.081	-0.232	-19	-44
ROM	Nord-Est	-0.082	0.082	-0.233	-12	-40
ROM	Sud-Est	-0.074	0.074	-0.225	-17	-41
ROM	Sud - Muntenia	-0.068	0.068	-0.218	-15	-45
ROM	București - Ilfov	-0.063	0.063	-0.212	-43	-99
ROM	Sud-Vest Oltenia	-0.079	0.079	-0.230	-14	-29
ROM	Vest	-0.084	0.084	-0.235	-21	-38

Continuation of Table 3

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
SWE	Stockholm	-0.111	0.111	-0.255	-169	-377
SWE	Östra Mellansverige	-0.131	0.131	-0.279	-114	-186
SWE	Småland med öarna	-0.139	0.139	-0.287	-115	-96
SWE	Sydsverige	-0.155	0.155	-0.303	-120	-176
SWE	Västsverige	-0.177	0.178	-0.324	-150	-294
SWE	Norra Mellansverige	-0.142	0.142	-0.290	-109	-92
SWE	Mellersta Norrland	-0.132	0.132	-0.280	-111	-41
SWE	Övre Norrland	-0.114	0.115	-0.262	-111	-57
SVN	Vzhodna Slovenija	-0.074	0.074	-0.224	-36	-39
SVN	Zahodna Slovenija	-0.071	0.071	-0.220	-52	-50
SVK	Bratislavský kraj	-0.077	0.077	-0.224	-81	-51
SVK	Západné Slovensko	-0.080	0.080	-0.231	-32	-59
SVK	Stredné Slovensko	-0.081	0.081	-0.231	-28	-37
SVK	Východné Slovensko	-0.081	0.081	-0.231	-24	-39
GBR	Tees Valley and Durham	-2.056	2.099	-2.280	-560	-666
GBR	Northumberland and Tyne and Wear	-2.050	2.093	-2.264	-632	-911
GBR	Cumbria	-2.012	2.054	-2.211	-722	-359
GBR	Greater Manchester	-1.862	1.897	-2.057	-649	-1795
GBR	Lancashire	-1.944	1.983	-2.151	-614	-909
GBR	Cheshire	-1.910	1.947	-2.073	-907	-834
GBR	Merseyside	-1.899	1.936	-2.106	-584	-891
GBR	East Yorkshire and Northern Lincolnshire	-2.113	2.159	-2.331	-633	-587
GBR	North Yorkshire	-2.056	2.099	-2.260	-698	-566
GBR	South Yorkshire	-1.971	2.011	-2.190	-540	-744
GBR	West Yorkshire	-1.939	1.977	-2.140	-650	-1489
GBR	Derbyshire and Nottinghamshire	-1.990	2.030	-2.198	-631	-1368
GBR	Leicestershire, Rutland and Northamptonshire	-2.039	2.081	-2.239	-713	-1273
GBR	Lincolnshire	-2.174	2.222	-2.404	-589	-436
GBR	Herefordshire, Worcestershire and Warwickshire	-1.976	2.016	-2.166	-755	-1000
GBR	Shropshire and Staffordshire	-1.969	2.008	-2.180	-596	-953
GBR	West Midlands	-1.897	1.934	-2.099	-617	-1756
GBR	East Anglia	-2.327	2.382	-2.536	-822	-2037
GBR	Bedfordshire and Hertfordshire	-2.043	2.086	-2.226	-841	-1542
GBR	Essex	-2.262	2.315	-2.480	-725	-1301
GBR	Inner London – West	-1.536	1.560	-1.359	-2.821	-3257
GBR	Inner London – East	-1.657	1.685	-1.781	-1.019	-2395
GBR	Outer London – East and North East	-1.839	1.874	-2.047	-535	-1006
GBR	Outer London – South	-1.870	1.905	-2.061	-666	-862
GBR	Outer London – West and North West	-1.739	1.770	-1.893	-864	-1796
GBR	Berkshire, Buckinghamshire and Oxfordshire	-2.013	2.055	-2.157	-1.105	-2620
GBR	Surrey, East and West Sussex	-2.218	2.268	-2.405	-912	-2598
GBR	Hampshire and Isle of Wight	-2.198	2.247	-2.389	-876	-1718
GBR	Kent	-2.312	2.367	-2.531	-748	-1354
GBR	Gloucestershire, Wiltshire and Bristol/Bath area	-2.070	2.113	-2.254	-851	-2086
GBR	Dorset and Somerset	-2.188	2.237	-2.406	-680	-894
GBR	Cornwall and Isles of Scilly	-2.229	2.280	-2.466	-579	-321
GBR	Devon	-2.215	2.265	-2.438	-663	-777
GBR	West Wales and The Valleys	-2.083	2.127	-2.312	-536	-1048
GBR	East Wales	-2.040	2.082	-2.241	-708	-815
GBR	Eastern Scotland	-1.995	2.035	-2.186	-763	-1581
GBR	South Western Scotland	-1.976	2.016	-2.178	-677	-1584
GBR	North Eastern Scotland	-2.017	2.059	-2.171	-1.055	-522
GBR	Highlands and Islands	-1.956	1.995	-2.157	-674	-316
GBR	Northern Ireland (UK)	-2.026	2.068	-2.240	-615	-1144

Columns 3 to 7 provide counterfactual changes in productivity and product diversity (column 3; % changes), markups (column 4; % changes), welfare (columns 5, 6 and 7; % changes, per capita changes in euros and aggregate changes in million euros, respectively). Productivity corresponds to value added per worker. Welfare corresponds to the change in income that, given initial prices, would allow consumers to reach the same utility level corresponding to the counterfactual equilibrium. Markups (as defined in the model) are equivalent to price over marginal cost.

Table 4

Economic costs of a soft Brexit, NUTS 2 regions

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
AUT	Burgenland	-0.020	0.020	-0.104	-29	-9
AUT	Niederösterreich	-0.020	0.020	-0.104	-35	-57
AUT	Wien	-0.013	0.013	-0.097	-47	-87
AUT	Kärnten	-0.019	0.019	-0.103	-35	-20
AUT	Steiermark	-0.020	0.020	-0.104	-37	-46
AUT	Oberösterreich	-0.021	0.021	-0.104	-43	-63
AUT	Salzburg	-0.019	0.019	-0.102	-50	-27
AUT	Tirol	-0.019	0.019	-0.102	-45	-33
AUT	Vorarlberg	-0.022	0.022	-0.105	-47	-18
BEL	Brussels	-0.105	0.105	-0.186	-117	-141
BEL	Prov. Antwerpen	-0.107	0.107	-0.190	-84	-154
BEL	Prov. Limburg (BE)	-0.085	0.085	-0.169	-52	-45
BEL	Prov. Oost-Vlaanderen	-0.148	0.148	-0.233	-81	-121
BEL	Prov. Vlaams-Brabant	-0.108	0.108	-0.191	-78	-87
BEL	Prov. West-Vlaanderen	-0.186	0.187	-0.271	-100	-118
BEL	Prov. Brabant Wallon	-0.109	0.110	-0.193	-82	-32
BEL	Prov. Hainaut	-0.139	0.139	-0.226	-54	-73
BEL	Prov. Liège	-0.078	0.078	-0.163	-44	-48
BEL	Prov. Luxembourg (BE)	-0.081	0.081	-0.167	-39	-11
BEL	Prov. Namur	-0.100	0.100	-0.185	-48	-24
BGR	Severozapaden	-0.037	0.037	-0.123	-5	-4
BGR	Severen tsentralen	-0.035	0.035	-0.120	-6	-5
BGR	Severoiztochen	-0.034	0.034	-0.120	-6	-6
BGR	Yugoiztochen	-0.034	0.034	-0.120	-7	-7
BGR	Yugozapaden	-0.036	0.036	-0.121	-13	-28
BGR	Yuzhen tsentralen	-0.035	0.035	-0.120	-6	-8
CHE	Région lémanique	-0.027	0.027	-0.109	-76	-121
CHE	Espace Mittelland	-0.027	0.027	-0.109	-75	-138
CHE	Nordwestschweiz	-0.023	0.023	-0.105	-80	-91
CHE	Zürich	-0.015	0.015	-0.097	-88	-129
CHE	Ostschweiz	-0.013	0.013	-0.096	-63	-72
CHE	Zentralschweiz	-0.018	0.018	-0.100	-73	-58
CHE	Ticino	-0.013	0.013	-0.095	-74	-26
CYP	Kypros	-0.036	0.036	-0.121	-26	-22
CZE	Praha	-0.032	0.032	-0.116	-40	-51
CZE	Střední Čechy	-0.029	0.029	-0.114	-18	-23
CZE	Jihozápad	-0.040	0.040	-0.125	-18	-22
CZE	Severozápad	-0.045	0.045	-0.130	-16	-18
CZE	Severovýchod	-0.041	0.041	-0.126	-17	-26
CZE	Jihovýchod	-0.036	0.036	-0.121	-19	-31
CZE	Střední Morava	-0.036	0.036	-0.121	-16	-20
CZE	Moravskoslezsko	-0.036	0.036	-0.121	-17	-21
DEU	Stuttgart	-0.046	0.046	-0.129	-65	-264
DEU	Karlsruhe	-0.051	0.051	-0.135	-57	-158
DEU	Freiburg	-0.046	0.046	-0.130	-48	-106
DEU	Tübingen	-0.042	0.042	-0.125	-51	-94
DEU	Oberbayern	-0.034	0.034	-0.117	-64	-293
DEU	Niederbayern	-0.036	0.036	-0.120	-45	-54
DEU	Oberpfalz	-0.041	0.041	-0.125	-50	-55
DEU	Oberfranken	-0.049	0.049	-0.133	-47	-50
DEU	Mittelfranken	-0.044	0.044	-0.128	-53	-92
DEU	Unterfranken	-0.053	0.053	-0.137	-52	-68
DEU	Schwaben	-0.038	0.038	-0.122	-46	-85
DEU	Berlin	-0.041	0.041	-0.125	-46	-162
DEU	Brandenburg	-0.047	0.047	-0.131	-36	-90

Continuation of Table 4

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
DEU	Bremen	-0.090	0.091	-0.173	-84	-56
DEU	Hamburg	-0.071	0.071	-0.153	-95	-170
DEU	Darmstadt	-0.059	0.059	-0.142	-70	-275
DEU	Gießen	-0.066	0.066	-0.150	-48	-50
DEU	Kassel	-0.066	0.066	-0.150	-53	-64
DEU	Mecklenburg-Vorpommern	-0.066	0.066	-0.151	-39	-63
DEU	Braunschweig	-0.069	0.069	-0.153	-56	-90
DEU	Hannover	-0.078	0.078	-0.162	-58	-123
DEU	Lüneburg	-0.081	0.081	-0.166	-45	-77
DEU	Weser-Ems	-0.102	0.102	-0.187	-63	-157
DEU	Düsseldorf	-0.090	0.090	-0.173	-70	-363
DEU	Köln	-0.086	0.086	-0.170	-70	-311
DEU	Münster	-0.091	0.091	-0.176	-57	-148
DEU	Detmold	-0.077	0.077	-0.161	-59	-121
DEU	Arnsberg	-0.078	0.079	-0.163	-55	-196
DEU	Koblenz	-0.075	0.075	-0.160	-53	-78
DEU	Trier	-0.086	0.086	-0.171	-51	-27
DEU	Rheinessen-Pfalz	-0.064	0.064	-0.148	-54	-111
DEU	Saarland	-0.076	0.076	-0.160	-57	-56
DEU	Dresden	-0.045	0.045	-0.130	-38	-62
DEU	Chemnitz	-0.048	0.048	-0.132	-36	-53
DEU	Leipzig	-0.051	0.051	-0.135	-42	-42
DEU	Sachsen-Anhalt	-0.060	0.060	-0.145	-39	-86
DEU	Schleswig-Holstein	-0.092	0.092	-0.177	-55	-158
DEU	Thüringen	-0.056	0.056	-0.141	-40	-86
DNK	Hovedstaden	-0.073	0.073	-0.155	-97	-173
DNK	Sjælland	-0.084	0.084	-0.169	-57	-47
DNK	Syddanmark	-0.101	0.101	-0.184	-81	-99
DNK	Midtjylland	-0.109	0.109	-0.192	-84	-109
DNK	Nordjylland	-0.108	0.108	-0.192	-78	-46
EST	Eesti	-0.059	0.059	-0.144	-23	-30
GRC	Attiki	-0.029	0.029	-0.114	-25	-95
GRC	Voreio Aigaio	-0.036	0.036	-0.121	-15	-3
GRC	Notio Aigaio	-0.034	0.034	-0.119	-21	-7
GRC	Kriti	-0.034	0.034	-0.119	-16	-10
GRC	Anatoliki Makedonia, Thraki	-0.038	0.038	-0.124	-14	-8
GRC	Kentriki Makedonia	-0.039	0.039	-0.124	-16	-30
GRC	Dytiki Makedonia	-0.041	0.041	-0.126	-18	-5
GRC	Ipeiros	-0.041	0.041	-0.126	-14	-5
GRC	Thessalia	-0.038	0.038	-0.123	-15	-11
GRC	Ionia Nisia	-0.040	0.040	-0.125	-19	-4
GRC	Dytiki Ellada	-0.038	0.038	-0.124	-15	-10
GRC	Stereia Ellada	-0.036	0.036	-0.121	-17	-10
GRC	Peloponnisos	-0.035	0.035	-0.120	-16	-9
ESP	Galicia	-0.084	0.085	-0.171	-37	-100
ESP	Principado de Asturias	-0.091	0.091	-0.177	-37	-38
ESP	Cantabria	-0.087	0.087	-0.173	-37	-22
ESP	Pais Vasco	-0.079	0.080	-0.164	-52	-113
ESP	Comunidad Foral de Navarra	-0.075	0.075	-0.160	-48	-31
ESP	La Rioja	-0.073	0.073	-0.159	-40	-12
ESP	Aragón	-0.064	0.064	-0.149	-39	-51
ESP	Comunidad de Madrid	-0.052	0.052	-0.136	-45	-288
ESP	Castilla y León	-0.073	0.073	-0.158	-36	-88
ESP	Castilla-la Mancha	-0.055	0.055	-0.140	-26	-54
ESP	Extremadura	-0.057	0.057	-0.143	-24	-26
ESP	Cataluña	-0.058	0.058	-0.142	-41	-304
ESP	Comunidad Valenciana	-0.052	0.052	-0.137	-29	-143
ESP	Illes Balears	-0.051	0.051	-0.135	-34	-39

Continuation of Table 4

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
ESP	Andalucía	-0.049	0.049	-0.134	-24	-200
ESP	Región de Murcia	-0.049	0.049	-0.134	-27	-39
ESP	Ciudad Autónoma de Ceuta (ES)	-0.046	0.046	-0.131	-25	-2
ESP	Ciudad Autónoma de Melilla (ES)	-0.044	0.044	-0.130	-23	-2
FIN	Länsi-Suomi	-0.056	0.056	-0.140	-49	-67
FIN	Helsinki-Uusimaa	-0.047	0.047	-0.130	-68	-109
FIN	Etelä-Suomi	-0.051	0.051	-0.135	-47	-54
FIN	Pohjois- ja Itä-Suomi	-0.052	0.052	-0.137	-44	-57
FIN	Åland	-0.057	0.057	-0.140	-66	-2
FRA	Île de France	-0.129	0.129	-0.210	-118	-1430
FRA	Champagne-Ardenne	-0.103	0.103	-0.189	-51	-68
FRA	Picardie	-0.184	0.184	-0.272	-68	-132
FRA	Haute-Normandie	-0.222	0.222	-0.310	-89	-165
FRA	Centre (FR)	-0.130	0.130	-0.216	-59	-153
FRA	Basse-Normandie	-0.245	0.246	-0.335	-88	-131
FRA	Bourgogne	-0.086	0.086	-0.172	-46	-76
FRA	Nord - Pas-de-Calais	-0.222	0.222	-0.310	-83	-337
FRA	Lorraine	-0.074	0.074	-0.159	-41	-96
FRA	Alsace	-0.050	0.051	-0.135	-41	-77
FRA	Franche-Comté	-0.061	0.061	-0.145	-38	-45
FRA	Pays de la Loire	-0.151	0.151	-0.238	-71	-264
FRA	Bretagne	-0.191	0.192	-0.279	-79	-263
FRA	Poitou-Charentes	-0.114	0.114	-0.200	-52	-95
FRA	Aquitaine	-0.082	0.082	-0.167	-49	-168
FRA	Midi-Pyrénées	-0.066	0.066	-0.150	-46	-139
FRA	Limousin	-0.093	0.093	-0.178	-48	-35
FRA	Rhône-Alpes	-0.053	0.053	-0.137	-45	-298
FRA	Auvergne	-0.076	0.076	-0.161	-46	-62
FRA	Languedoc-Roussillon	-0.055	0.055	-0.140	-34	-96
FRA	Provence-Alpes-Côte d'Azur	-0.042	0.042	-0.126	-39	-195
FRA	Corse	-0.029	0.029	-0.113	-31	-10
HRV	Jadranska Hrvatska	-0.051	0.051	-0.137	-14	-20
HRV	Kontinentalna Hrvatska	-0.051	0.051	-0.137	-15	-43
HUN	Közép-Magyarország	-0.043	0.043	-0.128	-23	-68
HUN	Közép-Dunántúl	-0.045	0.045	-0.131	-14	-15
HUN	Nyugat-Dunántúl	-0.046	0.046	-0.131	-17	-16
HUN	Dél-Dunántúl	-0.045	0.045	-0.131	-10	-9
HUN	Észak-Magyarország	-0.045	0.045	-0.131	-10	-12
HUN	Észak-Alföld	-0.044	0.044	-0.130	-10	-14
HUN	Dél-Alföld	-0.044	0.044	-0.130	-11	-14
IRL	Border, Midland and Western	-0.544	0.547	-0.642	-172	-217
IRL	Southern and Eastern	-0.519	0.521	-0.585	-408	-1413
ISL	Ísland	-0.085	0.085	-0.168	-91	-30
ITA	Piemonte	-0.050	0.050	-0.134	-39	-174
ITA	Valle d'Aosta/Vallée d'Aoste	-0.055	0.055	-0.139	-48	-6
ITA	Liguria	-0.046	0.046	-0.130	-40	-63
ITA	Lombardia	-0.040	0.040	-0.124	-45	-454
ITA	Abruzzo	-0.035	0.035	-0.119	-29	-38
ITA	Molise	-0.035	0.035	-0.120	-24	-7
ITA	Campania	-0.033	0.033	-0.118	-21	-126
ITA	Puglia	-0.034	0.034	-0.118	-21	-86
ITA	Basilicata	-0.034	0.034	-0.118	-24	-14
ITA	Calabria	-0.034	0.034	-0.119	-20	-39
ITA	Sicilia	-0.035	0.035	-0.120	-21	-104
ITA	Sardegna	-0.048	0.048	-0.133	-27	-45
ITA	Provincia Autonoma di Bolzano/Bozen	-0.043	0.043	-0.126	-54	-28
ITA	Provincia Autonoma di Trento	-0.041	0.041	-0.125	-44	-23
ITA	Veneto	-0.038	0.038	-0.122	-39	-190

Continuation of Table 4

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
ITA	Friuli-Venezia Giulia	-0.039	0.039	-0.123	-37	-45
ITA	Emilia-Romagna	-0.038	0.038	-0.122	-42	-188
ITA	Toscana	-0.040	0.040	-0.124	-37	-139
ITA	Umbria	-0.037	0.037	-0.121	-29	-26
ITA	Marche	-0.037	0.037	-0.121	-32	-50
ITA	Lazio	-0.034	0.034	-0.118	-37	-219
LTU	Lietuva	-0.057	0.057	-0.143	-19	-55
LUX	Luxembourg	-0.089	0.089	-0.169	-156	-90
LVA	Latvija	-0.058	0.058	-0.144	-18	-36
MLT	Malta	-0.076	0.076	-0.162	-36	-16
NLD	Groningen	-0.131	0.131	-0.214	-89	-52
NLD	Friesland (NL)	-0.155	0.155	-0.242	-69	-45
NLD	Drenthe	-0.128	0.128	-0.214	-62	-30
NLD	Overijssel	-0.125	0.125	-0.210	-72	-82
NLD	Gelderland	-0.125	0.125	-0.210	-73	-149
NLD	Flevoland	-0.146	0.147	-0.232	-74	-30
NLD	Utrecht	-0.145	0.145	-0.227	-110	-140
NLD	Noord-Holland	-0.168	0.168	-0.249	-132	-369
NLD	Zuid-Holland	-0.172	0.172	-0.255	-106	-385
NLD	Zeeland	-0.195	0.196	-0.282	-90	-34
NLD	Noord-Brabant	-0.136	0.136	-0.219	-95	-237
NLD	Limburg (NL)	-0.108	0.108	-0.192	-68	-76
NOR	Oslo og Akershus	-0.089	0.089	-0.169	-126	-158
NOR	Hedmark og Oppland	-0.095	0.095	-0.179	-76	-29
NOR	Sør-Østlandet	-0.101	0.101	-0.184	-80	-79
NOR	Agder og Rogaland	-0.135	0.135	-0.216	-127	-97
NOR	Vestlandet	-0.115	0.115	-0.196	-112	-100
NOR	Trøndelag	-0.085	0.085	-0.167	-86	-39
NOR	Nord-Norge	-0.059	0.059	-0.142	-69	-33
POL	Łódzkie	-0.043	0.043	-0.128	-13	-33
POL	Mazowieckie	-0.043	0.043	-0.128	-23	-121
POL	Małopolskie	-0.037	0.037	-0.122	-12	-42
POL	Śląskie	-0.038	0.038	-0.124	-14	-65
POL	Lubelskie	-0.041	0.041	-0.126	-10	-21
POL	Podkarpackie	-0.038	0.038	-0.124	-10	-21
POL	Świętokrzyskie	-0.040	0.040	-0.126	-10	-12
POL	Podlaskie	-0.045	0.045	-0.131	-11	-12
POL	Wielkopolskie	-0.049	0.049	-0.135	-16	-57
POL	Zachodniopomorskie	-0.060	0.060	-0.146	-14	-23
POL	Lubuskie	-0.051	0.051	-0.137	-13	-13
POL	Dolnośląskie	-0.044	0.044	-0.130	-16	-46
POL	Opolskie	-0.041	0.041	-0.127	-12	-11
POL	Kujawsko-Pomorskie	-0.050	0.050	-0.136	-12	-26
POL	Warmińsko-Mazurskie	-0.050	0.050	-0.136	-11	-15
POL	Pomorskie	-0.055	0.055	-0.141	-15	-35
PRT	Norte	-0.085	0.085	-0.172	-26	-94
PRT	Algarve	-0.064	0.064	-0.150	-28	-12
PRT	Centro (PT)	-0.075	0.075	-0.162	-25	-57
PRT	Área Metropolitana de Lisboa	-0.064	0.064	-0.149	-35	-99
PRT	Alentejo	-0.067	0.067	-0.153	-26	-19
ROM	Nord-Vest	-0.046	0.046	-0.132	-10	-26
ROM	Centru	-0.044	0.044	-0.129	-10	-24
ROM	Nord-Est	-0.044	0.044	-0.130	-7	-22
ROM	Sud-Est	-0.040	0.040	-0.125	-9	-23
ROM	Sud - Muntenia	-0.036	0.036	-0.121	-8	-25
ROM	București - Ilfov	-0.033	0.033	-0.118	-24	-55
ROM	Sud-Vest Oltenia	-0.042	0.042	-0.128	-8	-16
ROM	Vest	-0.045	0.045	-0.131	-12	-21

Continuation of Table 4

Country	Region	Change Productivity (%)	Change Markups (%)	Change Welfare (%)	Change Welfare in Euros (per capita)	Aggregate Welfare Change (Million EUR)
SWE	Stockholm	-0.060	0.060	-0.142	-94	-210
SWE	Östra Mellansverige	-0.071	0.071	-0.155	-63	-104
SWE	Småland med öarna	-0.076	0.076	-0.160	-64	-54
SWE	Sydsverige	-0.085	0.085	-0.169	-67	-98
SWE	Västsverige	-0.097	0.097	-0.180	-83	-164
SWE	Norra Mellansverige	-0.077	0.077	-0.161	-61	-51
SWE	Mellersta Norrland	-0.072	0.072	-0.156	-62	-23
SWE	Övre Norrland	-0.062	0.062	-0.146	-62	-32
SVN	Vzhodna Slovenija	-0.040	0.040	-0.125	-20	-22
SVN	Zahodna Slovenija	-0.038	0.038	-0.123	-29	-28
SVK	Bratislavský kraj	-0.041	0.041	-0.125	-45	-29
SVK	Západné Slovensko	-0.043	0.043	-0.128	-18	-33
SVK	Stredné Slovensko	-0.043	0.043	-0.129	-15	-21
SVK	Východné Slovensko	-0.043	0.043	-0.129	-13	-22
GBR	Tees Valley and Durham	-1.163	1.177	-1.284	-315	-375
GBR	Northumberland and Tyne and Wear	-1.159	1.173	-1.275	-356	-513
GBR	Cumbria	-1.138	1.152	-1.245	-407	-202
GBR	Greater Manchester	-1.057	1.068	-1.163	-367	-1015
GBR	Lancashire	-1.102	1.114	-1.214	-347	-513
GBR	Cheshire	-1.083	1.095	-1.171	-513	-471
GBR	Merseyside	-1.077	1.089	-1.190	-330	-503
GBR	East Yorkshire and Northern Lincolnshire	-1.195	1.210	-1.313	-357	-331
GBR	North Yorkshire	-1.163	1.177	-1.274	-393	-319
GBR	South Yorkshire	-1.117	1.130	-1.237	-305	-420
GBR	West Yorkshire	-1.099	1.112	-1.208	-367	-841
GBR	Derbyshire and Nottinghamshire	-1.128	1.141	-1.240	-356	-772
GBR	Leicestershire, Rutland and Northamptonshire	-1.155	1.169	-1.263	-402	-718
GBR	Lincolnshire	-1.229	1.244	-1.353	-332	-245
GBR	Herefordshire, Worcestershire and Warwickshire	-1.120	1.133	-1.223	-426	-565
GBR	Shropshire and Staffordshire	-1.116	1.128	-1.231	-336	-538
GBR	West Midlands	-1.077	1.089	-1.187	-349	-993
GBR	East Anglia	-1.313	1.331	-1.425	-462	-1144
GBR	Bedfordshire and Hertfordshire	-1.158	1.172	-1.256	-475	-870
GBR	Essex	-1.279	1.295	-1.395	-408	-732
GBR	Inner London – West	-0.878	0.885	-0.773	-1.604	-1852
GBR	Inner London – East	-0.945	0.954	-1.012	-579	-1361
GBR	Outer London – East and North East	-1.046	1.057	-1.160	-303	-570
GBR	Outer London – South	-1.063	1.074	-1.167	-377	-488
GBR	Outer London – West and North West	-0.991	1.000	-1.073	-490	-1019
GBR	Berkshire, Buckinghamshire and Oxfordshire	-1.141	1.155	-1.217	-624	-1479
GBR	Surrey, East and West Sussex	-1.254	1.270	-1.354	-513	-1462
GBR	Hampshire and Isle of Wight	-1.242	1.258	-1.344	-493	-967
GBR	Kent	-1.306	1.323	-1.423	-420	-761
GBR	Gloucestershire, Wiltshire and Bristol/Bath area	-1.172	1.185	-1.270	-480	-1176
GBR	Dorset and Somerset	-1.236	1.251	-1.353	-382	-503
GBR	Cornwall and Isles of Scilly	-1.257	1.273	-1.384	-325	-180
GBR	Devon	-1.250	1.266	-1.370	-373	-437
GBR	West Wales and The Valleys	-1.177	1.191	-1.301	-302	-590
GBR	East Wales	-1.154	1.168	-1.263	-399	-459
GBR	Eastern Scotland	-1.128	1.141	-1.231	-430	-890
GBR	South Western Scotland	-1.118	1.130	-1.227	-381	-892
GBR	North Eastern Scotland	-1.140	1.153	-1.221	-594	-294
GBR	Highlands and Islands	-1.105	1.117	-1.214	-379	-178
GBR	Northern Ireland (UK)	-1.144	1.157	-1.260	-346	-643

Columns 3 to 7 provide counterfactual changes in productivity and product diversity (column 3; % changes), markups (column 4; % changes), welfare (columns 5, 6 and 7; % changes, per capita changes in euros and aggregate changes in million euros, respectively). Productivity corresponds to value added per worker. Welfare corresponds to the change in income that, given initial prices, would allow consumers to reach the same utility level corresponding to the counterfactual equilibrium. Markups (as defined in the model) are equivalent to price over marginal cost.

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