

The Impact of the UK's EU Exit on the Attractiveness of Northern Ireland to FDI and Associated Job Creation Effects

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Abstract

This study examines possible Brexit effects on the attractiveness of Northern Ireland to greenfield foreign direct investment (FDI) and related job creation. Our results indicate that Northern Ireland would be less attractive as a location to FDI and would experience a reduction of FDI-related job creation in any of the considered Brexit outcomes in which Northern Ireland would have the same model of trade agreements with the EU as the rest of the United Kingdom (UK). Northern Ireland would become more attractive to FDI and would generate more FDI-related new jobs if it would remain in the EU Single Market for goods and services and the rest of the UK would leave the EU Single Market. Lowering the corporate tax rate to 12.5% in Northern Ireland would compensate the negative effects of Brexit on its attractiveness to FDI.

Key words: The location choice of foreign direct investment, Brexit, job creation.

JEL classification: F14, F15, F16, F23

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Executive Summary

This study examines possible Brexit impacts on the attractiveness of Northern Ireland to greenfield foreign direct investment (FDI)² and related job creation. The analysis follows on from a similar study on the UK's attractiveness to FDI and associated job creation effects post-Brexit.³ We analyse counterfactual outcomes relative to a "No Brexit" scenario including the following three options for the UK-EU trade relationship:

- Membership of the European Economic Area (EEA) following a three year implementation period
- Free Trade Agreement (FTA) with the EU with a three years implementation period
- No withdrawal deal with the EU (WTO option)

In addition, we examine counterfactual outcomes for the case of Northern Ireland and the rest of the UK having different trade agreements with the EU:

- Northern Ireland in the EU Customs Union and Single Market for goods and a FTA for the rest of the UK after a three years implementation period (an endeavour to model a backstop outcome)
- Northern Ireland in the EU Customs Union and Single Market for goods and services and a FTA for the rest of the UK after a three years implementation period

Further, we examine the effect of lowering the corporate tax rate in Northern Ireland to 12.5% to compensate Brexit negative effects on its attractiveness to FDI.

Taken together, our results indicate that Northern Ireland would be less attractive as a location to FDI and would experience a reduction of FDI-related job creation in any of the considered post-Brexit outcomes in which Northern Ireland would have the same model of trade agreements with the EU as the rest of the UK. These effects come about through reduced market potential due to lower market size and reduced access to the EU Single Market. Looking at post-Brexit outcomes for all the UK regions and Ireland, our results indicate that Northern Ireland losses in terms of its attractiveness to FDI relative to a No Brexit scenario would be larger than those for London, Ireland, Scotland, South-East and Wales, while the rest of the UK regions would experience larger losses.

² New greenfield FDI projects are new operations established by foreign companies at a new site. The foreign company may or may not already be present in the country, but the FDI project is in a new location within the country. It can also include relocation from one country to another.

³ "The Impact of the UK's EU Exit on its Attractiveness to FDI and Associated Job Creation", by Iulia Siedschlag and Manuel Tong Koecklin, March 2019, Department for the Economy, Northern Ireland, available at <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Impact-of-UK-EU-Exit-on-its-Attractiveness-to-FDI-and-Associated-Job-Creation-Effects.pdf>

The least damaging post-Brexit outcome would be in the case of the UK's membership in the EEA with a reduction in the medium to long run by 0.3% per annum of the number of FDI projects going to Northern Ireland relative to a No Brexit scenario. The corresponding reduction of the FDI-related new jobs would be 0.4% per annum. The largest losses would be for FDI in services by EU investors – the number of FDI projects would be lower by 0.4% and the FDI-related new jobs would be lower by 0.6% per annum. The implied cumulated reduction in greenfield FDI inflows over 2019-2030 would be 12.7 million GBP relative to no Brexit, with the largest reduction in the case of FDI in manufacturing by EU investors, 2.3 million GBP.

The most damaging post-Brexit outcome would be in the case of the UK leaving the EU without a withdrawal agreement. In this scenario, the number of FDI projects going to Northern Ireland would be lower in the medium to long run by 3% per annum and the FDI-related new jobs would be lower by 3.6% when only static (one-off) effects are considered. If additional dynamic effects are taken into account associated with foregone trade-related productivity growth, in the no-deal scenario, the corresponding losses would be in the medium to long run by 6% per annum in the case of the number of FDI projects and by 7.6% for FDI-related new jobs. The largest losses would be again in the case of FDI in services by EU investors: the number of FDI projects would be lower by 3.3% (static effects) and 6.8% (dynamic effects) respectively, while the number of FDI-related new jobs would be lower by 4.8% (one-off effects) and 10.1% (dynamic effects). The implied cumulated reduction in greenfield FDI inflows over 2019-2030 would be 123.1 million GBP (static effects), and 254.7 million GBP (dynamic effects), respectively. The largest cumulated loss would be for FDI in manufacturing by EU investors, 21.7 million GBP (static effects), and 45.7 million GBP (dynamic effects), respectively.

The results of this analysis indicate that Northern Ireland would become more attractive to FDI and would generate more FDI-related new jobs if it would remain in the EU Customs Union and Single Market for goods and services and the rest of the UK would leave the EU Single Market. In this scenario the rest of the UK regions would become less attractive to FDI and would have less FDI-related job creation. The number of the FDI projects in Northern Ireland in this case would be higher in the medium to long run by almost 1% per annum when only static effects are considered and by 1.4% if additional dynamic effects are taken into account. The highest gains would be for FDI in manufacturing by non-EU investors (by 1.3% and 2.3%, respectively). The corresponding FDI-related new jobs gains would be: for all FDI projects 0.9% (static effects) and 1.7% (dynamic effects) with the largest gains for FDI in manufacturing by non-EU investors, 1.6% (one-off effects only) and 2.9% (with additional dynamic effects), respectively. The implied cumulated gains in terms of invested capital in greenfield projects over 2019-2030 would be 29.7 million GBP (static effects) and 59.4 million GBP (dynamic effects), respectively. The largest cumulated gain would be for FDI in manufacturing by non-EU investors, 8.54 million GBP (static effects) and 15.1 million GBP (dynamic effects), respectively.

Lowering the corporate tax rate to 12.5% would more than compensate the negative effects of Brexit on Northern Ireland's attractiveness to FDI in the cases of a FTA and no deal scenarios. Lowering the corporate tax rate to 12.5% would be consistent with the policy of the previous Northern Ireland's Executive prior to the EU exit referendum which was expected to deliver a significant increase in FDI projects and related jobs.⁴ Our results indicate that relative to a baseline No Brexit scenario, in

⁴ For evidence on these expected effects see "Measuring the economic impact of a reduced rate of corporation tax in Northern Ireland", Economic Policy Centre, Ulster University, March 2016, available at <https://www.economy-ni.gov.uk/publications/economic-impact-corporation-tax>.

the medium to long run Northern Ireland would attract a significantly larger number of FDI projects and would become as attractive to FDI as East Midlands and more attractive than North East and Wales. The cumulated increase in invested capital over 2019-2030 would be 6.6 billion GBP (dynamic effects) in the case of a free trade agreement between the UK and the EU and 6.3 billion GBP (dynamic effects) in the case of UK leaving the EU with no withdrawal deal.

This Report is complemented by a set of presentation slides, a short summary version alongside a more detailed version available online at <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Impacts-of-EU-Exit-on-FDI-impacts-to-ni-Final-Presentation-short-version.pdf> and <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Impacts-of-EU-Exit-on-FDI-impacts-to-ni-Final-Presentation-detailed-pack.pdf> respectively.

1 Introduction

This study examines and quantifies the possible impact of Brexit on the attractiveness of Northern Ireland to greenfield foreign direct investment (FDI) and associated job creation effects. The analysis follows on from a similar study on the UK's attractiveness to FDI and related job creation post-Brexit.⁵

We examine the attractiveness of Northern Ireland and the other EU regions to all FDI projects and in addition we distinguish between FDI projects in manufacturing and in services;⁶ FDI projects by EU and non-EU investors as well as combinations of these different types of FDI projects: FDI projects in manufacturing by EU and non-EU investors; FDI projects in services by EU and non-EU investors.

Possible post-Brexit counterfactual outcomes we consider include the following alternative models of the UK-EU relationship:

- Membership of the European Economic Area (EEA) with a three years implementation period
- Free Trade Agreement (FTA) with the EU with a three years implementation period
- No withdrawal deal with the EU (WTO option)

In addition, we examine post-Brexit outcomes in the case of Northern Ireland and the rest of the UK having different trade agreements:

- Northern Ireland in the EU Customs Union and Single Market for goods and a FTA for the rest of the UK after a three years implementation period (an endeavour to model a backstop outcome)
- Northern Ireland in the EU Customs Union and Single Market for goods and services and a FTA for the rest of the UK after a three years implementation period

We generate counterfactual Brexit outcomes on Northern Ireland's attractiveness to FDI using our estimates on the location choice of FDI in EU regions combined with existing estimates on static (one-off) and dynamic effects⁷ of alternative Brexit scenarios on the GDPs of the UK and other EU countries and regions. Further, we estimate counterfactual Brexit outcomes with respect to FDI related job creation. Finally, we analyse the policy option to compensate negative Brexit effects by lowering the corporate tax rate to 12.5%.

To the best of our knowledge this evidence is novel in comparison to other recent studies on economic effects of Brexit in a number of ways: (i) we identify the attractiveness of Northern Ireland to greenfield FDI by using a multi-country, multi-region econometric set up; (ii) we estimate counterfactual Brexit static and dynamic effects on Northern Ireland's attractiveness to FDI; (iii) we

⁵ "The Impact of the UK's EU Exit on its Attractiveness to FDI and Associated Job Creation Effects", by Iulia Siedschlag and Manuel Tong Koecklin, Department for the Economy, Belfast, Northern Ireland, March 2019, available at <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Impact-of-UK-EU-Exit-on-its-Attractiveness-to-FDI-and-Associated-Job-Creation-Effects.pdf>.

⁶ Given the post-Brexit outcomes are conditioned by alternative models for the UK-EU trade relationship, this analysis includes greenfield FDI projects in the services sectors most outward oriented: Business services; Financial services; and Software and IT services. These three services sectors represented 73% of new greenfield FDI projects in services established in Northern Ireland over the analysed period 2003-2015.

⁷ Static effects are one-off losses due to lower trade while dynamic effects include additional losses over time due to forgone productivity gains associated with trade. Rojas-Romagosa (2016) provides a detailed discussion on modelling post-Brexit static and dynamic income outcomes.

estimate counterfactual Brexit outcomes for FDI-related job creation; (iv) we estimate the effect of lowering the corporate tax rate in Northern Ireland to compensate possible Brexit negative effects.

The rest of this paper is structured as follows. Section 2 discusses the empirical methodology. Next, section 3 describes the data used for the analysis and section 4 presents the empirical findings. Finally, section 5 summarises the key findings and concludes.

2 Empirical Methodology

To address the questions described above, we use multivariate econometric models to obtain insights on the relationships between access to the EU Single Market, attractiveness to FDI and FDI-related job creation. On the basis of these results and using existing estimates on the effects of alternative Brexit scenarios on the GDPs of the UK, Northern Ireland, and other EU countries, we examine possible impacts of Brexit on the attractiveness of Northern Ireland to FDI and associated FDI-related job creation effects.

The empirical strategy consists of the following four stages:⁸

- Modelling the importance of access to the EU Single Market and of other factors on the attractiveness of Northern Ireland to FDI
- Modelling the link between the attractiveness of EU regions to FDI and FDI - related job creation
- Predicting alternative Brexit outcomes for Northern Ireland's attractiveness to FDI and FDI-related job creation
- Examining policy options to compensate the negative Brexit effects on Northern Ireland's attractiveness to FDI

2.1 Modelling the location choice of greenfield FDI projects

We examine the role of access to the EU Single Market and other factors which influence the location choice of FDI projects by using a random utility maximization modelling framework following McFadden (1974).⁹ In this modelling set up, the foreign investor considers the set of alternative locations (Northern Ireland and the other NUTS 1 EU regions), and chooses the location with the highest profitability among competing alternatives. Each location's profitability is a function of the location's characteristics such as demand (market size and market access) and supply factors (production costs, skills availability, innovation capacity, corporate tax rate). It is assumed that locational characteristics affect the profitability of all investors symmetrically.

The baseline model specification we estimate is as follows:

⁸ The empirical strategy is similar to the approach used in a separate study on the effects of Brexit on the UK's attractiveness to FDI and related job creation, "The Impact of the UK's EU Exit on its Attractiveness to FDI and Associated Job Creation Effects", by Iulia Siedschlag and Manuel Tong Koecklin, available at <https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Impact-of-UK-EU-Exit-on-its-Attractiveness-to-FDI-and-Associated-Job-Creation-Effects.pdf>.

⁹ Recent reviews of this modelling framework include among others Schmidheiny and Brühlhart (2011), Siedschlag et al. (2013a, 2013b), and Lawless et al. (2014).

$$y_{ijt} = \begin{cases} 1 & \text{if } \pi_{ijt} > \pi_{ikt}, \forall j \neq k \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

The dependent variable y_{ijt} is a binary variable equal to 1 if a new FDI project i was established in region j in year t . π_{ijt} is the expected profit for FDI project i in region j in year t . Region j is chosen if π_{ijt} is larger than in any other alternative location k . Since π_{ijt} is not known *ex-ante* by the foreign investor, the probability that region j is chosen for the location of foreign affiliate/FDI project i depends on the likelihood that its profit will be maximized in region j depending on its characteristics. The expected profit, π_{ijt} is a function of observed locational characteristics X_{jt} , and a random term of unobserved profit μ_{ijt} :

$$\pi_{ijt} = \beta X_{jt-1} + \mu_{ijt} \quad (2)$$

β is a vector of coefficients related to the corresponding vector of observable location characteristics X_{jt-1} . The location characteristics are lagged by one year with respect to the location choice decision for each project to alleviate possible reverse causality. The description of the variables used in the econometric analysis and their data sources are given in Table A1 in the Appendix.

Following McFadden (1974), if, and only if, μ_{ijt} follows an extreme-value type 1 distribution and is independent and identically distributed across all investors i and alternative locations j , the probability that location j is chosen by firm i at time t is given by:

$$P_{jt} = \frac{e^{\beta X_{jt}}}{\sum_j e^{\beta X_{jt}}} \quad (3)$$

where $\sum_j P_{jt} = 1$

Given the assumption that location characteristics affect all investors symmetrically, the location probability P_{jt} quantifies the share of firms choosing to invest in location j in year t . The assumption about the distribution of stochastic terms μ_{ij} implies a statistical property known as independence of irrelevant alternatives (IIA). Under this assumption, the parameters β can be estimated by a conditional logit model (CLM). The IIA property implies that the total number of investments is fixed and that changes in the location characteristics affect only the distribution of investments across all location alternatives. This means that if a location becomes more attractive and attracts one additional investment, this will be at the expense of another location.¹⁰

Using the estimates obtained above, we predict the attractiveness of a representative location i to FDI in each year t , FDI_Prob_{it} .

¹⁰ This econometric framework has been used widely to model the location choice of foreign direct investment. Recent reviews of this literature include among others Barrios et al. (2012), Siedschlag et al. (2013a, 2013b), Davies, Siedschlag and Studnicka (2016).

2.2 Modelling the link between attractiveness to FDI and FDI related job creation

We examine the link between attractiveness to FDI and FDI related job creation by estimating the following model:

$$\ln FDI_Jobs_{it} = \alpha_0 + \alpha_1 \ln FDI_Prob_{it} + \sum_{i=1}^5 \beta_i X_{it-1} + \gamma_t + \varepsilon_{it} \quad (4)$$

The dependent variable taken in logs is the number of FDI related jobs created in a given region i and year t . The explanatory variables include the predicted attractiveness to FDI of a given region i and year t (retrieved from the previous modelling stage) and a vector of time variant region-specific characteristics which have been found to impact on job creation/employment:¹¹ real gross value added per employee, real gross value added per employee growth, real GDP growth, human capital (tertiary education attainment: the share of working age population with tertiary education in the total population aged 25-64), R&D intensity (R&D expenditures as % of GDP). These variables are lagged by one year with respect to the dependent variable to avoid possible reverse causality concerns. The model also includes time-specific effects (γ_t) to control for common macroeconomic shocks. Detailed descriptions of the variables and their data sources are given in Table A1 in the Appendix.

The parameter of interest is α_1 which captures the elasticity of FDI related job creation with respect to regions' attractiveness to FDI – the per cent change in FDI-related job creation following a one per cent change in the predicted region's attractiveness to FDI.

¹¹ See for example Nickell and Nicolitsas (1999).

2.3 Analysis of potential counterfactual Brexit scenarios

To examine possible Brexit effects on Northern Ireland's attractiveness to FDI, we estimate counterfactual outcomes corresponding to the possible options of the UK-EU relationship described above and compare these with the "No Brexit" baseline estimates obtained in the first stage of this analysis. More specifically, we use estimated reductions in GDP obtained by previous studies under alternative Brexit scenarios (Aichele and Felbermayr 2015; Rojas-Romagosa 2016; and Chen et al. (2018) and compute the corresponding reduced access to the EU Single Market for Northern Ireland and the other EU regions. On this basis, we obtain counterfactual post-Brexit outcomes for the attractiveness of Northern Ireland to FDI. Using the elasticities of FDI-related job creation with respect to regions' attractiveness to FDI and the changes in Northern Ireland's attractiveness to FDI, we compute the corresponding changes in FDI related job creation under alternative Brexit scenarios.

2.4 Compensatory policy options

Previous studies have found that foreign investors tend to locate their projects in countries with lower corporate tax rates and that the sensitivity of small countries' attractiveness to the location of FDI projects with respect to corporate taxation is relatively large.¹²

To compensate the negative effects of Brexit on Northern Ireland's attractiveness to FDI, we model the effect of lowering the corporate tax rate in Northern Ireland to 12.5% (the same as in the Republic of Ireland) on its attractiveness to FDI.

3 Data

We combine data from several sources including the following: (i) information on the location and number of new greenfield FDI projects, invested capital, and FDI-related job creation in Northern Ireland and the other NUTS 1 EU regions; (ii) data on location (region) characteristics; (iii) existing estimates on the exposure of EU countries and regions to Brexit; (iv) existing estimates on possible effects of alternative Brexit scenarios on the GDP of the UK and the other EU countries. We describe below these data.

3.1 The location of new greenfield FDI projects and related job creation

We analyse over 65,000 new greenfield FDI projects established in Northern Ireland and the other comparable (NUTS 1) EU regions over the period 2003-2017. The information has been extracted from the fDi Markets data base. Information on FDI-related job creation in Northern Ireland and the other EU regions has been also extracted from the fDi Markets data base. To net out any anticipated Brexit effect on the location choice of new greenfield FDI projects and associated employment effects, we base our analysis on new FDI projects and FDI-related job creation over the period 2003-2015.

¹² See among other recent studies Lawless et al. (2014) for Ireland and Davies, Siedschlag and Studnicka (2016) for Ireland and the other EU countries.

3.2 Location characteristics

We use annual data on location characteristics (provided by the Eurostat, OECD, and KPMG) including: GDP (in constant 2010 prices), GDP growth (in constant 2010 prices), GDP per capita (in constant 2010 prices), population, the share of the working age population (25-64) with tertiary education, R&D expenditures as per cent of GDP, statutory corporate tax rates, wage per employee (in constant 2010 prices), wage per employee growth (in constant 2010 prices).

A key variable in our analysis is each region's i access to the EU Single Market ($EU MP_i$) which is defined as follows:¹³

$$EU MP_i = GDP_i + \sum_j \frac{GDP_j}{d_{ij}}, \quad j \neq i, \text{ for all other possible locations } j \text{ relative to the host region } i. \quad (5)$$

d_{ij} denotes the distance between regions i and j to account for the fact that market access declines with transport cost. Bilateral distances are calculated using the travel time by lorry.¹⁴

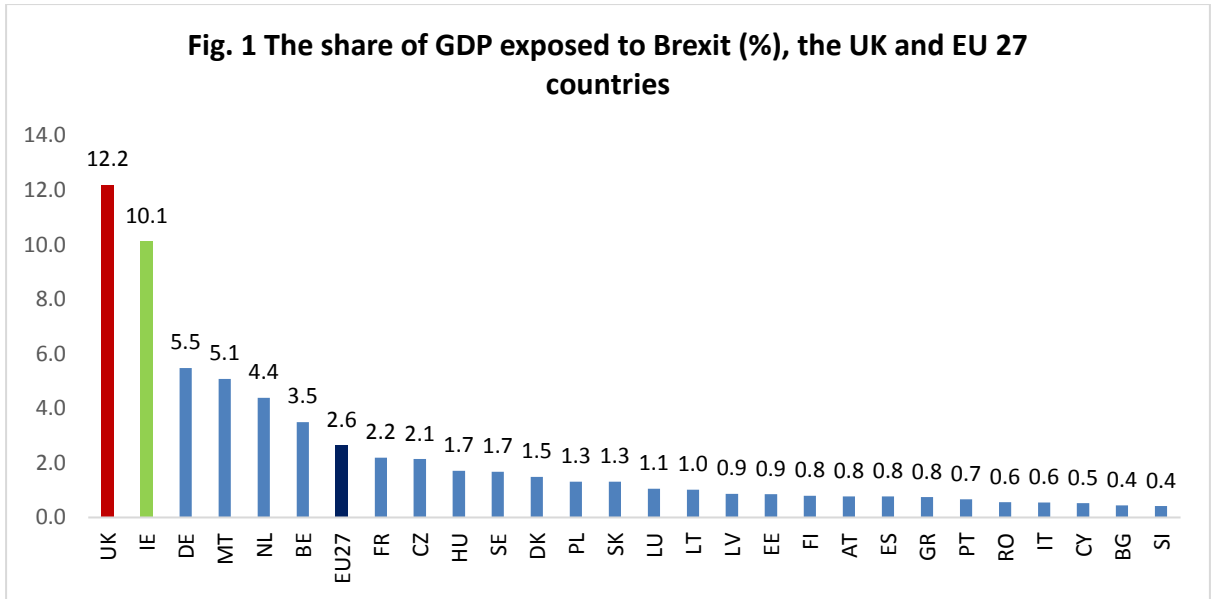
Northern Ireland access to the EU Single Market is obtained as a sum of its economic size (GDP) and the sum of the economic size of all other EU regions (including the rest of the UK region) to which Northern Ireland has access discounted by the bilateral distance between Northern Ireland and all these other regions.

3.3 Estimates of Brexit outcomes from the existing literature

To obtain counterfactual Brexit outcomes, we combine our estimates on the location choice of FDI projects across EU regions with estimates by Chen et al. (2018) on the share of EU countries and regions' GDP exposed to Brexit. These estimates are obtained using information on trade flows between the UK and the UK's regions and the rest of the EU countries and regions.

¹³ This measure has been first proposed by Harris (1954) and has been used widely in the literature on the location choice of foreign direct investment. See for example, Head and Mayer (2004), Crozet, Mayer, and Mucchielli (2004), Barrios et al. (2012), Siedschlag et al. (2013a, 2013b).

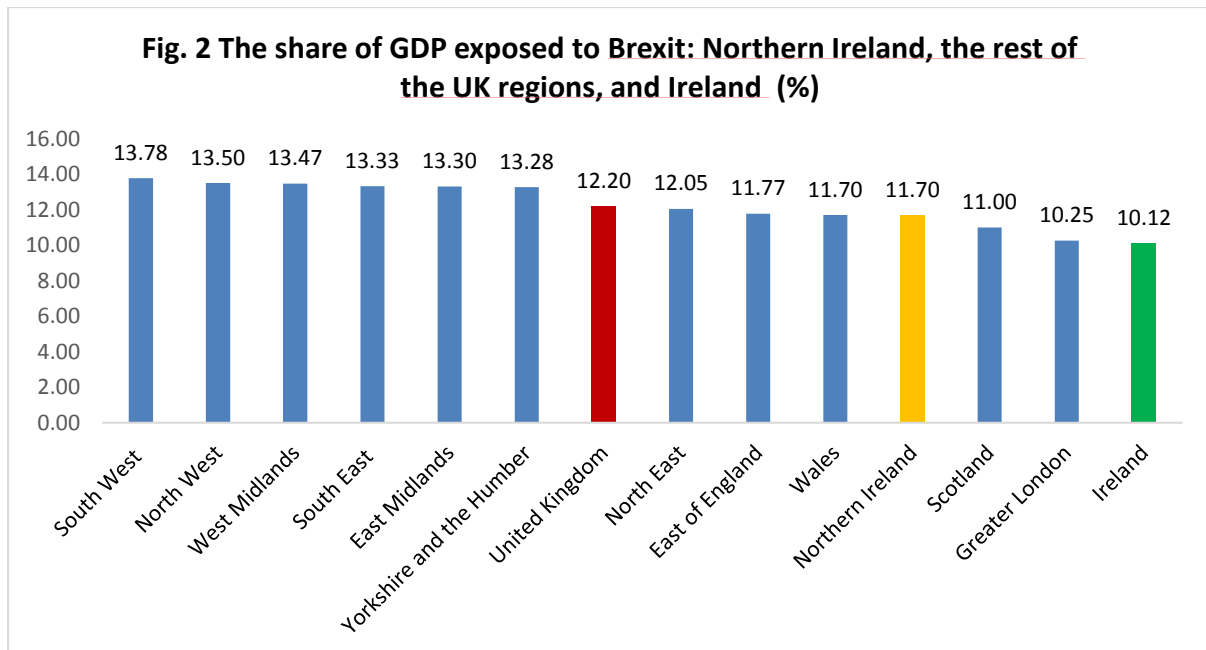
¹⁴ We thank Mathieu Crozet for sharing these data with us.



Source: Estimates by Chen et al. (2018).

Figure 1 shows that the UK is the most exposed to Brexit in terms of its GDP (12.2% of its GDP), followed by Ireland (10.1% of its GDP). The average Brexit exposure for the EU 27 countries is almost five times lower than the UK’s exposure (2.6%). Apart from Ireland, Germany, Malta, the Netherlands, and Belgium are most exposed to Brexit, with shares of their GDP exposed to Brexit larger than the EU 27 average. The other EU countries are less exposed to Brexit with shares of GDP exposed to Brexit ranging from 0.4 to 2.2 %.

Figure 2 shows the estimates by Chen et al. (2018) on the GDP’s exposure to Brexit in Northern Ireland, the rest of the UK regions and Ireland. Northern Ireland appears to be less exposed to Brexit than the UK and all the other UK regions with the exception of Scotland and the Greater London. Ireland’s exposure is close but below Greater London’s exposure.



Source: Estimates by Chen et al. (2018).

To obtain estimates of the effect of Brexit on Northern Ireland’s and the other EU regions’ GDPs, we combine the results on the GDP exposure to Brexit provided by Chen et al. (2018) with estimates of the effect of alternative Brexit scenarios on the UK’s and the other EU countries’ GDP taken from Aichele and Felbermayr (2015) and Rojas-Romagosa (2016).¹⁵ A description of the main features of these Brexit scenarios is provided in Box 1.

Table A2 in the Appendix shows the results of our calculations of the impact of Brexit on the GDPs of EU countries and regions based on the above estimates.

As shown in Table A2, Northern Ireland’s GDP in 2030 would be lower than in the baseline *No Brexit* scenario. The least damaging Brexit option would be membership in the EEA¹⁶ with a drop in GDP by 0.6%. The most damaging option would be the no-deal (WTO) option with a drop in GDP by 4.0% if only static effects are considered and by 8.3% if dynamic effects related to foregone trade-related innovation and productivity growth are taken into account. The corresponding GDP reductions in the case of a FTA scenario would be 3.3% (static effects only) and 5.7% (both static and dynamic effects), respectively.

Box 1: Brexit Scenarios
Static effects
<p>EEA scenario: The United Kingdom exits the EU, but receives a status similar to that of Norway or Switzerland, meaning that the EU and UK retain a deep trade agreement. The increased cost of trade results from reversing the trade cost reductions from joining the EU that were previously observed.</p> <p>FTA scenario: Free trade agreement with the EU after 10 years. From 2019 until 2029 the WTO’s most favoured nation (MFN) tariffs will be applied reciprocally for the UK’s trade with WTO members including the EU. In 2029 the tariffs will return to zero. In the case of the UK’s leaving the EU, non-tariff barriers (NTB) are assumed to be higher with the equivalent of the intra-EU NTB ad-valorem savings due to the EU Single Market estimated by Egger et al. (2015). Once the FTA will be in place, NTB costs are assumed half of the non-EU NTB levels.</p> <p>WTO scenario: Tariffs will increase to the WTO’s MFN level. NTB costs will increase to the non-EU NTB levels applied before the EU Single Market.</p>
Dynamic effects
<p>Larger losses are likely due to foregone dynamic income gains over time associated with productivity growth linked to trade-induced innovation. These dynamic trade effects in the context of Brexit have been discussed recently (for example by HM Treasury 2016; Dhingra et al. 2016; Kierzenkowski et al. 2016) following recent work by Keller (2002) and Melitz and Trefler (2012). This is not a standard approach of modelling trade policy. Above baseline trade volumes are obtained by creating an exogenous link between trade volumes and above-baseline total factor productivity increases. A conservative value for the elasticity of trade to productivity is used, 0.1. Given the lack of conclusive</p>

¹⁵ We thank Hugo Rojas-Romagosa for sharing with us his estimates of dynamic effects of Brexit on the GDP of EU countries.

¹⁶ Estimates of post-Brexit outcomes for GDP in the UK and the other EU countries in the case of the EEA scenario are available only for one-off effects.

empirical evidence on the precise mechanisms and estimates for the trade-productivity elasticity, these results should be considered as indicative only.

The scenarios described above are based on assumptions regarding the trade costs under different possible trade agreements between the EU and the UK. These assumptions do not include possible trade agreements between the UK and non-EU countries. Further, it is assumed that post-Brexit the UK will retain its WTO membership and it will also, continue to benefit from the preferential terms within the current free trade agreements (FTAs) negotiated by the EU with non-EU countries.

Sources: Aichele and Felbermayr (2015), Rojas-Romagosa (2016).

4 Results

4.1 Baseline estimates on determinants of the location choice of FDI projects in EU regions

Tables A2-A5 in the Appendix show the estimates for the importance of access to the EU Single Market and of other factors for the attractiveness of EU regions to all FDI projects and the different types of FDI considered. The results indicate that a larger EU market potential (a larger access to the EU Single Market) increases a regions' probability to be chosen as location for FDI projects. The importance of this factor appears to be greater in the case of investments from non-EU countries in comparison to intra-EU investments and for FDI in services in comparison to FDI in manufacturing. Other factors which are found to increase the attractiveness of EU regions to FDI are a lower corporate tax rate (more important for intra-EU investments and for FDI in services), and a skilled workforce (more important for FDI from non-EU countries than and for FDI in services). FDI projects from non-EU countries tend to locate in regions with a high GDP per capita, while intra-EU investments appear to seek locations with lower production costs (regions with lower GDP per capita). With respect to the sectoral breakdown, FDI projects in manufacturing appear to seek low-cost locations while FDI in services tend to locate in regions with a higher GDP per capita. Our results indicate that over and beyond the factors discussed above, FDI projects tend to locate in regions with lower R&D intensity. This result suggests that FDI projects complement local R&D and innovation capabilities. However, there might be non-linear effects with the relationship between the regions' R&D intensity and the corresponding attractiveness to FDI turning positive above a certain threshold of R&D intensity as found by Davies, Siedschlag and Studnicka (2016, 2018).

4.2 Northern Ireland's attractiveness to FDI

On the basis of the estimates shown in Tables A3-A6, Table 1 presents the estimated annual average probability for Northern Ireland to be chosen as location for FDI projects conditional on its locational characteristics over the period 2003-2015. For comparison, the corresponding probabilities for the rest of the UK regions and for Ireland are also shown. According to these results, the combined annual average probability for all UK regions to be chosen as location for FDI projects over the analysed period is 18.2%. The most attractive region in the UK is Greater London reflecting its economic size, greater proximity to the continental Europe as well as higher skills. In particular, the attractiveness of London to FDI in services by non-EU investors stands out: the annual average probability for London to be chosen as location for these FDI projects over the analysed period is 20.5%, the highest among all EU regions. Relative to London and the rest of the UK regions, Northern Ireland's attractiveness to FDI is lower given its smaller size and peripheral geographical position. Notwithstanding a similar peripheral geographical position, Ireland appears to be more attractive to FDI than Northern Ireland given more favourable location characteristics such as a larger economic size, a more competitive corporate tax rate, higher skills, higher R&D intensity (see Table 2).

Table 1 shows that Northern Ireland is more attractive to FDI by investors from EU countries in comparison to FDI from non-EU countries, and to FDI in manufacturing in comparison to FDI in services.

Table 2: Descriptive statistics for Northern Ireland, London and Ireland, averages over 2002-2014

Location characteristics	Northern Ireland	London	Ireland
EU Market Potential, million US dollars	50,460.4	483,455.9	196,087.6
GDP per capita, US dollars per capita	29,380.7	75,139.8	39,341.5
Tertiary educational attainment , %	29.1	44.1	34.3
Corporate tax rate , %	27.7	27.7	12.5
R&D expenditure intensity , % of GDP	1.2	1.0	1.4
Population, million	1.8	7.8	4.3

Source: Own calculations based on data from the Eurostat, the OECD, and KPMG.

Table 3 shows the sensitivity of Northern Ireland's attractiveness to FDI to changes in its access to the EU Single Market as well as with respect to the other analysed determinants of the location choice for FDI projects. The results indicate that a 1% increase in Northern Ireland's EU market potential is associated with an increase by 0.34% of its probability to be chosen as location for FDI projects. Northern Ireland's attractiveness to FDI appears to be most sensitive in the case of FDI projects from EU countries and for FDI in manufacturing. Lowering the corporate tax rate by 1% would increase by 0.47% Northern Ireland's probability to be chosen as location to FDI projects. Similarly with the pattern for EU market potential, Northern Ireland's attractiveness to FDI with respect to corporate taxation appears to be most sensitive in the case of FDI projects from EU countries and for FDI in manufacturing. A 1% increase in the share of employees with tertiary education would increase Northern Ireland's location probability to FDI projects by 0.31%. In contrast to access to the EU Single Market, and the corporate tax rate, Northern Ireland's attractiveness to FDI with respect to skilled employees, appears to be the highest for FDI from non-EU countries and for FDI in services. The sensitivity of Northern Ireland' attractiveness to FDI appears to be lower with respect to production costs (GDP per capita). However, it is worth noting that while lower production costs are associated with an increase in Northern Ireland's attractiveness to FDI by EU investors and FDI projects in manufacturing, the opposite effect is found for FDI projects by investors from outside the EU and for FDI projects in services.

Table 1: The attractiveness to FDI by type of FDI: Northern Ireland, the rest of the UK and Ireland, average annual conditional probabilities, 2003-2015 – No Brexit

Region	All FDI	EU FDI	Non-EU FDI	Man All FDI	Man EU FDI	Man Non EU FDI	Services All FDI	Services EU FDI	Services Non EU FDI
Northern Ireland	0.33%	0.34%	0.28%	0.22%	0.36%	0.27%	0.17%	0.33%	0.21%
North East	0.44%	0.48%	0.35%	0.31%	0.50%	0.36%	0.22%	0.41%	0.25%
North West	1.45%	1.40%	1.40%	0.99%	1.35%	1.55%	0.87%	1.42%	1.18%
Yorkshire and Humberside	1.10%	1.10%	0.96%	0.71%	1.05%	0.91%	0.62%	0.97%	0.81%
East Midlands	0.82%	0.83%	0.76%	0.58%	0.83%	0.84%	0.46%	0.82%	0.59%
West Midlands	1.09%	1.09%	0.96%	0.74%	1.07%	1.01%	0.60%	0.99%	0.78%
East of England	1.11%	1.08%	1.16%	0.84%	1.08%	1.50%	0.68%	1.26%	0.90%
London	6.20%	3.62%	10.24%	2.13%	2.39%	4.39%	9.81%	7.84%	20.46%
South East	2.58%	2.18%	3.00%	1.56%	1.91%	2.90%	2.02%	2.80%	3.15%
South West	1.20%	1.13%	1.19%	0.78%	1.07%	1.20%	0.76%	1.21%	1.06%
Wales	0.53%	0.58%	0.42%	0.38%	0.59%	0.45%	0.25%	0.46%	0.31%
Scotland	1.38%	1.29%	1.34%	0.87%	1.20%	1.31%	0.87%	1.31%	1.26%
Total UK	18.23%	15.14%	22.07%	10.11%	13.40%	16.68%	17.33%	19.83%	30.94%
Ireland	5.54%	5.03%	5.33%	2.97%	4.20%	4.04%	4.49%	6.31%	6.39%
Total UK and Ireland	23.77%	20.17%	27.40%	13.09%	17.59%	20.73%	21.82%	26.14%	37.33%

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

Table 3: The sensitivity of Northern Ireland's attractiveness to FDI to key location characteristics

FDI Projects	EU market potential	Real GDP per capita (2010 prices)	Tertiary education attainment, age group 25-64	Corporate tax rate	R&D expenditure (% GDP)
All FDI	0.34%	-0.01%	0.31%	-0.47%	-0.04%
EU FDI	0.35%	-0.11%	0.23%	-0.54%	-0.05%
Non EU	0.29%	0.09%	0.34%	-0.35%	0.00%
Man All	0.23%	-0.08%	0.12%	-0.32%	0.00%
Man EU	0.34%	-0.18%	0.16%	-0.55%	-0.04%
Man Non EU	0.30%	-0.03%	0.19%	-0.34%	0.05%
Serv All	0.19%	0.08%	0.27%	-0.25%	-0.01%
Serv EU	0.31%	0.14%	0.31%	-0.51%	0.01%
Serv Non EU	0.23%	0.08%	0.41%	-0.26%	-0.01%

Notes: The figures represent the per cent change in the Northern Ireland's probability to be chosen as location for FDI associated with an increase by 1% in the considered location characteristics. The effects shown above are symmetric for a 1% decrease in the considered determinants of the location choice of FDI projects. For example, a 1% reduction in Northern Ireland's EU market potential is associated with a 0.34% reduction of its probability to be chosen as a location for FDI while a reduction by 1% of the corporate tax rate would increase Northern Ireland's probability as a location for FDI by 0.47%.

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

4.3 The attractiveness of EU regions to FDI and FDI related job creation

Table 4 shows the estimated elasticity of FDI related jobs created with respect to changes in the conditional location probabilities of EU regions. The results indicate that on average, a 1% increase in the location probability of a representative EU region would increase the corresponding FDI-related new jobs by 1.3%. The highest elasticities are for FDI by EU investors and for FDI in services, 1.4% for each case. A 1% increase in a representative region's attractiveness to FDI in manufacturing by EU investors would increase the corresponding FDI-related jobs created by 1.3%. An increase by 1% of region's attractiveness to FDI in services by EU investors would increase the corresponding FDI-related jobs created by 1.5%. The results are symmetric in the case of a reduction of regions' attractiveness to FDI.

These estimates will be combined with the generated alternative counterfactual Brexit outcomes for Northern Ireland's attractiveness to FDI to obtain corresponding alternative counterfactual Brexit outcomes for FDI-related job creation.

Table 4: Average elasticities of FDI related jobs created with respect to changes in the conditional location probabilities of EU regions

FDI projects	Elasticity with respect to location probability
All FDI projects	1.272***
EU investors	1.392***
Non-EU investors	1.177***
FDI in manufacturing	1.118***
FDI in manufacturing – EU investors	1.331***
FDI in manufacturing – non-EU investors	1.216***
FDI in services	1.371***
FDI in services-EU investors	1.491***
FDI in services – non-EU investors	1.243***

Notes: Estimates obtained with the model described by Equation (4) in Section 2.2.

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

4.4 Analysis of counterfactual Brexit outcomes

Tables 5 and 6 summarise the results for the alternative counterfactual Brexit outcomes generated as discussed in Section 2.3. Tables 7 and 8 report the implied cumulated changes in greenfield FDI inflows to Northern Ireland over 2019-2030 relative to the baseline No Brexit scenario.

These results show that *post-Brexit* Northern Ireland would be less attractive to FDI relative to the baseline *No Brexit* scenario in any alternative model for the UK-EU relationship with the exception of a scenario in which Northern Ireland would remain in the EU Single Market for goods and services and the rest of the UK would move to a FTA after three years. Northern Ireland would also gain with respect to FDI in manufacturing only but would lose with respect to FDI in services if it stays in the EU Single Market for goods only and the rest of the UK moves to a FTA with the EU after three years.

The least damaging post-Brexit outcome would be in the case of the UK's membership in the EEA with a reduction in the medium to long run by 0.3% per annum of the number of FDI projects going to Northern Ireland. On the basis of the reported greenfield FDI inflows to Northern Ireland over the period 2003-2015, this reduction would be equivalent with a cumulated loss of greenfield FDI inflows of 12.7 million GBP. The largest cumulated losses would be for FDI in manufacturing by EU investors, 2.3 million GBP. The decrease of the FDI-related new jobs would be 0.4% per annum. The largest losses would be for FDI in services by EU investors (0.4% for the number of FDI projects and 0.6% for the FDI-related new jobs per annum).

The most damaging post-Brexit outcome would be a no-deal (WTO) scenario with a reduction in the medium to long run by 3% per annum of the number of FDI projects and a drop by 3.6% of the FDI-related new jobs when only static effects are considered. If additional dynamic effects are taken into account associated with foregone trade-related productivity growth, in the no-deal scenario, the corresponding losses would be by 6% in the case of the number of FDI projects and by 7.6% for FDI-related new jobs. The largest losses would be again in the case of FDI in services by EU investors: the number of FDI projects would be lower by 3.3% (static effects) and 6.8% (dynamic effects) respectively, while the number of FDI-related new jobs would be lower by 4.8% (static effects) and 10.1% (dynamic effects). The cumulated loss of FDI inflows over 2019-2030 would be equivalent to 123.1 million GBP in the case of static effects and 254.7 million GBP if additional dynamic effects are taken into account. The largest cumulated loss of FDI inflows would be for FDI in manufacturing by EU investors, 21.7 million GBP when only static effects are counted and by 45.7 million GBP with additional dynamic effects.

The results of our analysis indicate that Northern Ireland would gain in a post-Brexit scenario in which it would remain in the EU Single Market and the rest of the UK would move to a FTA with the EU following a three-year implementation period. The number of the FDI projects going to Northern Ireland would be higher in the medium to long run by almost 1% when only static effects are considered and by 1.4% if additional dynamic effects are taken into account. The highest gains would be for FDI in manufacturing by non-EU investors (by 1.3% and 2.3%, respectively). The cumulated greenfield FDI inflows gains over 2019-2030 would amount to 29.7 million GBP when only static effects are taken into account and 59.4 million GBP with additional dynamic effects. The largest cumulated gains would be for FDI in manufacturing by non-EU investors: 8.5 million GBP (static effects) and 15.1 million GBP (dynamic effects), respectively. The corresponding FDI-related new jobs gains would be:

for all FDI projects 0.9% (static effects) and 1.7% (dynamic effects) per annum with the largest gains for FDI in manufacturing by non-EU investors, 1.6% (static effects) and 2.9% (dynamic effects), per annum, respectively.

Tables A7-A15 show the counterfactual Brexit outcomes for Northern Ireland's attractiveness to FDI discussed above and the corresponding results for the rest of the UK regions and Ireland. Overall, the key message emerging from this comparative results is that Northern Ireland losses in terms of its attractiveness to FDI relative to a *No Brexit* scenario would be larger than those for London, Ireland, Scotland, South-East and Wales. The rest of the UK regions would experience larger losses. In contrast to the rest of the UK regions, Northern Ireland would become more attractive to FDI relative to a *No Brexit* scenario if it would remain in the EU Single Market for goods and services and the rest of the UK would move to a FTA agreement with the EU after an implementation period of three years.

Table 5: Counterfactual analysis of the potential impact of Brexit on the attractiveness of NI to FDI and associated job creation effects – Static effects, average annual change relative to a *No Brexit* baseline scenario

FDI projects	EEA with 3 year transition		FTA with 3 year transition		WTO - no deal		NI in EU CU and SM for Goods- FTA for GB with 3 years transition		NI in EU CU and SM - FTA for GB with 3 years transition	
	FDI	Jobs	FDI	Jobs	FDI	Jobs	FDI	Jobs	FDI	Jobs
All FDI	-0.3%	-0.4%	-1.7%	-2.2%	-2.9%	-3.6%			0.7%	0.9%
EU FDI	-0.4%	-0.5%	-1.9%	-2.6%	-3.1%	-4.4%			0.5%	0.7%
Non EU FDI	-0.3%	-0.3%	-1.5%	-1.7%	-2.3%	-2.7%			1.1%	1.3%
Manufacturing All FDI	-0.3%	-0.4%	-1.6%	-1.8%	-2.6%	-3.0%	0.8%	0.9%	0.8%	0.9%
Manufacturing EU FDI	-0.3%	-0.4%	-1.6%	-2.2%	-2.8%	-3.7%	0.6%	0.8%	0.6%	0.8%
Manufacturing Non-EU FDI	-0.3%	-0.3%	-1.4%	-1.7%	-2.2%	-2.7%	1.3%	1.6%	1.3%	1.6%
Services All FDI	-0.4%	-0.5%	-1.9%	-2.6%	-3.0%	-4.1%	-1.9%	-2.6%	0.5%	0.7%
Services EU FDI	-0.4%	-0.6%	-2.0%	-3.0%	-3.2%	-4.8%	-2.0%	-3.0%	0.2%	0.3%
Services Non-EU FDI	-0.3%	-0.4%	-1.7%	-2.1%	-2.6%	-3.2%	-1.7%	-2.1%	1.0%	1.2%

Note: The counterfactual effects for the case of Northern Ireland in the EU Customs Union and Single Market for goods are obtained assuming no change in Northern Ireland's EU market potential in the case of FDI in manufacturing and the reduced EU market potential for FDI in services corresponding to the FTA scenario. Given that the data on all FDI and FDI by EU and non-EU investors aggregate FDI in manufacturing and services, the counterfactuals in these cases could not be estimated.

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat. The counterfactual analysis uses estimates on GDP changes in various Brexit scenarios by Aichele and Felbermayr (2015) and Rojas-Romagosa (2016) and estimates on the share of GDP exposed to Brexit by Chen et al. (2017).

Table 6: Counterfactual analysis of the potential impact of Brexit on the attractiveness of NI to FDI and associated employment effects – Dynamic effects, average annual change relative to a *No Brexit* baseline scenario

FDI projects	FTA with 3 year transition		WTO - no deal		NI in EU CU and SM for Goods- FTA for GB with 3 years transition		NI in EU CU and SM - FTA for GB with 3 years transition	
	FDI	Jobs	FDI	Jobs	FDI	Jobs	FDI	Jobs
All FDI	-2.9%	-3.7%	-6.0%	-7.6%			1.4%	1.7%
EU FDI	-3.1%	-4.4%	-6.6%	-9.2%			1.0%	1.4%
Non EU FDI	-2.5%	-3.0%	-5.0%	-5.8%			2.0%	2.3%
Man All FDI	-2.7%	-3.0%	-5.6%	-6.3%	1.6%	1.7%	1.6%	1.7%
Man EU FDI	-2.8%	-3.7%	-5.9%	-7.8%	1.2%	1.5%	1.2%	1.5%
Man Non-EU FDI	-2.4%	-2.9%	-4.8%	-5.8%	2.3%	2.9%	2.3%	2.9%
Services All FDI	-3.2%	-4.4%	-6.4%	-8.8%	-3.2%	-4.4%	1.1%	1.4%
Services EU FDI	-3.5%	-5.2%	-6.8%	-10.1%	-3.5%	-5.2%	0.5%	0.7%
Serv Non-EU FDI	-2.9%	-3.7%	-5.6%	-7.0%	-2.9%	-3.7%	1.8%	2.2%

Note: The counterfactual effects for the case of Northern Ireland in the EU Customs Union and Single Market for goods are obtained assuming no change in Northern Ireland's EU market potential in the case of FDI in manufacturing and the reduced EU market potential for FDI in services corresponding to the FTA scenario. Given that the data on all FDI and FDI by EU and non-EU investors aggregate FDI in manufacturing and services, the counterfactuals in these cases could not be estimated.

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat. The counterfactual analysis uses estimates on GDP changes in various Brexit scenarios by Aichele and Felbermayr (2015) and Rojas-Romagosa (2016) and estimates on the share of GDP exposed to Brexit by Chen et al. (2017).

Table 7: Counterfactual Brexit impacts – Estimated cumulated changes in invested capital in new greenfield FDI in Northern Ireland relative to No Brexit, Static effects, 2019-2030, millions GBP

FDI Projects	EEA with 3 year transition	FTA with 3 year transition	WTO - no deal	NI in EU CU and SM for Goods-FTA for GB with 3 years transition	NI in EU CU and SM - FTA for GB with 3 years transition
All FDI	-12.74	-72.17	-123.11		29.72
EU FDI	-9.15	-43.47	-70.92		11.44
Non EU FDI	-5.87	-29.36	-45.02		21.53
Manufacturing All FDI	-4.30	-22.92	-37.25	11.46	11.46
Manufacturing EU FDI	-2.33	-12.41	-21.72	4.65	4.65
Manufacturing Non-EU FDI	-1.97	-9.20	-14.45	8.54	8.54
Services All FDI	-3.29	-15.63	-24.68	-15.63	4.11
Services EU FDI	-1.13	-5.63	-9.01	-5.63	0.56
Services Non-EU FDI	-1.62	-9.20	-14.07	-9.20	5.41

Note: The counterfactual effects for the case of Northern Ireland in the EU Customs Union and Single Market for goods are obtained assuming no change in Northern Ireland's EU market potential in the case of FDI in manufacturing and the reduced EU market potential for FDI in services corresponding to the FTA scenario. Given that the data on all FDI and FDI by EU and non-EU investors aggregate FDI in manufacturing and services, the counterfactuals in these cases could not be estimated.

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat. The counterfactual analysis uses estimates on GDP changes in various Brexit scenarios by Aichele and Felbermayr (2015) and Rojas-Romagosa (2016) and estimates on the share of GDP exposed to Brexit by Chen et al. (2017).

Table 8: Counterfactual Brexit impacts – Estimated cumulated changes in invested capital in new greenfield FDI in Northern Ireland relative to No Brexit, Dynamic effects, 2019-2030, millions GBP

FDI Projects	FTA with 3 year transition	WTO -no deal	NI in EU CU and SM for Goods-FTA for GB with 3 years transition	NI in EU CU and SM - FTA for GB with 3 years transition
All FDI	-123.11	-254.70		59.43
EU FDI	-70.92	-150.99		22.88
Non EU FDI	-48.93	-97.86		39.15
Man All FDI	-38.68	-80.22	22.92	22.92
Man EU FDI	-21.72	-45.76	9.31	9.31
Man Non-EU FDI	-15.76	-31.53	15.11	15.11
Services All FDI	-26.33	-52.66	-26.33	9.05
Services EU FDI	-9.85	-19.14	-9.85	1.41
Serv Non-EU FDI	-15.70	-30.31	-15.70	9.74

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat. The counterfactual analysis uses estimates on GDP changes in various Brexit scenarios by Aichele and Felbermayr (2015) and Rojas-Romagosa (2016) and estimates on the share of GDP exposed to Brexit by Chen et al. (2017).

4.5 Compensatory policy options

Table 9 shows the estimates of post-Brexit counterfactual outcomes for Northern Ireland’s attractiveness to FDI with a corporate tax rate of 12.5% in the case of a FTA between the UK and the EU after an implementation period of three years and a “no deal” (WTO option) scenario. These results indicate that relative to the No Brexit and no change in the corporate tax rate scenario, Northern Ireland would attract in the medium to long run a significantly larger number of FDI projects, with the effect of the reduced rate of corporate taxation more than outweighing the effect of any Brexit scenario. In the case of a FTA with a 12.5% corporate tax rate, the number of the FDI projects going to Northern Ireland would be higher by 158% if only one-off effects are considered and by 155% if additional dynamic effects are taken into account. The largest gains would be for FDI in manufacturing by EU investors. In the case of a no-deal Brexit with a 12.5% corporate tax rate outcome, relative to a No Brexit scenario, the number of FDI projects going to Northern Ireland in the medium to long run would be larger by 158% (static effects) and by 148% (dynamic effects), respectively. The largest gains would be again in the case of FDI in manufacturing by EU investors.

Table 9: Northern Ireland’s probability to be chosen as location to FDI projects with 12.5% corporate tax rate

FDI Projects	Baseline- No Brexit and no change of the corporate tax rate	FTA static	FTA dynamic	WTO static	WTO dynamic
All FDI	0.33%	0.85%	0.84%	0.85%	0.82%
EU FDI	0.34%	0.94%	0.92%	0.93%	0.90%
Non-EU FDI	0.28%	0.67%	0.66%	0.66%	0.65%
Manufacturing All FDI	0.22%	0.56%	0.55%	0.56%	0.54%
Manufacturing EU FDI	0.36%	0.94%	0.92%	0.93%	0.90%
Manufacturing Non-EU FDI	0.27%	0.61%	0.61%	0.61%	0.60%
Services All FDI	0.17%	0.48%	0.47%	0.47%	0.46%
Services EU FDI	0.33%	0.93%	0.91%	0.92%	0.89%
Services Non-EU FDI	0.21%	0.56%	0.55%	0.56%	0.54%

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

Comparing the results shown above with the attractiveness of the rest of the UK to FDI (Table 1), lowering the corporate tax rate in Northern Ireland to 12.5% and under no changes in the location characteristics of in the rest of the UK regions, would make Northern Ireland as attractive to FDI as East Midlands and more attractive than North East and Wales.

Table 10 shows the cumulated potential increases in greenfield FDI inflows to Northern Ireland over 2019-2030 with a 12.5% corporate tax rate introduced as a compensatory policy option. The cumulated FDI inflows gains over the period 2019-2030 would be 6.6 billion GBP (on average 0.55

billion GBP per annum) in the case of a FTA agreement between the UK and the EU and 6.3 billion GBP in the case of the UK leaving the EU with no deal (dynamic effects).

Table 10: Counterfactual cumulated increases in invested capital in new greenfield FDI in Northern Ireland with 12.5% corporate tax rate relative to baseline (No Brexit and no change to corporate tax rate), 2019-2030, billions GBP

FDI Projects	FTA static	FTA dynamic	WTO static	WTO dynamic
All FDI	6.69	6.56	6.69	6.30
EU FDI	4.04	3.90	3.97	3.77
Non-EU FDI	2.73	2.66	2.66	2.59
Manufacturing All FDI	2.21	2.15	2.21	2.08
Manufacturing EU FDI	1.25	1.21	1.23	1.16
Manufacturing Non-EU FDI	0.83	0.83	0.83	0.80
Services All FDI	1.50	1.45	1.45	1.40
Services EU FDI	0.51	0.49	0.50	0.48
Services Non-EU FDI	0.90	0.88	0.90	0.85

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

5 Summary of Key Findings

This study examines possible post-Brexit consequences on the attractiveness of Northern Ireland to greenfield foreign direct investment (FDI) and related job creation. We analyse both static (one-off) and dynamic counterfactual outcomes of alternative models for the UK-EU relationship relative to a “No Brexit scenario”. Further, we examine the effect of lowering the corporate tax rate in Northern Ireland to 12.5% to compensate Brexit negative effects. We analyse over 65,000 new greenfield FDI projects established in Northern Ireland and the other comparable (NUTS 1) EU regions over the period 2003-2015. In addition, we further distinguish and examine different types of FDI projects: FDI by EU and by non-EU investors; FDI in manufacturing and in services; FDI in manufacturing by EU and non-EU investors; FDI in services by EU and non-EU investors.

Taken together, our results indicate that Northern Ireland would be less attractive as a location to FDI and would experience a reduction of FDI-related job creation in any of the considered Brexit outcomes in which Northern Ireland would have the same model of trade agreements with the EU as the rest of the United Kingdom (UK). We find similar patterns for FDI-related new jobs across the analysed Brexit scenarios with the job creation effects being larger than in the case of the attractiveness to FDI. This result is explained by the large responsiveness of FDI-related new jobs to changes in the attractiveness to FDI (it is greater than 1, which means that a 1% reduction in the attractiveness to FDI results in a reduction of the number of FDI-related new jobs by more than 1%).

The least damaging post-Brexit outcome would be in the case of the UK’s membership in the EEA with a reduction from 2019 to 2030 by 0.3% per annum of the number of FDI projects going to Northern Ireland. On the basis of the pattern of FDI inflows over the period 2003-2015, this reduction would be equivalent with a cumulated loss of greenfield FDI inflows of 12.7 million GBP. The largest cumulated losses would be for FDI in manufacturing by EU investors, 2.3 million GBP. The reduction of the FDI-related new jobs would be 0.4% per annum. The largest losses in terms of the number of FDI projects would be for FDI in services by EU investors (by 0.4% for the number of FDI projects and by 0.6% for the FDI-related new jobs).

The most damaging post-Brexit outcome would be a no-deal scenario with a reduction from 2019 to 2030 by 3% per annum of the number of FDI projects and by 3.6% of the FDI-related new jobs when only one-off effects are considered. The cumulated loss of FDI inflows over 2019-2030 would be equivalent to 123.1 million GBP. If additional dynamic effects are taken into account associated with foregone trade-related productivity growth, in the no-deal scenario, the corresponding losses would be 6% in the case of the number of FDI projects and 7.6% for FDI-related new jobs. The cumulated loss of FDI inflows in 2030 would be 254.7 million GBP. The largest losses would be again in the case of FDI in services by EU investors: the number of FDI projects would be lower by 3.3% (one-off effects) and 6.8% (dynamic effects) respectively, while the number of FDI-related new jobs would be lower by 4.8% (static effects) and 10.1% (dynamic effects). The largest cumulated loss of FDI inflows would be for FDI in manufacturing by EU investors, 21.7 million GBP when only static effects are taken into account and by 45.7 million GBP with additional dynamic effects.

The results of our analysis indicate that Northern Ireland would become more attractive to FDI and will generate more FDI-related jobs if it would remain in the EU Single Market for goods and services and

the rest of the UK would leave the EU Single Market. The number of the FDI projects would be higher in the long to medium run by almost 1% per annum when only one-off effects are considered and by 1.4% if additional dynamic effects are taken into account. The highest gains would be for FDI in manufacturing by non-EU investors (by 1.3% and 2.3% per annum, respectively). The cumulated greenfield FDI inflows gains over 2019-2030 would amount to 29.7 million GBP when only static effects are taken into account and 59.4 million GBP with additional dynamic effects. The largest cumulated gains would be for FDI in manufacturing by non-EU investors: 8.5 million GBP (static effects) and 15.1 million GBP (dynamic effects), respectively. The corresponding FDI-related new jobs gains would be: for all FDI projects 0.9% (static effects) and 1.7% (dynamic effects) per annum with the largest gains for FDI in manufacturing by non-EU investors, 1.6% (static effects) and 2.9% (dynamic effects) per annum, respectively.

Looking at post-Brexit outcomes for all the UK regions and Ireland, our results indicate that Northern Ireland losses in terms of its attractiveness to FDI relative to a No Brexit scenario would be larger than those for London, Ireland, Scotland, South-East and Wales, while the rest of the UK regions would experience larger losses. In contrast to the rest of the UK regions, Northern Ireland would become more attractive to FDI relative to a No Brexit scenario if it would remain in the EU Single Market for goods and services and the rest of the UK would move to a FTA agreement with the EU after an implementation period of three years.

Lowering the corporate tax rate to 12.5% would more than compensate the negative effects of Brexit on Northern Ireland's attractiveness to FDI. Our results indicate that relative to the No Brexit scenario, Northern Ireland would attract in the medium to long run a significantly larger number of FDI projects. The largest gains would be for FDI in manufacturing by EU investors. The cumulated FDI inflows gains over the period 2019-2030 would be 6.6 billion GBP in the case of a FTA agreement between the UK and the EU and 6.3 billion GBP in the case of the UK leaving the EU with no deal (dynamic effects).

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Appendix

Table A1: Variables Definitions and Data Sources

Variable	Definition	Data source
Location choice	Binary variable equal to 1 if a FDI project was established in host region, 0 otherwise	fDi Markets
Number of FDI-related new jobs	Number of new jobs created by new FDI projects	fDi Markets
Invested capital	Investment in new greenfield FDI projects, million GBP	fDi Markets
EU market potential	The sum of GDP in the host region and the inverse travel time-weighted GDP of all alternative locations in the European Union other than the host region	OECD and Brulhart et al. (2004)
Bilateral distance	Road-freight travel time between regional capitals by lorry, in minutes	Brülhart et al. (2004)
Real GDP per capita	GDP in 2010 PPP prices, US dollars per head	OECD
Real GDP	GDP in constant 2010 PPP prices, US dollars	OECD
Real GDP growth	Annual change in real GDP	Own calculations based on data from the OECD
Corporate tax rate	Statutory corporate tax rate	KPMG https://home.kpmg/kh/en/home/services/tax
R&D expenditure intensity	Public and private R&D expenditure, % of GDP	Eurostat
Real regional gross value added per employee	Regional gross value added per employee in 2010 PPP prices, US dollars	OECD
Real regional gross value added per employee growth	Annual change in the real regional gross value added per employee	Own calculations based on data from the OECD
Tertiary educational attainment	The share of the population with tertiary education in the population in the age group 25-64	Eurostat

Table A2: Brexit exposure and its impact on EU regions - % change in GDP in different scenarios for the EU-UK relationship

EU Countries and NUTS 1 Regions	Brexit Exposure	Brexit Exposure Ratio Reg/Nat	CPB Scenarios				IfO Scenarios	
			Static effects		Dynamic effects		Static effects	
			% GDP change in 2030 relative to baseline no Brexit scenario		% GDP change in 2030 relative to baseline no Brexit		% GDP change in 2030 relative to baseline no Brexit	
		FTA	WTO	FTA	WTO	EEA	WTO	
AT-Austria	0.77	1.00	-0.3	-0.4	-0.5	-0.7	-0.05	-0.18
AT1	0.75	0.97	-0.29	-0.39	-0.49	-0.68	-0.05	-0.18
AT2	0.76	0.99	-0.30	-0.39	-0.49	-0.69	-0.05	-0.18
AT3	0.79	1.02	-0.31	-0.41	-0.51	-0.72	-0.05	-0.18
BE-Belgium	3.5	1.00	-1.5	-2.1	-2.15	-2.98	-0.23	-0.96
BE1	2.78	0.79	-1.19	-1.67	-1.71	-2.37	-0.18	-0.76
BE2	3.736	1.07	-1.60	-2.24	-2.30	-3.18	-0.25	-1.02
BE3	3.704	1.06	-1.59	-2.22	-2.28	-3.16	-0.24	-1.02
BG-Bulgaria	0.44	1.00	-0.5	-0.6	-0.64	-0.77	-0.08	-0.20
CY-Cyprus	0.52	1.00	-0.7	-0.8	-1.00	-1.27	-0.38	-1.48
CZ-Czech Republic	2.14	1.00	-0.5	-0.6	-0.82	-1.26	-0.12	-0.35
DK-Denmark	1.49	1.00	-0.7	-0.8	-1.14	-1.45	-0.13	-0.32
ES-Spain	0.77	1.00	-0.7	-0.9	-1.37	-1.91	-0.09	-0.32
ES1	0.66	0.86	-0.60	-0.77	-1.18	-1.64	-0.08	-0.27
ES2	0.72	0.93	-0.65	-0.84	-1.28	-1.77	-0.08	-0.30
ES3	0.94	1.22	-0.85	-1.10	-1.68	-2.33	-0.11	-0.39
ES4	0.59	0.77	-0.54	-0.69	-1.06	-1.47	-0.07	-0.25
ES5	0.81	1.06	-0.74	-0.95	-1.45	-2.02	-0.10	-0.34
ES6	0.71	0.92	-0.64	-0.82	-1.26	-1.75	-0.08	-0.29
ES7	0.51	0.66	-0.46	-0.60	-0.91	-1.26	-0.06	-0.21
EE-Estonia	0.85	1.00	-0.3	-0.4	-0.53	-0.66	-0.10	-0.47
FI-Finland	0.80	1.00	-0.4	-0.4	-0.77	-0.97	-0.10	-0.40
FI1	0.82	1.03	-0.41	-0.41	-0.79	-1.00	-0.10	-0.41
FI2	0.64	0.80	-0.32	-0.32	-0.61	-0.78	-0.08	-0.32
FR-France	2.19	1.00	-0.50	-0.60	-0.97	-1.38	-0.07	-0.27
FR1	2.07	0.95	-0.47	-0.57	-0.92	-1.30	-0.07	-0.26
FR2	2.32	1.06	-0.53	-0.64	-1.03	-1.46	-0.07	-0.29
FR3	2.13	0.97	-0.49	-0.58	-0.95	-1.34	-0.07	-0.26
FR4	2.46	1.12	-0.56	-0.67	-1.09	-1.55	-0.08	-0.30
FR5	2.02	0.92	-0.46	-0.55	-0.90	-1.27	-0.06	-0.25
FR6	2.21	1.01	-0.50	-0.61	-0.98	-1.39	-0.07	-0.27
FR7	2.5	1.14	-0.57	-0.68	-1.11	-1.58	-0.08	-0.31
FR8	2.11	0.96	-0.48	-0.58	-0.94	-1.33	-0.07	-0.26

DE-Germany	5.48	1.00	-0.50	-0.60	-0.89	-1.23	-0.09	-0.33
DE1	5.9	1.08	-0.54	-0.65	-0.95	-1.32	-0.10	-0.36
DE2	5.69	1.04	-0.52	-0.62	-0.92	-1.27	-0.09	-0.34
DE3	5.33	0.97	-0.49	-0.58	-0.86	-1.19	-0.09	-0.32
DE4	4.96	0.90	-0.45	-0.54	-0.80	-1.11	-0.08	-0.30
DE5	5.93	1.08	-0.54	-0.65	-0.96	-1.33	-0.10	-0.36
DE6	5.3	0.97	-0.48	-0.58	-0.86	-1.19	-0.09	-0.32
DE7	5.44	0.99	-0.50	-0.60	-0.88	-1.22	-0.09	-0.33
DE8	4.67	0.85	-0.43	-0.51	-0.75	-1.05	-0.08	-0.28
DE9	5.25	0.96	-0.48	-0.57	-0.85	-1.18	-0.09	-0.32
DEA	5.29	0.97	-0.48	-0.58	-0.85	-1.19	-0.09	-0.32
DEB	4.96	0.91	-0.45	-0.54	-0.80	-1.11	-0.08	-0.30
DEC	5.5	1.00	-0.50	-0.60	-0.89	-1.23	-0.09	-0.33
DED	5.07	0.92	-0.46	-0.55	-0.82	-1.14	-0.08	-0.31
DEE	5.08	0.93	-0.46	-0.56	-0.82	-1.14	-0.08	-0.31
DEF	5.27	0.96	-0.48	-0.58	-0.85	-1.18	-0.09	-0.32
DEG	5.26	0.96	-0.48	-0.58	-0.85	-1.18	-0.09	-0.32
GR-Greece	0.75	1.00	-0.40	-0.60	-0.68	-0.93	-0.05	-0.21
GR1	0.69	0.91	-0.37	-0.55	-0.62	-0.85	-0.05	-0.19
GR2	0.73	0.98	-0.39	-0.59	-0.67	-0.91	-0.05	-0.21
GR3	0.79	1.05	-0.42	-0.63	-0.72	-0.98	-0.05	-0.22
GR4	0.77	1.03	-0.41	-0.62	-0.70	-0.95	-0.05	-0.22
HU-Hungary	1.71	1.00	-0.70	-0.80	-1.08	-1.36	-0.09	-0.26
HU1	1.75	1.02	-0.72	-0.82	-1.10	-1.39	-0.09	-0.27
HU2	1.72	1.00	-0.70	-0.80	-1.08	-1.36	-0.09	-0.26
HU3	1.59	0.93	-0.65	-0.75	-1.00	-1.26	-0.08	-0.24
IE-Ireland	10.12	1.00	-3.40	-3.70	-4.86	-5.79	-0.85	-2.66
IT-Italy	0.55	1.00	-0.40	-0.50	-0.81	-1.08	-0.07	-0.23
ITC	0.52	0.95	-0.38	-0.47	-0.76	-1.02	-0.07	-0.22
ITD	0.50	0.91	-0.36	-0.45	-0.73	-0.98	-0.06	-0.21
ITE	0.53	0.97	-0.39	-0.48	-0.78	-1.04	-0.07	-0.22
ITF	0.48	0.87	-0.35	-0.43	-0.70	-0.94	-0.06	-0.20
ITG	0.51	0.93	-0.37	-0.46	-0.75	-1.00	-0.06	-0.21
LT-Lithuania	1.02	1.00	-0.30	-0.40	-0.53	-0.66	-0.09	-0.28
LU-Luxembourg	1.05	1.00	-1.50	-2.10	-2.15	-2.98	-0.49	-0.80
LV-Latvia	0.86	1.00	-0.30	-0.40	-0.53	-0.66	-0.06	-0.17
MT-Malta	5.08	1.00	-0.70	-0.80	-1.00	-1.27	-0.46	-1.34
NL-Netherlands	4.39	1.00	-0.90	-1.20	-1.50	-2.00	-0.12	-0.35
NL1	4.58	1.04	-0.94	-1.25	-1.56	-2.09	-0.13	-0.37
NL2	4.40	1.00	-0.90	-1.20	-1.50	-2.01	-0.12	-0.35
NL3	4.44	1.01	-0.91	-1.21	-1.52	-2.02	-0.12	-0.35
NL4	4.43	1.01	-0.91	-1.21	-1.51	-2.02	-0.12	-0.35
PL-Poland	1.31	1.00	-0.40	-0.60	-0.81	-1.10	-0.07	-0.24
PL1	1.33	1.01	-0.40	-0.61	-0.82	-1.11	-0.07	-0.24
PL2	1.24	0.95	-0.38	-0.57	-0.77	-1.04	-0.07	-0.23
PL3	1.28	0.98	-0.39	-0.59	-0.79	-1.07	-0.07	-0.23

PL4	1.35	1.03	-0.41	-0.62	-0.84	-1.13	-0.07	-0.25
PL5	1.335	1.02	-0.41	-0.61	-0.83	-1.12	-0.07	-0.24
PL6	1.32	1.01	-0.40	-0.60	-0.82	-1.10	-0.07	-0.24
PT-Portugal	0.67	1.00	-0.70	-0.90	-1.11	-1.59	-0.08	-0.26
RO-Romania	0.56	1.00	-0.30	-0.30	-0.52	-0.66	-0.05	-0.16
SK-Slovakia	1.31	1.00	-0.50	-0.60	-0.72	-0.97	-0.09	-0.28
SI-Slovenia	0.42	1.00	-0.30	-0.30	-0.38	-0.48	-0.06	-0.19
SE-Sweden	1.68	1.00	-0.60	-0.70	-1.13	-1.49	-0.13	-0.48
SE1	1.81	1.08	-0.65	-0.75	-1.21	-1.61	-0.14	-0.52
SE2	1.79	1.07	-0.64	-0.75	-1.20	-1.59	-0.14	-0.51
SE3	1.23	0.73	-0.44	-0.51	-0.83	-1.09	-0.10	-0.35
UK-United Kingdom	12.2	1.00	-3.40	-4.10	-5.90	-8.70	-0.64	-2.98
UKC	12.05	0.99	-3.36	-4.05	-5.83	-8.59	-0.63	-2.94
UKD	13.5	1.11	-3.76	-4.54	-6.53	-9.63	-0.71	-3.30
UKE	13.28	1.09	-3.70	-4.46	-6.42	-9.47	-0.70	-3.24
UKF	13.3	1.09	-3.71	-4.47	-6.43	-9.48	-0.70	-3.25
UKG	13.47	1.10	-3.75	-4.53	-6.51	-9.60	-0.71	-3.29
UKH	11.77	0.96	-3.28	-3.95	-5.69	-8.39	-0.62	-2.87
UKI	10.25	0.84	-2.86	-3.44	-4.96	-7.31	-0.54	-2.50
UKJ	13.33	1.09	-3.71	-4.48	-6.44	-9.50	-0.70	-3.25
UKK	13.78	1.13	-3.84	-4.63	-6.66	-9.83	-0.72	-3.37
UKL	11.7	0.96	-3.26	-3.93	-5.66	-8.34	-0.61	-2.86
UKM	11.00	0.90	-3.07	-3.70	-5.32	-7.84	-0.58	-2.69
UKN-Northern Ireland	11.70	0.96	-3.26	-3.93	-5.66	-8.34	-0.61	-2.86
EU27	2.64	1.00	-0.60	-0.80	-1.10	-1.50	-0.10	-0.36

Sources: Own calculations based on estimates of shares of GDP exposed to Brexit by Chen et al. (2017) and simulations of changes in GDP for various options of the UK-EU relationship by Rojas-Romagosa (2016) and Aichele and Felbermayr (2015).

Table A3: Determinants of the location choice of FDI projects in EU regions, 2003-2015, All FDI and by EU and non-EU investors

Determinants of FDI location choice	All FDI	EU Investors	Non-EU Investors
EU market potential	1.052*** (0.009)	1.009*** (0.013)	1.082*** (0.013)
Real GDP per capita (2010 prices)	0.248*** (0.021)	-0.190*** (0.029)	0.827*** (0.030)
Tertiary education attainment, age 25-64	0.711*** (0.020)	0.520*** (0.028)	0.878*** (0.030)
Corporate tax rate	-1.603*** (0.018)	-1.682*** (0.025)	-1.437*** (0.029)
R&D expenditure (% GDP)	-0.207*** (0.011)	-0.190*** (0.015)	-0.108*** (0.015)
Number of observations	4,180,000	2,260,000	1,900,000
Pseudo R ²	0.074	0.055	0.117

Notes: Estimates obtained with a conditional logit model (CLM).

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

Table A4: Determinants of the location choice of FDI projects in EU regions, 2003-2015, All FDI and by sector

Determinants of FDI location choice	All FDI	Manufacturing All FDI	Services All FDI
EU market potential	1.052*** (0.009)	1.031*** (0.017)	1.087*** (0.020)
Real GDP per capita (2010 prices)	0.248*** (0.021)	-0.272*** (0.038)	1.160*** (0.047)
Tertiary education attainment, age 25-64	0.711*** (0.020)	0.416*** (0.036)	1.104*** (0.050)
Corporate tax rate	-1.603*** (0.018)	-1.545*** (0.035)	-1.659*** (0.043)
R&D expenditure (% GDP)	-0.207*** (0.011)	-0.045** (0.020)	-0.202*** (0.024)
Number of observations	4,180,000	2,070,000	1,320,000
Pseudo R ²	0.074	0.051	0.143

Notes: Estimates obtained with a conditional logit model (CLM).

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

Table A5: Determinants of the location choice of FDI projects in EU regions, 2003-2015, All Manufacturing FDI and by EU and non-EU investors

Determinants of FDI location choice	Manufacturing All FDI	Manufacturing EU FDI	Manufacturing Non EU FDI
EU market potential	1.031*** (0.017)	0.949*** (0.017)	1.122*** (0.021)
Real GDP per capita (2010 prices)	-0.272*** (0.038)	-0.428*** (0.037)	0.064 (0.049)
Tertiary education attainment, age 25-64	0.416*** (0.036)	0.319*** (0.037)	0.524*** (0.044)
Corporate tax rate	-1.545*** (0.035)	-1.620*** (0.034)	-1.349*** (0.046)
R&D expenditure (% GDP)	-0.045** (0.020)	-0.125*** (0.021)	0.159*** (0.024)
Number of observations	2,070,000	1,250,000	826,000
Pseudo R ²	0.051	0.047	0.081

Notes: Estimates obtained with a conditional logit model (CLM).

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

Table A6: Determinants of the location choice of FDI projects in EU regions, 2003-2015, All Services FDI and by EU and non-EU investors

Determinants of FDI location choice	Services All FDI	Services EU FDI	Services Non EU FDI
EU market potential	1.087*** (0.020)	0.949*** (0.024)	1.175*** (0.021)
Real GDP per capita (2010 prices)	1.160*** (0.047)	0.785*** (0.055)	1.392*** (0.050)
Tertiary education attainment, age 25-64	1.104*** (0.050)	0.671*** (0.055)	1.441*** (0.056)
Corporate tax rate	-1.659*** (0.043)	-1.695*** (0.047)	-1.598*** (0.047)
R&D expenditure (% GDP)	-0.202*** (0.024)	-0.018 (0.026)	-0.240*** (0.025)
Number of observations	1,320,000	608,000	710,000
Pseudo R ²	0.143	0.093	0.211

Notes: Estimates obtained with a conditional logit model (CLM).

Source: Own estimates based on FDI data from the fDi Markets, OECD and the Eurostat.

Table A7: The potential impact of Brexit on the attractiveness to FDI- Northern Ireland, the rest of the UK and Ireland, EEA – Static effects

	All FDI	All Man	All Serv	EU FDI	Man EU	EU Serv	Non EU FDI	Man NonEU	Non EU Serv
North East	-0.37%	-0.34%	-0.39%	-0.38%	-0.34%	-0.39%	-0.34%	-0.33%	-0.37%
North West	-0.38%	-0.37%	-0.39%	-0.36%	-0.34%	-0.34%	-0.40%	-0.41%	-0.44%
Yorkshire and Humberside	-0.37%	-0.35%	-0.37%	-0.35%	-0.33%	-0.34%	-0.36%	-0.38%	-0.39%
East Midlands	-0.40%	-0.38%	-0.42%	-0.39%	-0.36%	-0.38%	-0.39%	-0.40%	-0.44%
West Midlands	-0.39%	-0.38%	-0.39%	-0.37%	-0.35%	-0.36%	-0.39%	-0.41%	-0.42%
East of England	-0.33%	-0.32%	-0.35%	-0.32%	-0.30%	-0.31%	-0.34%	-0.35%	-0.38%
London	0.01%	0.01%	0.00%	0.04%	0.03%	0.03%	-0.02%	-0.02%	-0.01%
South East	-0.29%	-0.29%	-0.29%	-0.26%	-0.26%	-0.23%	-0.32%	-0.34%	-0.35%
South West	-0.36%	-0.35%	-0.37%	-0.35%	-0.33%	-0.33%	-0.36%	-0.37%	-0.40%
Wales	-0.34%	-0.31%	-0.34%	-0.34%	-0.30%	-0.34%	-0.30%	-0.30%	-0.33%
Scotland	-0.23%	-0.22%	-0.23%	-0.22%	-0.20%	-0.20%	-0.23%	-0.24%	-0.25%
Northern Ireland	-0.35%	-0.31%	-0.37%	-0.36%	-0.32%	-0.40%	-0.29%	-0.28%	-0.33%
Ireland	-0.20%	-0.24%	-0.13%	-0.21%	-0.23%	-0.13%	-0.18%	-0.24%	-0.14%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A8: The potential impact of Brexit on the attractiveness to FDI- Northern Ireland, the rest of the UK and Ireland, FTA with 3 years transition – Static effects

	All FDI	Man All	Serv All	EU FDI	EU Man	Serv EU	Non EU FDI	Non EU Man	Non EU Serv
North East	-1.87%	-1.74%	-1.99%	-1.92%	-1.71%	-2.01%	-1.68%	-1.66%	-1.89%
North West	-2.00%	-1.94%	-2.05%	-1.89%	-1.78%	-1.77%	-2.08%	-2.14%	-2.28%
Yorkshire and Humberside	-1.86%	-1.81%	-1.85%	-1.81%	-1.69%	-1.70%	-1.83%	-1.91%	-1.94%
East Midlands	-2.08%	-1.98%	-2.19%	-2.04%	-1.88%	-2.02%	-2.04%	-2.05%	-2.29%
West Midlands	-1.98%	-1.93%	-2.00%	-1.92%	-1.80%	-1.83%	-1.98%	-2.08%	-2.13%
East of England	-1.75%	-1.70%	-1.90%	-1.69%	-1.58%	-1.69%	-1.83%	-1.87%	-2.11%
London	-0.10%	-0.14%	-0.05%	-0.01%	-0.09%	0.04%	-0.18%	-0.24%	-0.11%
South East	-1.57%	-1.58%	-1.56%	-1.44%	-1.42%	-1.28%	-1.72%	-1.85%	-1.85%
South West	-1.91%	-1.85%	-1.95%	-1.85%	-1.74%	-1.76%	-1.91%	-1.96%	-2.10%
Wales	-1.65%	-1.55%	-1.70%	-1.69%	-1.53%	-1.67%	-1.48%	-1.47%	-1.63%
Scotland	-1.14%	-1.12%	-1.12%	-1.09%	-1.05%	-0.98%	-1.14%	-1.19%	-1.21%
Northern Ireland	-1.75%	-1.59%	-1.91%	-1.86%	-1.63%	-2.04%	-1.47%	-1.40%	-1.71%
Ireland	-0.79%	-0.92%	-0.51%	-0.82%	-0.89%	-0.49%	-0.71%	-0.92%	-0.53%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A9: The potential impact of Brexit on the attractiveness to FDI- Northern Ireland, the rest of the UK and Ireland, FTA with 3 years transition – Dynamic effects

	All FDI	Man All	Serv All	EU FDI	EU Man	Serv EU	Non EU FDI	Non EU Man	Non EU Serv
North East	-3.16%	-2.96%	-3.36%	-3.25%	-2.92%	-3.41%	-2.86%	-2.84%	-3.22%
North West	-3.52%	-3.41%	-3.60%	-3.33%	-3.14%	-3.11%	-3.65%	-3.75%	-4.00%
Yorkshire and Humberside	-3.20%	-3.13%	-3.15%	-3.12%	-2.94%	-2.92%	-3.13%	-3.28%	-3.30%
East Midlands	-3.61%	-3.43%	-3.80%	-3.54%	-3.26%	-3.50%	-3.56%	-3.56%	-3.99%
West Midlands	-3.43%	-3.36%	-3.45%	-3.33%	-3.13%	-3.17%	-3.43%	-3.60%	-3.69%
East of England	-3.12%	-3.00%	-3.40%	-3.00%	-2.79%	-3.01%	-3.27%	-3.30%	-3.77%
London	-0.31%	-0.41%	-0.17%	-0.20%	-0.33%	-0.05%	-0.41%	-0.56%	-0.25%
South East	-2.82%	-2.85%	-2.81%	-2.61%	-2.57%	-2.32%	-3.08%	-3.29%	-3.30%
South West	-3.33%	-3.24%	-3.40%	-3.24%	-3.05%	-3.07%	-3.34%	-3.43%	-3.66%
Wales	-2.78%	-2.62%	-2.85%	-2.85%	-2.59%	-2.82%	-2.50%	-2.49%	-2.76%
Scotland	-1.97%	-1.95%	-1.91%	-1.90%	-1.83%	-1.69%	-1.96%	-2.06%	-2.08%
Northern Ireland	-2.94%	-2.70%	-3.24%	-3.14%	-2.76%	-3.46%	-2.51%	-2.41%	-2.94%
Ireland	-1.07%	-1.26%	-0.67%	-1.12%	-1.23%	-0.63%	-0.93%	-1.22%	-0.67%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A10: The potential impact of Brexit on the attractiveness to FDI- Northern Ireland, the rest of the UK and Ireland, WTO option – Static effects

	All FDI	Man All	Serv All	EU FDI	EU Man	Serv EU	Non EU FDI	Non EU Man	Non EU Serv
North East	-3.07%	-2.90%	-3.16%	-3.22%	-2.90%	-3.18%	-2.66%	-2.64%	-2.91%
North West	-3.25%	-3.20%	-3.37%	-3.09%	-2.92%	-2.89%	-3.37%	-3.51%	-3.65%
Yorkshire and Humberside	-3.09%	-3.01%	-3.10%	-3.01%	-2.81%	-2.80%	-3.00%	-3.12%	-3.17%
East Midlands	-3.38%	-3.27%	-3.54%	-3.37%	-3.11%	-3.26%	-3.28%	-3.34%	-3.61%
West Midlands	-3.32%	-3.24%	-3.38%	-3.23%	-3.01%	-3.02%	-3.29%	-3.40%	-3.53%
East of England	-2.92%	-2.84%	-3.19%	-2.84%	-2.64%	-2.80%	-3.03%	-3.08%	-3.45%
London	-0.31%	-0.33%	-0.30%	-0.14%	-0.18%	-0.14%	-0.45%	-0.54%	-0.36%
South East	-2.67%	-2.68%	-2.80%	-2.44%	-2.36%	-2.25%	-2.95%	-3.12%	-3.20%
South West	-3.14%	-3.07%	-3.25%	-3.06%	-2.86%	-2.90%	-3.13%	-3.23%	-3.41%
Wales	-2.70%	-2.59%	-2.72%	-2.81%	-2.56%	-2.69%	-2.36%	-2.39%	-2.55%
Scotland	-1.85%	-1.84%	-1.85%	-1.79%	-1.70%	-1.61%	-1.84%	-1.95%	-1.94%
Northern Ireland	-2.86%	-2.65%	-3.00%	-3.14%	-2.77%	-3.21%	-2.29%	-2.20%	-2.59%
Ireland	-1.02%	-1.16%	-0.78%	-1.04%	-1.08%	-0.71%	-0.94%	-1.17%	-0.74%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A11: The potential impact of Brexit on the attractiveness to FDI- Northern Ireland, the rest of the UK and Ireland, WTO option – Dynamic effects

	All FDI	Man All	Serv All	EU FDI	EU Man	Serv EU	Non EU FDI	Non EU Man	Non EU Serv
North East	-6.42%	-6.13%	-6.67%	-6.76%	-6.13%	-6.72%	-5.67%	-5.63%	-6.22%
North West	-7.12%	-7.01%	-7.38%	-6.80%	-6.43%	-6.39%	-7.34%	-7.62%	-7.97%
Yorkshire and Humberside	-6.64%	-6.53%	-6.64%	-6.54%	-6.14%	-6.07%	-6.45%	-6.73%	-6.80%
East Midlands	-7.27%	-7.03%	-7.64%	-7.24%	-6.71%	-7.05%	-7.09%	-7.18%	-7.83%
West Midlands	-7.13%	-6.98%	-7.27%	-6.97%	-6.54%	-6.55%	-7.06%	-7.31%	-7.58%
East of England	-6.44%	-6.21%	-7.06%	-6.23%	-5.79%	-6.20%	-6.68%	-6.71%	-7.64%
London	-1.15%	-1.32%	-0.97%	-0.93%	-1.02%	-0.73%	-1.31%	-1.66%	-0.99%
South East	-6.05%	-6.04%	-6.28%	-5.60%	-5.39%	-5.14%	-6.54%	-6.90%	-7.09%
South West	-6.87%	-6.74%	-7.13%	-6.74%	-6.33%	-6.41%	-6.85%	-7.07%	-7.46%
Wales	-5.66%	-5.47%	-5.75%	-5.91%	-5.44%	-5.69%	-5.03%	-5.10%	-5.43%
Scotland	-4.11%	-4.12%	-4.09%	-4.02%	-3.84%	-3.61%	-4.06%	-4.33%	-4.28%
Northern Ireland	-6.00%	-5.63%	-6.38%	-6.58%	-5.86%	-6.80%	-4.97%	-4.77%	-5.62%
Ireland	-1.32%	-1.53%	-0.89%	-1.35%	-1.43%	-0.80%	-1.13%	-1.47%	-0.80%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A12: NI in the EU CU for goods and the rest of the UK in a FTA with the EU – Static effects

	Man All	Serv All	EU Man	EU Serv	Non EU Man	Non EU Serv
North East	-1.81%	-1.99%	-1.78%	-2.01%	-1.74%	-1.89%
North West	-1.95%	-2.05%	-1.79%	-1.77%	-2.15%	-2.28%
Yorkshire and Humberside	-1.83%	-1.85%	-1.71%	-1.70%	-1.93%	-1.94%
East Midlands	-2.01%	-2.19%	-1.91%	-2.02%	-2.09%	-2.29%
West Midlands	-1.95%	-2.00%	-1.82%	-1.83%	-2.10%	-2.13%
East of England	-1.71%	-1.90%	-1.60%	-1.69%	-1.88%	-2.11%
London	-0.14%	-0.05%	-0.08%	0.04%	-0.24%	-0.11%
South East	-1.57%	-1.56%	-1.41%	-1.28%	-1.84%	-1.85%
South West	-1.87%	-1.95%	-1.76%	-1.76%	-1.99%	-2.10%
Wales	-1.61%	-1.70%	-1.58%	-1.67%	-1.52%	-1.63%
Scotland	-1.14%	-1.12%	-1.06%	-0.98%	-1.21%	-1.21%
Northern Ireland	0.84%	-1.91%	0.61%	-2.04%	1.31%	-1.71%
Ireland	-0.90%	-0.51%	-0.87%	-0.49%	-0.91%	-0.53%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A13: NI in the EU CU for goods and the rest of the UK in a FTA with the EU – Dynamic effects

	Man All	Serv All	EU Man	EU Serv	Non EU Man	Non EU Serv
North East	-3.08%	-3.36%	-3.03%	-3.41%	-2.96%	-3.22%
North West	-3.42%	-3.60%	-3.15%	-3.11%	-3.76%	-4.00%
Yorkshire and Humberside	-3.17%	-3.15%	-2.98%	-2.92%	-3.33%	-3.30%
East Midlands	-3.49%	-3.80%	-3.32%	-3.50%	-3.63%	-3.99%
West Midlands	-3.39%	-3.45%	-3.17%	-3.17%	-3.64%	-3.69%
East of England	-3.03%	-3.40%	-2.83%	-3.01%	-3.33%	-3.77%
London	-0.40%	-0.17%	-0.32%	-0.05%	-0.56%	-0.25%
South East	-2.83%	-2.81%	-2.55%	-2.32%	-3.27%	-3.30%
South West	-3.28%	-3.40%	-3.09%	-3.07%	-3.47%	-3.66%
Wales	-2.72%	-2.85%	-2.69%	-2.82%	-2.59%	-2.76%
Scotland	-1.98%	-1.91%	-1.85%	-1.69%	-2.09%	-2.08%
Northern Ireland	1.56%	-3.24%	1.16%	-3.46%	2.35%	-2.94%
Ireland	-1.23%	-0.67%	-1.19%	-0.63%	-1.20%	-0.67%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A14: NI in the EU CU for goods and services and the rest of the UK in a FTA with the EU – Static effects

	All FDI	Man All	Serv All	EU FDI	EU Man	Serv EU	Non EU FDI	Non EU Man	Non EU Serv
North East	-1.94%	-1.81%	-2.07%	-1.99%	-1.78%	-2.08%	-1.75%	-1.74%	-1.99%
North West	-2.01%	-1.95%	-2.06%	-1.89%	-1.79%	-1.77%	-2.09%	-2.15%	-2.29%
Yorkshire and Humberside	-1.89%	-1.83%	-1.88%	-1.83%	-1.71%	-1.73%	-1.85%	-1.93%	-1.97%
East Midlands	-2.12%	-2.01%	-2.23%	-2.08%	-1.91%	-2.05%	-2.08%	-2.09%	-2.34%
West Midlands	-2.01%	-1.95%	-2.03%	-1.94%	-1.82%	-1.85%	-2.01%	-2.10%	-2.16%
East of England	-1.77%	-1.71%	-1.93%	-1.71%	-1.60%	-1.70%	-1.85%	-1.88%	-2.14%
London	-0.09%	-0.14%	-0.04%	-0.01%	-0.08%	0.05%	-0.17%	-0.24%	-0.10%
South East	-1.56%	-1.57%	-1.55%	-1.43%	-1.41%	-1.27%	-1.71%	-1.84%	-1.83%
South West	-1.93%	-1.87%	-1.98%	-1.87%	-1.76%	-1.78%	-1.94%	-1.99%	-2.13%
Wales	-1.71%	-1.61%	-1.77%	-1.75%	-1.58%	-1.73%	-1.54%	-1.52%	-1.71%
Scotland	-1.16%	-1.14%	-1.14%	-1.11%	-1.06%	-1.00%	-1.16%	-1.21%	-1.24%
Northern Ireland	0.72%	0.84%	0.54%	0.50%	0.61%	0.20%	1.08%	1.31%	0.97%
Ireland	-0.77%	-0.90%	-0.49%	-0.80%	-0.87%	-0.47%	-0.69%	-0.91%	-0.51%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

Table A15: NI in the EU CU for goods and services – Dynamic effects

	All FDI	Man All	Serv All	EU FDI	EU Man	Serv EU	Non EU FDI	Non EU Man	Non EU Serv
North East	-3.28%	-3.08%	-3.51%	-3.36%	-3.03%	-3.53%	-2.99%	-2.96%	-3.39%
North West	-3.53%	-3.42%	-3.62%	-3.34%	-3.15%	-3.13%	-3.67%	-3.76%	-4.03%
Yorkshire and Humberside	-3.24%	-3.17%	-3.20%	-3.16%	-2.98%	-2.97%	-3.18%	-3.33%	-3.36%
East Midlands	-3.67%	-3.49%	-3.88%	-3.60%	-3.32%	-3.57%	-3.63%	-3.63%	-4.09%
West Midlands	-3.47%	-3.39%	-3.50%	-3.36%	-3.17%	-3.21%	-3.47%	-3.64%	-3.74%
East of England	-3.15%	-3.03%	-3.45%	-3.03%	-2.83%	-3.04%	-3.31%	-3.33%	-3.83%
London	-0.30%	-0.40%	-0.14%	-0.19%	-0.32%	-0.03%	-0.40%	-0.56%	-0.23%
South East	-2.81%	-2.83%	-2.79%	-2.60%	-2.55%	-2.30%	-3.06%	-3.27%	-3.27%
South West	-3.38%	-3.28%	-3.46%	-3.28%	-3.09%	-3.12%	-3.39%	-3.47%	-3.73%
Wales	-2.88%	-2.72%	-2.98%	-2.95%	-2.69%	-2.93%	-2.61%	-2.59%	-2.91%
Scotland	-2.00%	-1.98%	-1.96%	-1.93%	-1.85%	-1.72%	-1.99%	-2.09%	-2.12%
Northern Ireland	1.37%	1.56%	1.06%	1.00%	1.16%	0.46%	1.96%	2.35%	1.77%
Ireland	-1.04%	-1.23%	-0.63%	-1.09%	-1.19%	-0.59%	-0.90%	-1.20%	-0.64%

Source: Own calculations based on estimates by Aichele and Felbermayr (2015), Rojas-Romagosa (2016) and Chen et al. (2018).

