In the United Kingdom and its twelve regions, what impact does Greenfield Foreign Direct Investment from the EU have on goods exports to the EU?

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Abstract

This research aims to shed light on the relationship between EU greenfield FDI to the UK and its effect on UK goods exports to the EU. This paper is unique, as it observes the relationship at a subnational aggregation. Currently the UK government has an ambition to reach £1trillion in exports, an ambitious target to many. Economic literature suggesting that one method of boosting exports is through the increased attraction of FDI. As a result, it is hypothesised that greenfield FDI will lead to an increase in UK goods exports to the EU. Presently, there is no academic literature on this relationship which exists at a subnational level. This is meaningful as the UK also has another ambition to 'level up' the country. By adopting a regional perspective towards this issue, there is an opportunity to merge two of the government's primary objectives into a single effort. A sample of 4,884 greenfield FDI projects was examined in this study using fixed effects and two-way fixed effects models. The analysis was conducted using panel data and incorporated several control variables. Alongside a series of robustness checks, a range of lags were used to model FDI and its relationship with exports. Empirical results demonstrate the positive relationship greenfield FDI and goods exports share. With findings suggesting that following a percentage change increase in greenfield FDI of 1%, we can anticipate a corresponding percentage change increase in EU goods exports that falls within the range of 0.02-0.12%; with an estimated three-year lag for FDI to take effect. The study concludes by proposing a set of policy recommendations that are directed towards both national and regional levels.

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1. Introduction

1.1. Economic theory

Thousands of years on from the inception of trade, nations still trade for the same reasons they did all that time ago. With theories such as David Ricardo's comparative advantage still "remaining a cornerstone of modern trade theory" (Fontagné et al. 2014). Trade is a powerful tool which has improved billions of lives through the increased trend of globalisation, with Krugman (1995) describing globalisation as the "integration of markets in goods, services, and capital that has resulted from reductions in barriers to trade and investment". O'Rourke and Williamson (2001) suggest that globalisation in the leading economies (such as the UK) began around the middle of the nineteenth century.

Trade allows countries to access resources, goods and services which in the home nation could not be produced as cheaply, to as high a standard, or perhaps not even at all. This paper will focus on exports following the UKs ambition to reach an export value of £1 trillion[1]. Whilst imports constitute a leak in the economy, exports provide the economy with a capital boost by bringing money in from overseas. Exports and GDP share a positive association since higher levels of exports result in greater growth in the balance of trade and GDP. Thus, many countries work to boost their export levels. However, in the long run there's likely a positive correlation between imports and GDP as imports are often used as intermediaries for exports.

The paper analyses to what extent could greenfield Foreign Direct Investment (FDI) support the UKs ambitions in reaching £1trillion of exports. FDI is the flow of capital, technology, and knowledge and 'helps to fill the gap between savings and the required level of investment' (Sabir and Khan 2018). Due to data limitations, this paper focuses solely on greenfield FDI, a type of FDI whereby a foreign company establishes a new business or expands an existing business in a new market. This can be done through building new facilities, such as a factory or office, or investing in new machinery and equipment. Greenfield FDI does not include M&As and makes up the majority of FDI flows across the world, in 2020 greenfield FDI was responsible for 62% of FDI flows globally[2].

FDI facilitates the process of comparative advantage, by allowing companies to invest abroad into countries where goods or services can be produced more efficiently. Neoclassicals such as Solow (1957) view FDI as a positive force for economic development, with it bringing capital, technology and know-how to recipient economies. FDI often boosts jobs and productivity and as a result recipient economies grow (Dutt 1998).

As theorised by Dunning (2000) in his eclectic paradigm there are three main types of FDI: market seeking, resource seeking and efficiency seeking. Market seeking FDI aims to penetrate the local markets of host countries and as a result may not support export growth. Resource seeking and efficiency seeking FDI look to utilise an economies source of competitiveness, such as it's workforce, infrastructure and business environment – supporting export growth.

[1] Gov.uk (2021): 'Made in the UK, Sold to the World: New strategy to boost exports to £1 trillion'
[2] UNCTAD (2021): 'World Investment Report 2021 – Investment beyond the pandemic'

1.2 Why is the UK important, why regions and why the EU?

The vast majority of literature around FDI is focused on developing economies, this paper offers a comprehensive analysis of the opportunity FDI provides to boost exports in a developed economy. Even though the United Kingdom's officially left the European Union in 2021, FDI from the EU reached it's highest ever level in 2022 – at £37.9bn[3] (up 168% since 2019). The EU is one of the UKs most important trade and investment partners, with the union holding £669.5bn[4] (33.4%) in FDI stock within the UK and making up 48.0%[5] of the UKs goods exports in 2021.

Economic theory would suggest that the UK, a developed economy, should invest overseas (through FDI) to benefit from lower costs. Since 2003, just 1.2% of investing companies from the EU have invested in the UK to benefit from lower costs. Most companies (45.0%) invest in the UK for the 'proximity to markets or customers', aligning with market seeking FDI. 34.0% and 18.6% of companies invest for 'domestic market growth' and 'skilled workforce availability' respectively[6]. This shows the varied nature of investment into the UK, more motives & location determinants can be found in appendix A.

This paper researches the impact that investment from the EU has had on goods exports to the EU and can provide policy recommendations on whether promoting inward investment from the EU should be prioritised in the goal of achieving £1trillion of exports. With the UK trade deficit rising to £108bn in 2022[7], the highest since levels began, it is now more than ever the stated aim of the British government to boost exports. The benefits of exports to the British economy are clear, with government analysis estimating that 'exports supported 6.5m jobs across the UK in 2016, with exporters paying higher wages. Separate analysis shows that goods exporting businesses are on average 21% productive'[8].

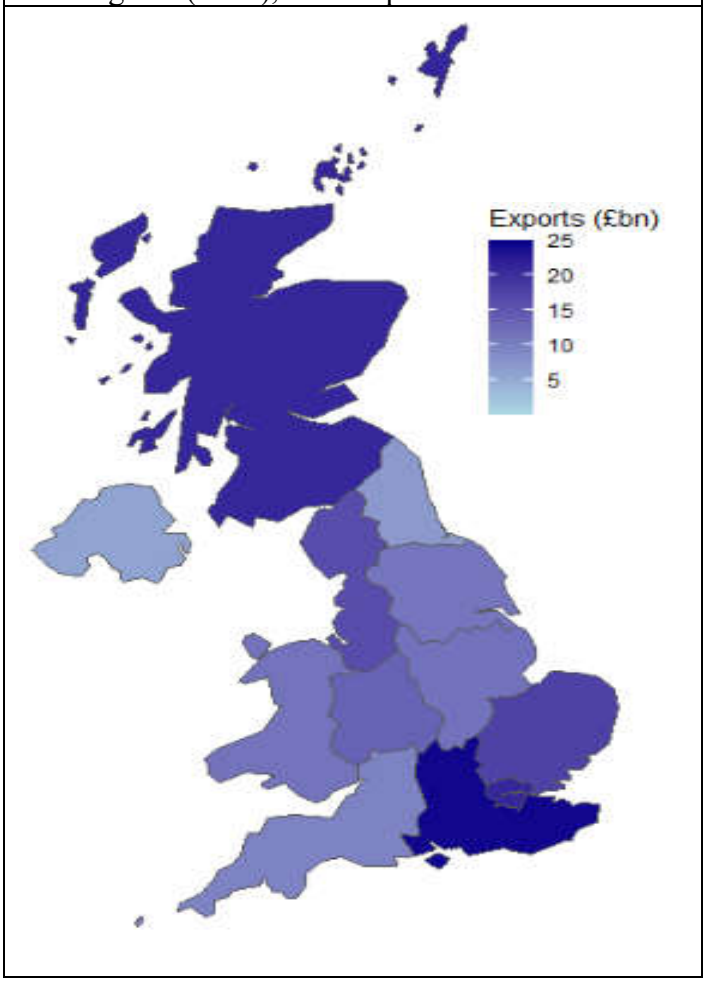
FDI has been found to improve UK's economic impact factors, including gross value added via capital and employment measures, employment and wage levels, and labour productivity[9]. There is also emerging evidence pointing to the benefits of outward FDI in trade and national income as well as research & development through technology diffusion and access to raw materials, intermediate goods, human capital and destination markets for trade[10].

The UK is often referred to as a 'service-based economy', this paper focuses on goods exports to understand whether FDI can increase competitiveness in the export of goods. 63.5%[11] of the UKs service exports to the EU are concentrated in London and the South East, suggesting that service exports are not as competitive across the UK. Goods exports are better distributed throughout the United Kingdom (figure 1) and are therefore a more powerful mechanism in supporting the countries ambition of levelling up[12]. Though improving services exports would benefit regions outside London and the South East. In addition, goods exports make for a better

[3] fDi Markets (2023)
[4] ONS (2023): 'Foreign direct investment (FDI) totals for inward and outward flows, positions and earnings: 2020 and 2021'
[5] ONS (2023): 'UK total trade: all countries, seasonally adjusted'
[6] fDi Markets (2023)
[7] ONS (2023): 'UK trade: December 2022'
[8] Gov.uk (2021): 'Made in the UK, Sold to the World: New strategy to boost exports to £1 trillion'
[9] DIT (2022) 'Estimating FDI and its impact in the UK', Accessible via: Understanding FDI and its impact in the United Kingdom for DIT's investment promotion activities and services.
[10] UNESCAP (2020) 'Promoting inward and outward foreign direct investment in the post coronavirus disease era'
[11] ONS (2022): 'Subnational trade in services'
[12] Gov.uk (2022): 'Levelling up the United Kingdom'

comparison due to the varied data across UK regions. Whilst this paper is only researching goods exports, greenfield investment into both goods and services will be modelled. This is due to the spillovers that services investment provides to goods sectors with increased investment in services leading to productivity gains in goods sectors (Amiti 2007).

Figure 1: The distribution of EU goods exports in UK Regions (2022), current prices



Literature often focuses on analysing the relationship between exports and FDI through a national lens, this paper looks at subnational trends. Aligning with the governments objective of levelling up which aims to reduce inequalities between different regions of the UK. The UK has high regional contrasts in terms of GDP per capita, which ranges from 175.1% of the average UK GDP in London to 72.3% in the North East[13]. Moreover, at ITL3 areas GDP per capita in Camden and the City of London is £410,912, in Dunbartonshire, Helensburgh and Lomond this is just £19,072. Unemployment ranges from 2.3% in the South West, to 4.5% in the West Midlands[14] – this can be found in table 1.

[13] ONS (2022): 'Regional economic activity by gross domestic product, UK: 1998 to 2020'
[14] ONS (2023): 'Labour market overview, UK: March 2023'

Table 1 Macroeconomic indicators by ITL1 UK regions, Source: ONS and HMRC, 2022

	Goods Exports, %	**GDP per capita, £**	**GDP per capita (UK = 100)**	**Unemployment rate, %**
North East	4.8	23,109	72.3	4.1
North West	10.4	28,257	88.4	3.7
Yorkshire and The Humber	6.7	25,696	80.4	3.2
East Midlands	7.3	25,956	81.2	3.5
West Midlands	8.4	26,281	82.2	4.5
East of England	10.0	29,176	91.3	3.8
London	10.3	55,974	175.1	4.5
South East	15.0	34,516	108.0	3.8
South West	6.4	28,012	87.6	2.3
Wales	6.5	23,882	74.7	3.5
Scotland	10.4	29,629	92.7	3.1
Northern Ireland	3.5	25,575	80.0	2.4
UK	**100**	**31,972**	**100**	**3.7**

The UK economy has struggled in recent times due to several economic shocks, firstly the decision to leave the European Union and the subsequent market uncertainty. As per the Bank of England in 2019, Brexit reduced the UK's economic growth by 2% since the referendum in 2016[15]. A driver of this is the staff shortages created by Brexit, by September 2022 there was a significant shortfall of around 460,000 EU-origin workers, covering several industries across the UK[16].

The COVID-19 pandemic only exacerbated issues presented by Brexit, but this time on a truly global scale. In 2022 and when adjusting for inflation[17], UK goods exports to the EU were still 6.9% below their pre-covid (2019) levels[18]. The British economy is still struggling from the pandemic and has not experienced an equally dispersed COVID-19 economic impact. Whilst certain regions and industries have been particularly heavily struck by the pandemic, others have fared better. For instance, compared to other regions, London and the South East have seen less severe economic downturns. The impact of the pandemic makes analysis at a regional level more important, to support the economic recovery and increase exports findings from this paper will be crucial.

[15] Bank of England (2019): 'In focus – Uncertainty and Brexit'
[16] UK in a changing Europe (2023): 'The impact of Brexit on the UK labour market: an early assessment'
[17] Chained volume measures have been used to account for inflation.
[18] ONS (2023): 'UK trade time series'

2. Literature review

The relationship between FDI and exports has been extensively debated in economic research and literature. The rise in interest in this field of study corresponds with the recent shift in policymakers' priorities towards increasing FDI inflows. Many studies have found that FDI inflows bring enormous benefits to the host country, with empirical studies finding a positive growth effect on recipient economies of FDI (De Mello, 1999). However, Ericcson (2001) found no such evidence and Moran (1998) even found a negative effect. Dutt (1998) discusses the importance of foreign investment for economic growth and the significance of a creating an optimal economic environment to boost productivity and increase competitiveness in areas which receive investment.

Early literature of international trade traditionally claimed that trade and international capital movements are substitutes. This early theoretical analysis was largely based on the Heckscher-Ohlin (H-O) general equilibrium model of trade, Mundell (1957) was a proponent of this way of thinking. Only in later years did studies begin to debate that a complementary relationship exists between FDI and trade (Kojima 1975).

Buckley et al. (2002) argues the economic and social conditions of the recipient country determine how much FDI helps spur growth. According to Buckley, 'nations with high rates of savings, an open trade system, and high levels of technological proficiency would stand to gain more from an increase in FDI to their economy'. This is reinforced by Beck (2002) who finds that countries with lower levels of financial development often have a lower share of exports in industries with higher external finance dependencies. Durham (2004) concludes the flow of FDI depends on the technology absorption capacity of the host nation. Businesses are more likely to invest into an economy which already has experience in hosting investment and adds value to investing businesses. Thus, we'd expect in the UK, with its open trade system and vast experience in hosting investment, a positive relationship between FDI and exports.

FDI and exports are often found to be complementary to each other and tend to reinforce one another. Blomström (1992) finds that FDI facilitates exports by providing access to new markets, improving supply chain efficiency and reducing transportation costs. Evidence has also been found by UNCTAD (2019) on reverse causality between FDI and exports. UNCTAD find that whilst a positive relationship exists between FDI and exports, exports alone can attract FDI. This is because an established export market, to which the UK is, draws in profit-seeking businesses who want to take advantage of the opportunity to export from the host country, potentially utilising its efficiencies and resources. Reverse causality suggests that policies to promote exports may also have positive spillover effects on FDI.

Sakyi (2015) reports that FDI has a positive effect on export performance, with the effect even stronger for greenfield investment. The study advocates for greenfield investment as it allows for firms to develop their own capabilities and knowledge, eventually resulting in better export performance. Gorg et al. (2001) identifies that greenfield FDI is more likely to generate spillovers than brownfield FDI. Spillovers are larger in industries which are more technologically advanced, and competition is fiercer. Xuan's (2008) analyses of FDI in Vietnam discovers a positive relationship with FDI.

Whilst literature suggests that FDI can boost export performance, researchers have also found other mechanisms which support exports. Robson (2012) finds a positive relationship between human capital and exporting, Becker (1975) suggests that those with higher levels of human capital will in turn be more productive. Bloom et al. (2010) finds evidence of benefits to productivity of an increased workforce size. And Algieri (2016) suggests that gross fixed

capital formation is 'conducive to an increase in overall production capacity, and thus to an upsurge in export capacity'.

A limitation of the literature is that the vast majority of it looks at developing nations, this is to be expected as FDI is often a tool for developing nations in supporting growth of their economies. Research from non-oil export performance in Nigeria from Odigwe et al. (2019) finds a positive relationship between FDI and exports. In the Western Balkans, through a in a least squares dummy variables (LSDV), Selim et al. (2016) discover that FDI positively affects export performance. In Gu et al's., (2008) study of the impact of FDI on Chinese export performance, a positive and significant relationship was found in the relationship between FDI and export performance. Sultan (2013) analyses FDI inflows and exports in India, using the Vector Error Correction Model, he finds a stable long run relationship; an increase in FDI inflows leads to a rise in Indian exports. Other studies, such as Prasanna (2010), Achandi (2011) and Haq (2012) reinforce the conclusion that FDI has a positive impact on export performance within the host country.

Another limitation is the lack of literature that looks into the relationship between FDI and export performance in the UK at a regional level, though there is research from other nations; for example, regional analysis by Alegieri (2016), revealing that both investment and R&D intensity are important in boosting exports as 'investments increase overall production capacity and thus intensify exports'. And with Leichenko's (1997) study into FDI and exports at a US state level also finding a strong relationship between the two.

There are a number of academics who suggest that FDI may not always have a positive impact on the recipient country and its exports. A study by Sultanuzzman (2018) indicates that although FDI inflows have a positive and significant relationship with economic growth, it has a negative relationship with exports in the long-run. Sharma (2000) and Goldberg & Klein (1998), argue that a relationship between FDI and export performance does not exist; and that FDI has no impact on exports.

In some cases, FDI can lead to substitutability, particularly where the home market is not established enough and will subsequently struggle to compete with foreign investors. In Helpman's (2004) analysis of U.S. firms exports and FDI across 38 countries, he finds evidence of substitutability between FDI and exports. Substitutability is especially found in industries where FDI is used to produce goods for export. Consequently, it's likely that FDI may displace domestic firms and reduce the need for exports.

3. Data

3.1 Data sources

This paper uses a range of data, a table is included in annex B with specific data sources. Data is mainly from the Office for National Statistics (ONS); however, some data is from other government departments as well as private sector databases. As this paper looks specifically into UK regions and the relationship between goods exports and FDI within the twelve UK regions, data availability is reduced. The period of analysis is 2008-2019 for UK regions and 2008-2021 for the UK.

3.2 Research strategy

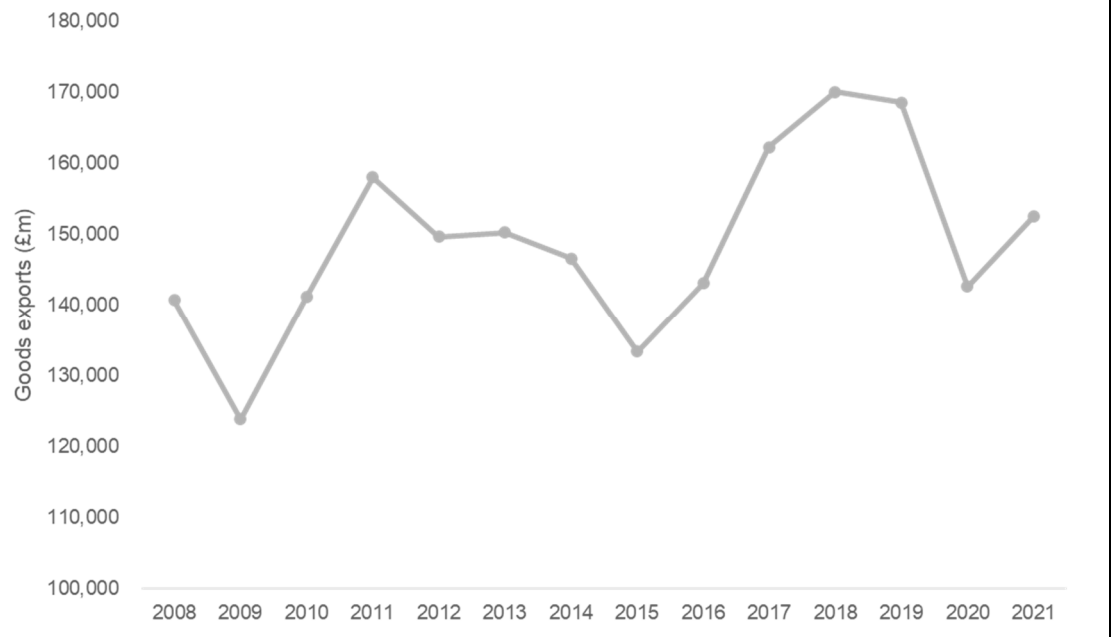
The statistical software, gretl, will be utilised to carry out the analysis. The panel ID variable for this dataset is the UK region, as the UK is split up into 12 NUTS1 regions, including the devolved administrations of Scotland, Wales and Northern Ireland. Analysis is split into two: national analysis and regional analysis. Due to data limitations, a small number of variables have been proxied in the regional analysis following the national analysis.

3.3 Variables

Dependent variable

This paper focuses on what drives goods exports to the EU, focusing mainly on the relationship between exports and FDI. At a regional aggregation only goods trade is available, with the earliest year of data being 2008, thus the starting point for analysis is 2008. The dependent variable for this research is goods exports.

Figure 2: UK Goods Exports to the EU (2008-2021), current prices



Source: HMRC Regional Trade Statistics

Figure 2 displays the value of UK goods exports to the EU over the period 2008-2021. Exports aren't consistent across this period, with a fall in exports on the previous year occurring in six out of the fourteen years of focus. A more volatile trend is found at a regional level, this can be observed in figure 3.

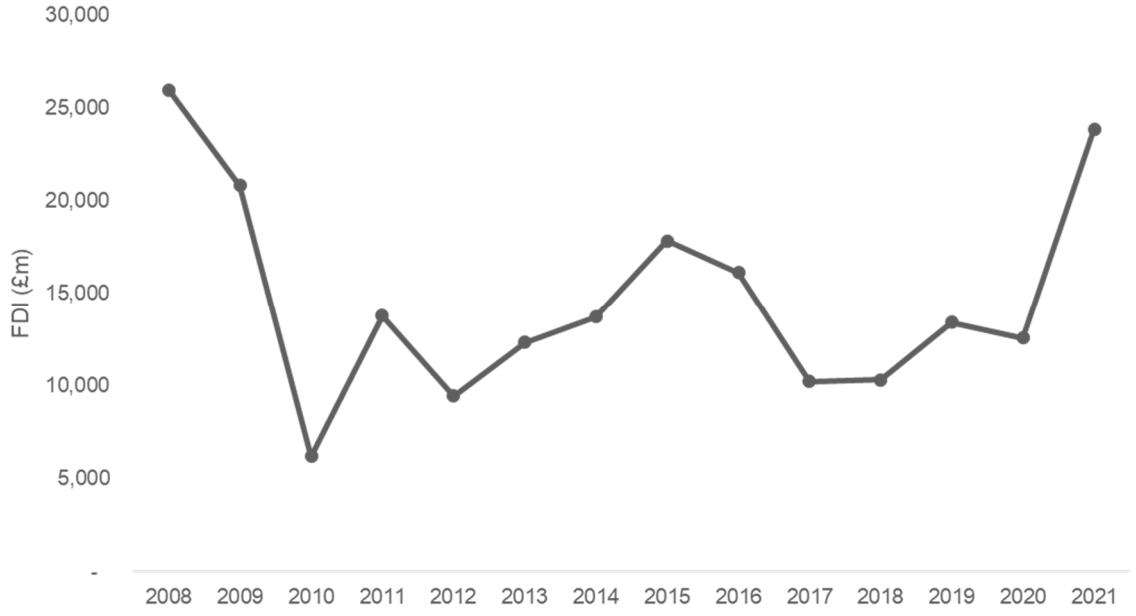
Figure 3: UK Regions Goods Exports to the EU (2008-2021), current prices

Source: HMRC Regional Trade Statistics

Independent variable

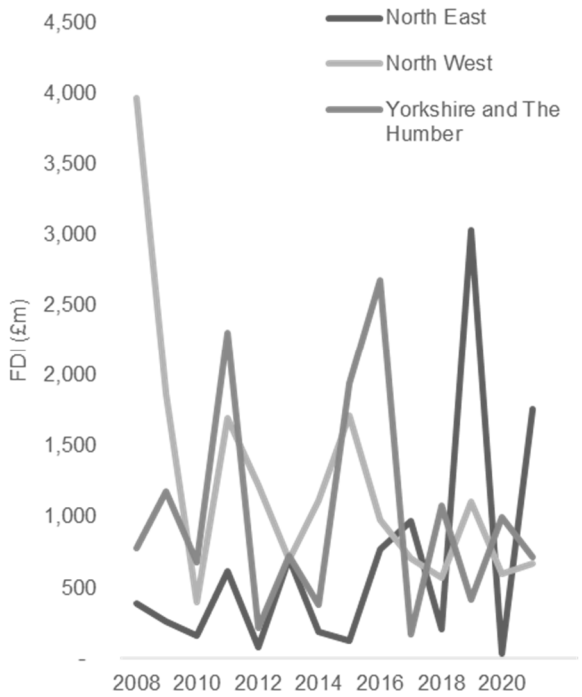
The main independent variable being analysed is greenfield foreign direct investment, data is available for the whole duration of the period of research. Figure 4 displays greenfield inward FDI from the EU across the UK. In the twelve regions of the UK, FDI is considerably more volatile, as shown in figure 5.

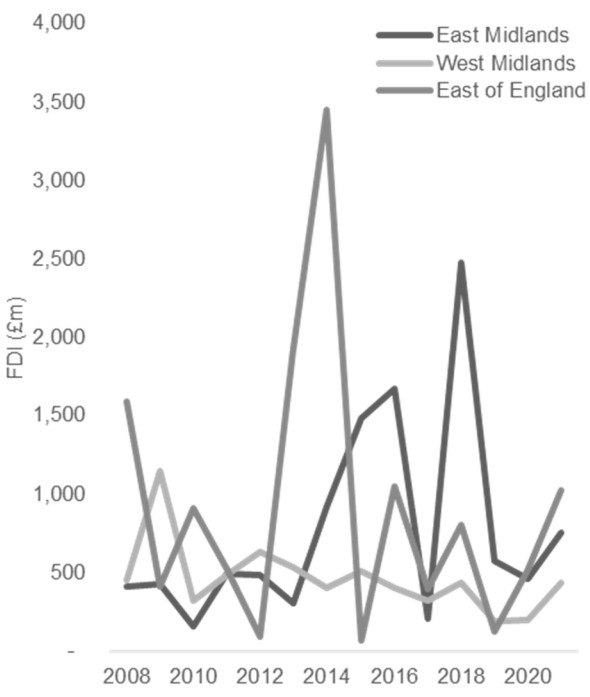
Figure 4: UK inward Greenfield FDI from the EU (2008-2021)

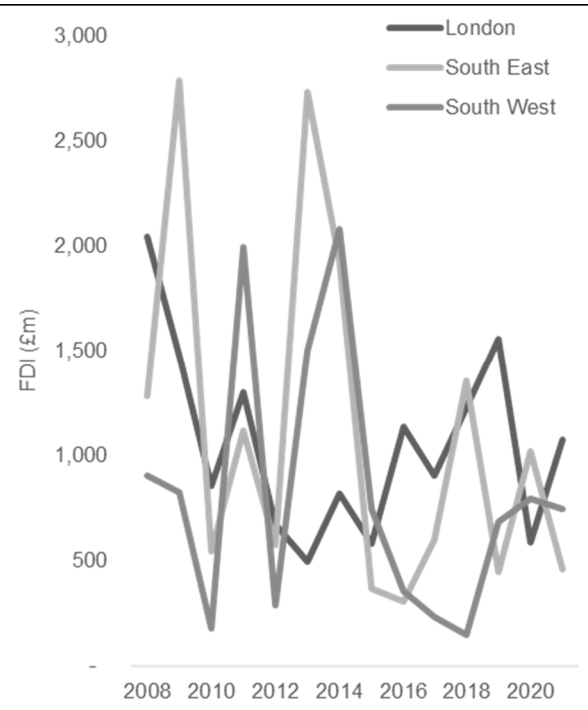


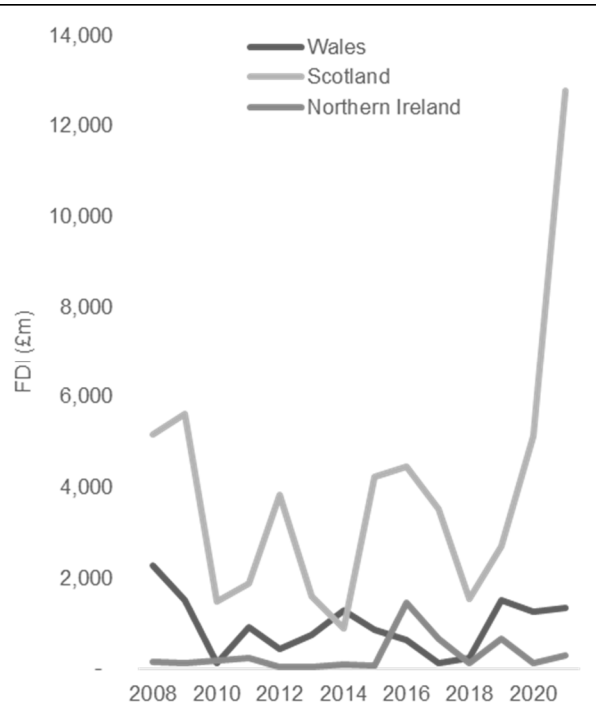
Source: fDi Markets

Figure 5: UK regions inward Greenfield FDI from the EU (2008-2021)









Source: fDi Markets

Control variables

There are a number of drivers of exports, beyond just FDI. To ensure the validity and strength of the model it is important to control for as many observable variables which may drive exports. There are many drivers of exports which are extensively covered within economic literature. This analysis uses four control variables to improve the robustness of the model, these are:

1. The workforce of a region

The size of a workforce in a given region provides an indication of the potential of labour for businesses looking to export. Labour is less mobile than the other factors of production, thus the potential labour force within a region will be a driver of that regions ability to export.

2. Human capital

Following the same theory of the importance of labour to an exporting firm, a workforce in itself is not enough, the workforce must be highly skilled to produce quality goods for export.

3. Productivity

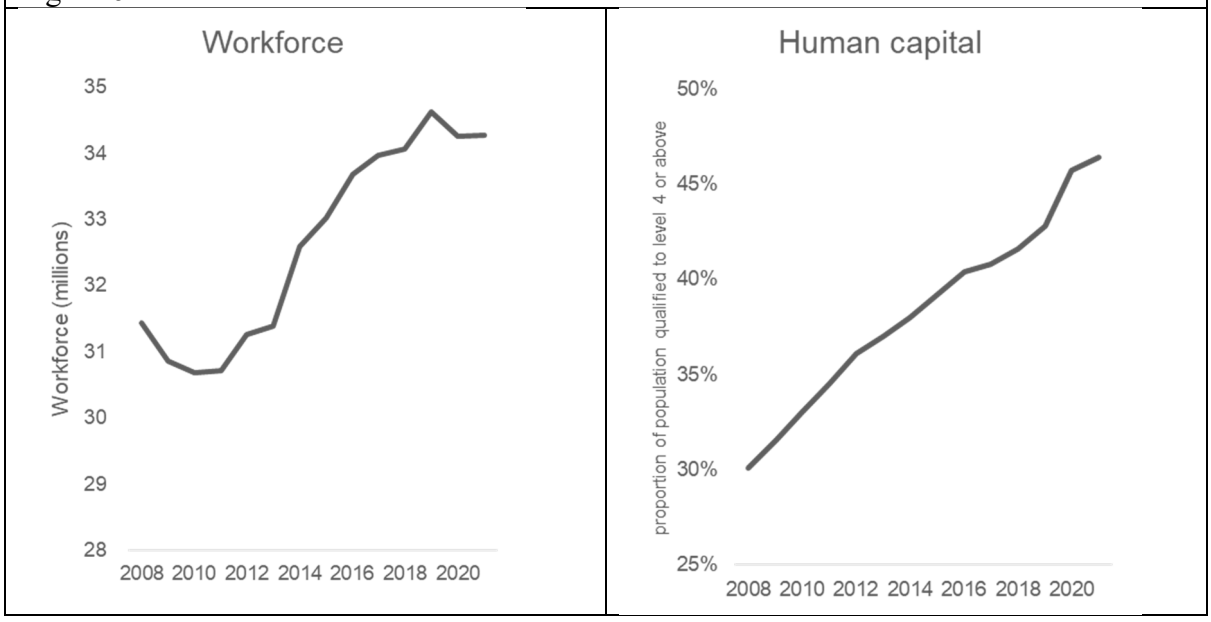
A region's ability to increase productivity will certainly have an impact on a regions propensity to export, with those which are more productive having a large advantage.

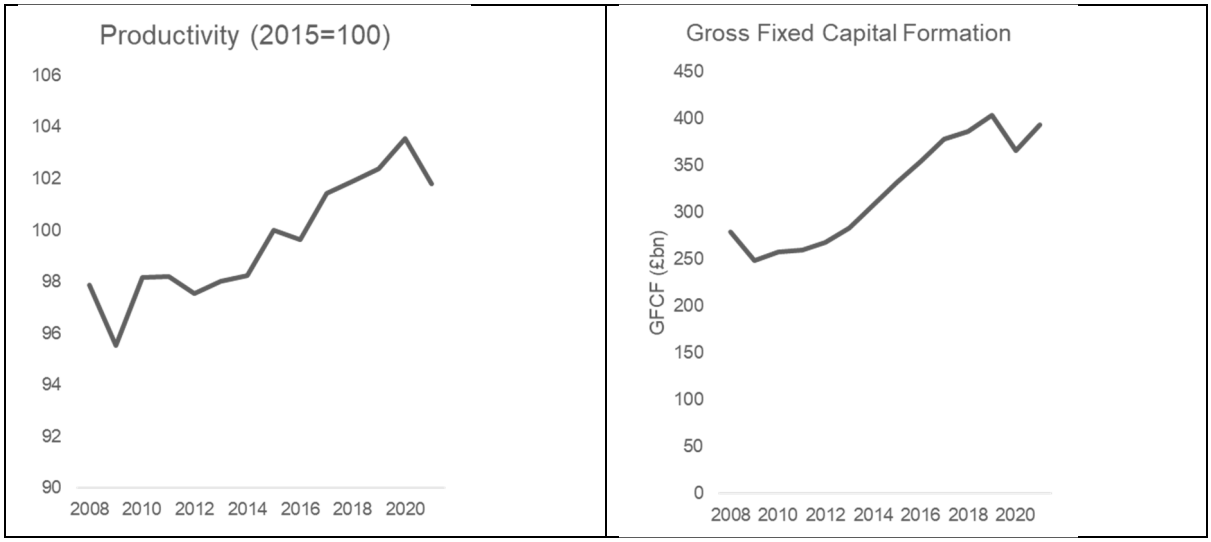
4. Gross Fixed Capital Formation (GFCF)

GFCF is a component of GDP and a measure of the total value of a region's capital investments in fixed assets such as buildings, machinery and equipment. It's a useful measure of the stock of capital within the economy. A full list of variables and their sources can be found in appendix B.

The below figure 6 displays the trends in these variables over the period of focus at a national level.

Figure 6: Control variables at a national level





4. Analysis

4.1 Model specification

There are a number of factors which may affect export performance in a given year, this analysis aims to account for as many factors where possible and this is done through the inclusion of control variables. The functional form of the regional model follows:

$$\ln(\mathrm{d}(Exports_{it})) = region_i + year_t + \sum_{p=0}^{P} \beta_P \ln(\mathrm{d}(FDI_{it-p})) + \gamma' X_{it} + \varepsilon_{it}$$

And for the national model, follows:

$$\ln(\mathrm{d}(Exports_{it})) = year_t + \sum_{p=0}^{P} \beta_p \ln\,(\mathrm{d}\,(FDI_{it-p})) + \gamma' X_{it} + \varepsilon_{it}$$

Where[19]:

- i is the UK region.
- t is the year
- P is the maximum number of lags
- Xit is the covariate matrix[20]

FDI doesn't have an instant impact on the recipient economy and can take a number of years. Therefore, within the model, the variable FDI has been lagged. The range of lags were decided through a combination of economic literature and econometric techniques.

The Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are commonly used in econometric analysis to determine the maximum lag length in time series and panel models. Academics such as Barhoumi & Dridi (2020), and Asongu & Nwachukwu (2016) use the AIC and BIC to select the maximum lag length. Following model outputs after

[19] The beta coefficient estimate will be the average treatment effect. This assumes homogeneity of treatment across the regions and time.

[20] Control variables are covered in the covariate matrix

running the AIC and BIC, the maximum lag length is 5 lags. This is reinforced by an array of literature. An overview of the AIC and BIC model outputs can be found in Appendix C.

Lee and Tcha (2016) found that the positive impact of FDI on the export performance of developing countries was observed in the medium to long term. The study found that the effect of FDI on exports becomes statistically significant after about five years. Similarly, a study by Wang and Wei (2009) found that the positive impact of FDI on a recipient country's export performance is stronger in the long term. The study analysed data from China and found that FDI has a positive impact on export performance in the long term (more than three years) but not in the short term (less than two years). This is reinforced by UNCTAD (2018), who find that the impact of FDI is more significant in the medium to long term (3-10 years) and the IMF (2002) who find FDI can take up to five years to be fully realised.

Subsequently, a lag of up to 5 years for FDI will be modelled. Whilst the period of focus for the model is 2008-2021, for the variable FDI this will range from 2003-2021.

A Hausman test is performed to determine whether a fixed effects model (FEM) is strongly preferable to a random effects model. The Hausman test finds a p-value of 0.0096, suggesting that the random effects model is significantly different from the FEM. The null hypothesis is rejected and a FEM is preferable to the random effects model. Baltagi (2005) suggests that a FEM is an appropriate specification for panel analysis when focusing on a specific set of individuals, this is in line with our papers focus on the 12 UK regions. Gu et al (2008) uses fixed effects to analyse the contribution of FDI to China's export performance at a sectoral level.

In order to control for time-invariant unobserved heterogeneity and to reduce endogeneity bias a two-way fixed effect (TWFE) model is used in the UK regions model. TWFE models control for unobserved heterogeneity at both the individual and time level, including individual-specific fixed effects and time-specific fixed effects in the regression analysis. Wooldridge (2010) argues TWFE models provide more efficient estimates than other panel data models, particularly when there is unobserved heterogeneity that varies over time and across individuals (regions). Wooldridge's research suggests that incorporating time effects is a simple and effective approach to alleviate cross-sectional dependence among panel IDs (regions). Algieri (2016) uses a TWFE model in his analysis of the drivers of exports in Italian regions.

Following the decision to use a FEM and TWFE model, tests have been undertaken to ensure that data is stationary. A stationary dataset will allow for identification of the causal effects of independent variables on the dependent variable without the confounding effects of non-stationarity. An Augmented Dicky Fuller test was used to identify whether unit roots existed in the data, where unit roots were found a log difference of the variable was used to correct for this non-stationarity.

4.2 Results and diagnostic checks

National

The chosen methodology at a national level was modelled for the period 2008-2021, including several lags for the variable FDI. The period of analysis includes the COVID-19 pandemic, where UK goods exports to the EU fell 15% in 2020. Results are displayed in table 2 below.

Table 2: National model results

	coefficient		p-value
const	0.000183		0.995463
ld_FDI_t1	0.037776		0.185995
ld_FDI_t2	-0.08823		0.091512
ld_FDI_t3	0.115511		0.004765
ld_FDI_t4	-0.02716		0.339471
ld_FDI_t5	0.111258		0.009187
ld_Workforce	-9.92659		0.020818
ld_Human_capital	-0.9924		0.296766
ld_Productivity	5.016534		0.022643
ld_GFCF	2.66441		0.011349
LSDV R-squared	0.984116	Within R-squared	0.984116
rho	-0.49494	Durbin-Watson	2.943343

Coefficients of 0.12 and 0.11 are found for lags of three and five respectively and are significant at 0.05. This is evidence of a causal relationship between goods exports and greenfield FDI, implying that a 1% increase in percentage change in FDI is associated with a percentage change increase in exports ranging from 0.11-0.12%[21]. This is in line with Xuan's (2016) analysis into Vietnamese exports, which reveals a 1% increase in FDI boosts exports by 0.13%. Although a negative relationship is found between exports and FDI for a lag of two and four, these results are not statistically significant.

The R^2 of this model is 0.9824, meaning that approximately 98% of the variability of exports is explained by the independent variables within the model. However, it should be noted that using multiple lags within a model may capture additional information about exports not explained by the current time period alone.

Robustness checks[22]

Using variance inflation factors (VIF), no signs of Collinearity were found between exports and FDI, collinearity was found in some of the control variables; namely workforce and GFCF. However, as per Hair (2010) removing control variables, could lead to biased estimates and a reduced model fit. As a result, the variables are not removed. The Jarque-Bera (JB) test statistic is calculated to ensure that residuals are normally distributed (Greene 2011), the test statistic hypothesis is as follows:

H_0: Normally Distributed

H_1: Not Normally Distributed

The test result finds a p-value of 0.223, therefore the null hypothesis is not rejected. The data is normally distributed and residuals are distributed symmetrically around zero, there is no skewness or kurtosis and the core assumption of normality of residuals holds.

[21] The estimated beta coefficient quantifies the sensitivity or responsiveness of the percentage change in ln(d(exports)) to changes in ln(d(FDI))

[22] Detailed findings are in appendix D

The national model provides a basis for the creation of the regional model. To improve the quality and the strength of the regional model, an FEM will be compared to a TWFE including time fixed effects.

Regional model

Following on from national analysis, this paper will now explore the relationship between greenfield FDI from the EU and goods exports to the EU at a subnational level. Due to regional data limitations, the period of observations has decreased to 2008-2019.

Table 3: Regional FEM results

	coefficient		p-value
const	0.023999		0.345458
ld_FDI	0.003473		0.758529
ld_FDI_t1	-0.01769		0.223676
ld_FDI_t2	0.025025		0.111691
ld_FDI_t3	0.040656		0.007401
ld_FDI_t4	0.030498		0.029105
ld_FDI_t5	-0.00256		0.803181
ld_Workforce	-1.21489		0.105961
ld_Human_capital	-0.73928		0.102082
ld_GVA	1.06646		0.235006
ld_GFCF	0.37829		0.027334
LSDV R-squared	0.278936	Within R-squared	0.252529
rho	-0.20244	Durbin-Watson	2.189698

The above table 3 outlines the initial results of the regional FEM. Like to its predecessor, the national model, results again indicate a causal relationship between goods exports and greenfield FDI suggesting that when FDI increases, exports do too. These findings support the hypothesis of this paper (FDI would have a positive effect on exports) and are in line with findings from Leichenko (1997) who writes about the positive effect FDI has on US States manufacturing exports. Leichenko finds that a 1% change in the level of FDI in a state is associated with a 0.14% increase in export levels. In this model, at a 0.05 significance level lags of three and four years are found significant: with coefficients of 0.04 and 0.03 respectively. Suggesting that, although smaller than Leichenko's findings, for a 1% percentage change increase in FDI, we can expect to find the percentage change of exports to increase between 0.03-0.04%, ceteris paribus.

FDI with lags of one and five are both found to share a negative relationship with exports, though these variables are not statistically significant. It's important to note that the R^2 of this model is relatively low – especially when compared to the national FEM. An R^2 of 0.279 means that the independent variables within the model explain just 28% of the variation in exports. The research finds that as the number of regions analysed increases, the R^2 declines. Whilst this is low, it's expected due to underlying differences between regions that are driving variation within exports. Some UK regions export less than others, with FDI also being more volatile – there is potential that one large project may skew flows when compared over a number of years. These are all contributing factors to a low R^2.

When the sample of regions is reduced, the R^2 increases however independent variables (most importantly FDI) become insignificant. A reduction in sample size is likely to lead to a bias in the estimates as remaining observations are not representative of the population as a whole, which in this case leads to lower statistical significance. There was just one region where a significant (level of 0.10) coefficient was found for FDI. Greenfield FDI in the North East of England was discovered to share a causal relationship with goods exports for lags of three and four years, 0.175 and 0.223 respectively[23]. This would imply that for a 1% percentage change increase in FDI, exports would increase by a percentage change of between 0.18-0.22% in the North East. This is significantly above the national average, suggesting that the North East stands more to gain from FDI.

FE Robustness checks[24]

To satisfy the core assumptions of fixed effect models, tests were undertaken for multicollinearity, the normality of residuals and homoscedasticity.

There were no signs of Collinearity in any of the variables, including FDI with VIFs all below 10 (Kennedy 2008). The Jarque-Bera (JB) test statistic is calculated to ensure that residuals are normally distributed (Greene 2011), the test statistic hypothesis is as follows:

H_0: Normally Distributed

H_1: Not Normally Distributed

The test result finds a p-value of 0.136, therefore the null hypothesis is not rejected. The data is normally distributed and residuals are distributed symmetrically around zero. White's test for heteroscedasticity is used to detect for homoscedasticity (Gujarati 2003), the test statistic hypothesis is as follows:

H_0: Homoskedasticity

H_1: Heteroskedasticity

A test result p-value of 0.420 is found as a result the null hypothesis of homoskedasticity is not rejected. The data is therefore homoscedastic where all random variables have the same finite variance. To ensure autocorrelation does not exist within the data, Wooldridge's test for autocorrelation in panel data is used (Wooldridge 2010). Whilst first-order correlation refers to the correlation between two variables at the same point in time, autocorrelation refers to the correlation between a variable and it's own lagged values. The hypothesis is as follows:

H_0: No first-order autocorrelation

H_1: first order autocorrelation

A p-value of 0.100 is found and therefore the null hypothesis is not rejected, there is no first-order autocorrelation within the model. A Durbin Watson (DW) statistic has also been produced (table 3), this refers to autocorrelation in the residuals from the model (Wooldridge 2010). In this context, the DW test has been performed as panel datasets often have heterogeneity across individuals and time periods, this can result in correlation among errors. The DW statistic 2.19, this is a relatively typical result for a dataset like what has been modelled in this paper. The result means that negative correlation exists within the dataset, which

[23] Detailed findings are in appendix E
[24] Detailed findings are in appendix D

suggests a decrease in exports in the previous period is likely to continue to fall in the next period.

In order to improve the strength of the model, time fixed effects are included through a TWFE model.

Table 4: Regional TWFE model results

	coefficient		p-value
const	0.013195		0.74515
ld_FDI	0.000978		0.917698
ld_FDI_t1	0.001953		0.872949
ld_FDI_t2	0.01041		0.445337
ld_FDI_t3	0.021226		0.098015
ld_FDI_t4	0.012501		0.2803
ld_FDI_t5	0.008217		0.352262
ld_Workforce	-0.1847		0.779331
ld_Human_capital	0.084162		0.82189
ld_GVA	-0.5249		0.556762
ld_GFCF	0.31884		0.027852
dt_2	-0.13636		0.048286
dt_3	0.034896		0.47077
dt_4	0.221968		2.27E-06
dt_5	-0.09403		0.025162
dt_6	0.007232		0.864069
dt_7	-0.05224		0.196645
dt_8	0.015844		0.70312
dt_9	0.041511		0.286045
dt_10	0.108303		0.007294
dt_11	0.042849		0.291007
LSDV R-squared	0.632825	Within R-squared	0.619379
rho	-0.28876	Durbin-Watson	2.388987

As shown in table 4, the causal relationship between goods exports and greenfield FDI continues, albeit at a lesser significance. With a coefficient of 0.02, a lag of three years is determined to be statistically significant at a 0.10 level of significance. Suggesting for a 1% increase in the percentage change of FDI, we can expect to find a 0.02% percentage change increase in exports, ceteris paribus. This positive relationship is consistent with findings from Olayiwolaand (2013) and Achandi (2011). Under the TWFE model, the impact of FDI on exports is smaller than the national and regional FEMs. The lack of significance among the variables within the TWFE suggests that the variable FDI is correlated with some time-invariant factors which also influence the dependent variable. Time effects have absorbed some of the variation in exports which were previously explained by FDI.

When estimating the TWFE model, R^2 increases to 0.633 – in other words the independent variables within the model explains 63% of the variation in exports. This is a significant improvement on the previous FE model. Bell (2014) discusses the impact of incorporating time fixed effects on R^2, he writes that time fixed effects can reduce bias and increase the accuracy of estimates through controlling for time-specific variation and unobserved heterogeneity. This

is in line with Algeiri's (2016) estimation of the drivers of exports, he uses a TWFE model and his models range from an R^2 of 0.552-0.735.

Time variables dt_4, dt_10 and dt_5 (2011, 2017 and 2012) are the most significant results within the model. Figure 3 plots EU goods exports across the UK regions, exports in regions such as London, the South East and the East of England increased significantly in the years 2011, 2017 and 2012. As a result the variables dt_4, dt_10 and dt_5 are more important in explaining the variation of exports than other years modelled.

TWFE Robustness checks[25]

Following VIF results, no signs of collinearity was found within the model across all variables. The JB statistic is also calculated to ensure the residuals are normally distributed.

H_0: Normally Distributed

H_1: Not Normally Distributed

A p-value of 0.123 was found and thus the null hypothesis was not rejected. TWFE models are more prone to heteroscedasticity than FE models – so White's test is executed.

H_0: Homoskedasticity

H_1: Heteroskedasticity

The analysis reveals a p-value of 0.214, whilst lower than the FE result of 0.420 the null hypothesis is not rejected and the dataset is therefore homoscedastic. Lastly, Wooldridge's test for autocorrelation is performed.

H_0: No first-order autocorrelation

H_1: first order autocorrelation

A p-value of 0.125 is obtained, with the test providing evidence to not reject the null hypothesis. Similarly, the Durbin-Watson TS (table 4) of 2.389 suggests negative correlation exists within the dataset – in line with the FE model.

A Comparison of the models

Analytical findings reinforce the hypothesis that greenfield FDI and goods exports share a causal relationship and are in line with findings from Xuan (2016), Leichenko (1997), Olayiwolaand (2013) to name a few. All three models find a lag of three years as the most significant, at a 0.05 significance in the FEMs and at 0.10 in the TWFE. All else equal and for a lag of three years, if the percentage change in FDI increases by 1%, we can anticipate a corresponding percentage change increase in exports within the range of 0.02-0.12%. Though the coefficient declines as sample size increases, with the national model and North Easts FDI coefficient higher than both regional models. This is because the sample size is smaller, the estimates are based on a limited amount of data, which can make them more susceptible to being influenced by outliers or other unusual observations in the sample.

The R^2 in the TWFE model was more than double that of the regional FE model, this is to be expected as it captures the time-varying effects common to the model. Whilst the R^2 within the

[25] Detailed findings are in appendix D

national FEM model was considerably larger, though it is likely that this is driven by included lags within the model.

TWFE time dummies helped to identify insignificance around independent variables as when using time-varying effects, a reduction in significance in independent variables was found. Considering that four of the coefficient estimates of the year dummies were statistically significant at the 0.05 level, it was appropriate to incorporate time-fixed effects. By eliminating potential effects that affect regions in the same manner, the use of time dummies enables a more precise analysis of the causal relationship.

In terms of the control variables analysed, just GCFC was found to be significant at 0.05 in all three models. The variable relates to the capital stock within the nation/region. It's noteworthy that as only this variable was found to be statistically significant, it implies that the other control variables included in the model are overly critical and that there is no causal relationship between exports and them. This is contrary to findings in literature, with several papers suggesting that the other control variables contribute to export performance.

5. Limitations and future research

5.1 Limitations

This papers focus on UK regions has led to a number of data limitations. Firstly in academia, there is little literature around the impact of regional FDI on UK exports – nonetheless for the impact of EU greenfield FDI on UK goods exports to the EU. It is highly likely that the lack of literature is due to the absence of data around UK regions. At a regional aggregation only goods data is published on a regular basis – services data only exists for 2019 and 2020. As referred to in the introduction, the UK is a service-based economy and thus export data on services exports would reinforce the validity of the model and expand its coverage. Using total export data would also improve this research's ability to be compared with other papers.

In a perfect scenario, all FDI flows would be included – both greenfield and brownfield; but due to data limitations, only greenfield data exists at a regional level. Though the ONS do publish total FDI flows, this is only at a national level. Greenfield FDI across the UK and its regions is incredibly volatile, which increases the risk of spurious results. Whilst precautions were taken, such as using a log difference, using total FDI would increase the robustness of this analysis. As displayed in appendix A, market seeking FDI is the most invested type of FDI, these businesses are unlikely to export. Ideally, to increase the strength of the model, market seeking FDI would be removed from the dataset.

The research being focused on a regional level also limited the options of control variables to include within the analysis. A greater range and quality of control variables could increase the robustness of the research and as a result the model. The greater quality the control variables, the more likely a stronger R^2 and better fit of the model. Similarly, the subnational focus also limited the time-period of analysis. UK regional goods exports data have only been recorded since 2008 and as a result, 2008 is the starting year of the model. Wooldridge (2010) writes about the advantages of using longer panel datasets, thus if possible a longer period of analysis would have been preferred.

5.2 Future research

If reproduced, this research could be widened to include and compare other global regions beyond the EU. Whilst this analysis had a focus on the EU, following the UKs decision to leave the European Union in 2016, research could be repeated for other global regions and compared to the EU. Perhaps FDI from Asia Pacific or North America increases exports more than FDI from the EU. This in turn could help policymakers target where best to attract FDI from. This research could also be produced at a global scale, measuring the overall impact of UK inward FDI from across the world on UK exports to the world. The recommendation would be for future research to still focus on UK regions with the purpose of increasing FDI, but altering the source country of FDI.

There is also potential for a focus on sectors in future research. Analysis into which sectors provide the best return of exports for a given investment, such as in Gu's (2008) paper. This would again help policymakers decide which areas of the economy should be prioritised for investment promotion.

6. Conclusions and policy recommendations

The purpose of this paper was to further understand, when analysing UK regions, whether additional greenfield FDI from the EU would increase the UKs goods exports to the EU. This research is the first to analyse the relationship between UK goods exports and greenfield FDI in the UK at a subnational level using panel data.

FDI facilitates the process of comparative advantage (Solow 1957) and can support businesses to produce goods or services more efficiently. Improvements in efficiency can often put firms in a better position to export and trade their goods internationally. As a result, this research hypothesised that greenfield FDI would share a positive relationship with goods exports.

This research reaffirms the complex nature of exports and its drivers, following literature where a number of findings suggest a wide range of factors drive exports. Econometric results reveal that greenfield FDI does indeed share a positive relationship with the UKs goods exports to the EU. The results indicate that if the percentage change in greenfield FDI increases by 1%, there is an expected percentage change increase in EU goods exports within the range of 0.02-0.12%; with an estimated three-year lag for FDI to take effect. This is consistent with findings from Xuan (2016) and Leichenko (1997) who find respectively a 0.13% and 0.14% increase in exports for a 1% rise in FDI.

The paper recommends that the UK government should allocate some of its resources towards investment promotion activities to support its objective of reaching £1 trillion in exports. HMG should also consider methods of targeting regions outside of London and the South East in order to contribute to the levelling up agenda. FDI was found in the North East of England to have an effect on exports above the national level, implying an expected percentage change increase in EU goods export of 0.18-0.22% for a percentage change increase of 1% in EU greenfield FDI.

It is important to note that due to data limitations, this research does not include services exports nor brownfield FDI and thus does not provide the whole picture. Therefore, these findings

should be viewed with some degree of uncertainty. In future research, it would be advisable to incorporate brownfield FDI and service exports into the analysis, and to expand the scope beyond the EU once additional regional data becomes available.

7. References

Fontagné, L., & Orefice, G. (2014). The international elasticity puzzle is worse than you think. Journal of International Economics, 94(2), 218-233. doi: 10.1016/j.jinteco.2014.06.005

Krugman, P., Cooper, R.N. and Srinivasan, T.N. (1995) "Growing world trade: Causes and consequences," Brookings Papers on Economic Activity, 1995(1), p. 327. Available at: https://doi.org/10.2307/2534577.

Kevin H. O'Rourke, Jeffrey G. Williamson (1999) Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy. https://doi.org/10.7551/mitpress/3310.001.0001

Sabir, S., Rafique, A. & Abbas, K. Institutions and FDI: evidence from developed and developing countries. Financ Innov 5, 8 (2019). https://doi.org/10.1186/s40854-019-0123-7

Solow, R. M. (1957). Technical change and the aggregate production function. The Review of Economics and Statistics, 39(3), 312-320. https://doi.org/10.2307/1926047

Dutt, A. K. (1998). Foreign Direct Investment and Productivity: Evidence from the UK Industry Level Panel Data. Applied Economics, 30(5), 557-574. doi: 10.1080/000368498324119

Dunning, J. H. (2000). The eclectic paradigm as an envelope for economic and business theories of MNE activity. International Business Review, 9(2), 163-190. doi: 10.1016/s0969-5931(99)00035-4

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. American Economic Review, 97(5), 1611-1638. doi: 10.1257/aer.97.5.1611

de Mello Jr, L. R. (1999). Foreign direct investment-led growth: evidence from time series and panel data. Oxford Economic Papers, 51(1), 133-151. doi: 10.1093/oep/51.1.133.

Ericsson, J., & Irandoust, M. (2001). On the causality between foreign direct investment and output: A comparative study. The International Trade Journal, 15(1), 1-26. doi: 10.1080/088539001300005431.

Moran, T. H. (1998). Foreign Direct Investment and Development: The New Policy Agenda for Developing Countries and Economies in Transition. Peterson Institute.

Mundell, R. A. (1957). International Trade and Factor Mobility. The American Economic Review, 47(3), 321-335.

Kojima, K. (1975) International Trade and Foreign Investment: Substitutes or Complements. Hitotsubashi Journal of Economics, 16, 1-12.

Buckley, P., Clegg, J., & Wang, C. (2002). The impact of inward FDI on the performance of Chinese manufacturing firms. Journal of International Business Studies, 33(4), 637-655. https://doi.org/10.1057/palgrave.jibs.8491037

Beck, T. (2002). Financial development and international trade: Is there a link?. Journal of International Economics, 57(1), 107-131.

Durham, J.B. (2004) Absorptive Capacity and the Effects of Foreign Direct Investment and Equity Foreign Portfolio Investment on Economic Growth. European Economic Review, 48, 285-306. http://dx.doi.org/10.1016/S0014-2921(02)00264-7

Blomström, M., Lipsey, R. E., & Zejan, M. (1992). What explains developing country growth?. NBER working paper, (4132).

UNCTAD (2019). World Investment Report: Special Economic Zones. United Nations Conference on Trade and Development.

Sakyi, D. (2015). Export performance of emerging market firms: The role of FDI intensity and greenfield investment. Journal of World Business, 50(4), 696-706.

Görg, H., & Strobl, E. (2001). Multinational companies and productivity spillovers: A meta-analysis. The Economic Journal, 111(475), F723-F739. doi:10.1111/1468-0297.00612

Xuan, N.T. and Xing, Y. (2008) "Foreign direct investment and exports the experiences of Vietnam," The Economics of Transition, 16(2), pp. 183–197. https://doi.org/10.1111/j.1468-0351.2008.00321.x.

Leichenko, R.M. and Erickson, R.A. (1997) "Foreign Direct Investment and state export performance," Journal of Regional Science, 37(2), pp. 307–329. https://doi.org/10.1111/0022-4146.00056.

Robson, P. J., Akuetteh, C. K., Westhead, P. and Wright, M. (2012), "Exporting intensity,

human capital and business ownership experience", International Small Business Journal, Vol. 30 No. 4, pp. 367-387.

Becker, G. S. (1975). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education (2nd ed.). New York: National Bureau of Economic Research.

Bloom, N., & Van Reenen, J. (2010). Why do management practices differ across firms and countries? Journal of Economic Perspectives, 24(1), 203-224. doi:10.1257/jep.24.1.203

Algieri, B., Aquino, A. & Mannarino, L. Non-Price Competitiveness and Financial Drivers of Exports: Evidences from Italian Regions. Ital Econ J 4, 107–133 (2018). https://doi.org/10.1007/s40797-016-0047-6

Odigwe, F. N., Agu, C. I., & Udeh, S. N. (2019). Foreign direct investment, non-oil exports, and economic growth in Nigeria: A causality analysis. International Journal of Business and Society, 20(S3), 83-98

Selim, N., Sadiku, L., Kushtrim, R. (2016). The impact of FDI on the export performance: Empirical evidence for Western Balkan countries ILIRIA International Review, 6 (1), 57 66. https://doi.org/10.21113/iir.v6i1.235

Gu, Weishi & Awokuse, Titus O. & Yuan, Yan (2008). "The Contribution of Foreign Direct Investment to China's Export Performance: Evidence from Disaggregated Sectors," 2008 Annual Meeting, July 27-29, 2008, Orlando, Florida 6453, American Agricultural Economics Association (New Name 2008: Agricultural and Applied Economics Association).

Sultan, Zafar (2013) "A Causal Relationship between FDI Inflows and Export: The Case of India." Journal of Economics and Sustainable Development, vol. 4, pp. 1-9.

Prasanna, N. (2010). Impact of Foreign Direct Investment on Export Performance in India. Journal of Social Sciences, 24, 65-71.

Achandi, E. L. (2011). Effect of foreign direct investments on export performance in Uganda. Uganda: Makerere University.

Aurangzeb, & Ul Haq, A. (2012). Impact of foreign capital inflows on economic growth in Pakistan. European Journal of Economics, Finance and Administrative Sciences, (46), 6-12.

Sultanzzaman, Md. R., Fan, H., & Wang, B. (2018). The role of FDI inflows and export on economic growth in Sri Lanka: An ARDL. Approach, Cogent Economics and Finance, 6(1).

Sharma, K. (2000). Export growth in India: Has FDI played a role. Yale University Economic Growth Center Discussion Paper, No. 816. Available online at: http://www.econ.yale.edu/~egcenter/EGCdp3.htm

Golberg, S., & Klein, W. (1998). Foreign Direct – Investment, Trade and Real Exchange Rate Linkages in Developing Countries, in Reuben Glick (Ed) Managing capital flows and Exchange Rates: Lessons from the pacific Basin. Cambridge University Press. 5th Edition.

Helpman, E., Melitz, M. J., & Yeaple, S. R. (2004). Export versus FDI with heterogeneous firms. American Economic Review, 94(1), 300-316.

Barhoumi, K., & Dridi, J. (2020). Foreign aid and economic growth in African countries: A panel VAR approach. Economic Analysis and Policy, 68, 235-249. doi: 10.1016/j.eap.2020.10.001

Asongu, S. A., & Nwachukwu, J. C. (2016). The role of governance in mobile phones for inclusive human development in Sub-Saharan Africa. Technological Forecasting and Social Change, 102, 89-110. doi: 10.1016/j.techfore.2015.09.018

Lee, Y., & Tcha, M. (2016). Foreign direct investment and export performance: The mediating role of domestic investment. Journal of International Trade & Commerce, 12(5), 87-109.

Wang, Z., & Wei, S. J. (2009). What accounts for the rising sophistication of China's exports? (No. w14768). National Bureau of Economic Research.

United Nations Conference on Trade and Development (UNCTAD). (2018). World Investment Report 2018. https://unctad.org/system/files/official-document/wir2018_en.pdf

International Monetary Fund (IMF). (2002). Foreign Direct Investment in Developing Countries: What Economists Don't Know and What Policymakers Shouldn't Do. https://www.imf.org/en/Publications/WP/Issues/2016/12/30/Foreign-Direct-Investment-in-Developing-Countries-What-Economists-Dont-Know-and-What-3472

Baltagi, B. (2005). Econometric Analysis of Panel Data, 3rd edn. Wiley, Chichester, England.

Wooldridge, J.M. (2010). Econometric analysis of cross section and panel data. The MIT Press.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis (7th ed.). Prentice Hall.

Greene, W. H. (2011). Econometric Analysis (7th ed.). Upper Saddle River, NJ: Prentice Hall

Gujarati, D. N. (2003). Basic Econometrics (4th ed.). New York: McGraw-Hill/Irwin

Kennedy, P. (2008). A Guide to Econometrics (6th ed.). Malden, MA: Blackwell Publishing.

8. Appendices

Appendix A: Motive & Location determinants from EU FDI into the UK (2003-2022)

Motive	Projects	% of FDI Projects	Companies	% of Companies
Proximity to markets or customers	406	40.2	382	45.0
Domestic market growth	341	33.7	289	34.0
Skilled workforce availability	186	18.4	158	18.6
Transport infrastructure	122	12.0	110	12.9
Industry cluster	103	10.2	99	11.6
Other	**363**	**35.1**	**346**	**40.2**

Appendix B: Modelled variables

Variable	Source	
	National	**Regional**
Trade in Goods	HMRC Regional Trade Statistics	
Greenfield FDI	fDi Markets	
Workforce	ONS	
Human capital	Stats Wales – Proportion of population qualified to level 4 or above	
Productivity	OECD – GDP per hour worked	ONS – Regional Gross Value Added
Gross Fixed Capital Formation (GFCF)	ONS – Gross fixed capital formation	

Appendix C: AIC and BIC criteria

P	R2	AIC	BIC
1	0.05136	2457	2463
2	0.08952	2242	2250
3	0.1285	2041	2053
4	0.1265	1844	1857
5	0.1737	1639	1654

Appendix D: Robustness checks

Collinearity test[26]:

Variable	Variation Inflation Factors		
	National FEM	Regional FEM	Regional TWFE
ld_FDI		1.747	2.168
ld_FDI_t1	3.21	2.719	3.397
ld_FDI_t2	8.726	3.32	4.362
ld_FDI_t3	1.575	3.229	4.101
ld_FDI_t4	4.003	2.684	3.287
ld_FDI_t5	2.684	1.701	2.217
ld_Workforce	21.003	1.733	2.305
ld_Human_capital	2.957	1.122	1.388
ld_Productivity	5.403	2.382	4.052
ld_GFCF	18.277	1.776	2.243
dt_2			5.889
dt_3			3.091
dt_4			2.626
dt_5			2.369
dt_6			2.467
dt_7			2.207
dt_8			2.385
dt_9			2.077
dt_10			2.175
dt_11			2.254

Other robustness tests:

Test	P-value		
	National FEM	Regional FEM	Regional TWFE
White's test		0.420	0.214
Wooldridge test		0.100	0.125
Jarque-Bera test	0.223	0.135	0.123

[26] *Where the minimum value is 1.0 and values >10 indicate a collinearity problem.*

Appendix E: FEM Results in the North East

	coefficient	std. error	t-ratio	p-value
const	0.046574	0.024354	1.912409	0.306723
ld_FDI_t1	-0.09917	0.022282	-4.45071	0.140701
ld_FDI_t2	-0.04678	0.022553	-2.07412	0.286002
ld_FDI_t3	0.17594	0.021401	8.221104	0.077059
ld_FDI_t4	0.224733	0.029293	7.67182	0.082516
ld_FDI_t5	0.111543	0.018944	5.887991	0.1071
ld_Workforce	3.239022	0.832927	3.888722	0.160237
ld_Human_capital	-2.951	0.628689	-4.6939	0.133629
ld_GVA	-0.22206	0.775612	-0.28631	0.822481
ld_GFCF	1.521388	0.171251	8.883974	0.071359