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Brexit had no measurable effect on Irish exporters

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Brexit Had no Measurable Effect on Irish Exporters

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Brexit Had no Measurable Effect on Irish Exporters*

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This version: August 15, 2024

We study the impact of the Brexit referendum on Irish exporters to the UK. The referendum triggered a sharp devaluation of the British pound vis-a-vis the euro and led to considerable uncertainty about future trade relations between the UK and the EU. Using administrative data on the universe of Irish exporters, we compare exporters with different levels of exposure to the UK market before the referendum. Our findings do not point to a significant effect of the referendum on Irish exporters. Over the period 2015-2021, the firms least exposed to the UK — but most internationalised otherwise — had considerably higher exit rates from exporting to the UK and from the market overall. They also saw greater declines in employment and sales compared to more exposed firms. We do not find significant differences for export volumes to the UK or elsewhere or for average wages. These findings are robust to controlling for a variety of firm characteristics.

Keywords: Brexit, firm performance, Trade, Wages, Employment

JEL Codes: E65, F02, F13, F14, F15, F16, F31, F40

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1 Introduction

In today's interconnected global economy, political shocks can easily spread across borders. In the presence of strong trade linkages, political events in one country have the potential to significantly impact the economies of its trading partners. To reduce the vulnerability of firms and consumers to external shocks, policymakers need to understand the international consequences of national shocks and the mechanisms through which they are transmitted.

This paper focuses on the policy uncertainty created by the unexpected result of the Brexit referendum in June 2016, when the majority in the United Kingdom (UK) voted in favor of leaving the European Union (EU). The first, immediate, effect of the referendum was a 5.8 percent depreciation of the pound against the euro. The second effect of this shock was a prolonged period of uncertainty about the future of UK-EU political and trade relations. More than three years after the referendum the UK had still not left the EU and the future of UK-EU relations remained unclear until a last minute deal in late December 2020 prevented a 'disorderly' Brexit. Without this deal — the Trade and Cooperation Agreement (TCA) — which kept tariffs at zero, trade between the UK and EU would have been governed by WTO most-favored nation tariffs from January 1, 2021.

In this paper, we examine the impact of the Brexit referendum on firm-level outcomes of Irish exporters to the UK. Ireland is a prime example of a small open economy that has strong ties with the global economy. Due to its geography and colonial history, the UK to this day remains one of Ireland's largest trading partners, with 14 percent of Irish goods exports going to the UK in 2015. Moreover, Ireland is the only country that shares a land border with the UK. Given the profound changes brought about by the Brexit referendum, economic theory would predict that Irish exporters would be adversely affected by the exchange rate and uncertainty shocks.

Using administrative data, we investigate whether Irish exporters with a higher level of exposure to the UK pre-Brexit experienced differential effects in terms of export volume, exit from exporting, sales, employment, wages, and profitability relative to firms with less exposure. By combining information from firm censuses, customs trade records, and administrative income tax data we can track the universe of firms that exported goods to the UK between 2013 and 2015 over the post-referendum period to 2020/2021. We measure a firm's exposure to Brexit as the share of total exports going to the UK between 2013 and 2015 and group firms into quintiles according to this measure.

We restrict our analysis to firms with positive exports to the UK in 2013, 2014, and 2015 and focus

on the effect of the Brexit referendum in the years 2016-2020. For some outcomes we have information for 2021, the first year post-TCA. Theory would predict that the impact of the depreciation and the trade policy uncertainty post-referendum are likely to affect firms' trading patterns. If these trade effects are strong enough, they may impact firm performance and affect workers within these firms. As a result, we will examine both the trade outcomes and fundamentals of these firms, including export volume to the UK, total export volume, exit from exporting to the UK, exit from exporting, sales, employment, average wages, and profitability. For each year after the referendum we regress the deflated log difference of each of our outcome variables between that year and 2015 on a set of dummy variables that capture the firm's level of exposure to the UK.¹ That is, we estimate the differential impact on firms by exposure quintile over the post-referendum period while holding the pre-referendum exposure constant.

Our results do not point to a significant effect of the Brexit referendum on Irish exporters in the five years following the referendum. We find that the firms with a *lower* exposure to the UK were more likely to exit from exporting — to the UK and generally — in 2016 and 2017. These firms also decreased their exports to the UK relative to 2015, but this occurred only in 2020 and 2021, once the uncertainty surrounding Brexit was nearly resolved. We do not find differential effects on sales, employment, average wages, and profitability. The differences in exit rates suggest that exits were more common among firms for which the UK is a marginal export market. These firms tend to be large foreign-owned firms that export to many destinations besides the UK and they responded immediately to the Brexit referendum and the TCA. In contrast, firms with higher exposure to the UK market tend to be smaller and Irish-owned; these firms did not respond to sudden changes in the economic and political environment. Once we control for firm size and foreign ownership, the difference in exit rates is considerably smaller. In light of the small effect on trade outcomes, it is not surprising that Brexit did not translate into significant changes in terms of firm fundamentals.

Our results relate to and can be rationalised by two strands of literature: First, the literature on preferential trade agreements, which includes studies on trade and economic disintegration, Brexit, and the effects of trade policy uncertainty. Secondly, it relates to the literature on exchange rates and trade outcomes, exchange rate pass-through and pricing-to-market, as well as the international elasticity puzzle which examines the impact of exchange rate and trade shocks on exports prices, revenue, entry and exit. We discuss each of these literatures in turn.

¹In the exit regressions, we use a dummy indicating whether the firm is still exporting (to the UK) in that year as the dependent variable.

The literature on preferential trade agreements (PTAs), summarised in [Limão \(2016\)](#), by and large concludes that although there is trade diversion, trade flows between the signatories of trade agreements do increase. Recent work by [Ptashkina \(2022\)](#) suggests that there are no anticipation effects of PTAs for the parties involved and the full effects only materialise over the medium to longer term (5-15 years after implementation). Work examining the disintegration of the Soviet Union, Yugoslavia, Czechoslovakia ([Djankov and Freund, 2002](#), [Fidrmuc and Fidrmuc, 2003](#), [De Sousa and Lamotte, 2007](#)), and changes to country borders in Europe following World War I ([Heinemeyer, 2006](#)) and the breakup of the Austro-Hungarian Empire ([de Ménil and Maurel, 1994](#)) found that despite a sharp decline in trade intensity following these events, home bias with strong trade links persisted for some time. In other words, it takes time for the full benefits of trade agreements to materialise, and it also takes time for these benefits to dissipate.

The existing research on Brexit, as summarised by [Bloom et al. \(2019\)](#) and [Dhingra and Sampson \(2022\)](#), points to significant negative effects on the UK economy in terms of prices, wages and investment even before the UK left the EU. However, recent studies examining the impact on trade outcomes for firms in other European trading partners of the UK have identified no or minor effects for the period between 2015 and 2020. On the other hand, there have been substantial effects on trade outcomes post-TCA. For instance, [Fernandes and Winters \(2021\)](#) suggest that Portuguese exporters to the UK reduced both export volumes and export prices in the UK market during the immediate post-referendum period. [Martin et al. \(2019\)](#) do not find this to be the case for French exporters. Both papers find that the probability of product entry decreased post-referendum. [Flynn et al. \(2021a\)](#) and [Kren and Lawless \(2022\)](#) provide evidence of small reductions in UK-EU trade post-referendum, but much more substantial effects in the first six months post-TCA. Similar results are obtained by [de Lucio et al. \(2023\)](#) for Spanish exporters to the UK. In these cases, the reduced probability of product market entry and the increase in the probability of product market exit are 10 times higher post-TCA than in the interim post-referendum period. Analysing product-level trade data for Ireland, [Flynn et al. \(2021b\)](#) find that Irish exports to the UK declined by around 18 per cent in the post-referendum period, but no further after the TCA. They also provide evidence of trade diversion effects from direct trade with Great Britain (GB) to indirect trade via Northern Ireland (NI).²

The literature on the economic effects of uncertainty associated with the formation or dissolution of trade agreements indicates that policy uncertainty largely affects the extensive margin of trade,

²Post-referendum the decline in exports is fully attributable to exports to GB, post-TCA the coefficient on exports to GB is negative but not statistically significant, in turn, exports to NI increased by about 42 percent.

especially the entry margin, and to a much lesser extent — if at all — the intensive margin (Limão and Maggi, 2015, Handley and Limão, 2015, 2017, Crowley et al., 2018, 2020). This finding is consistent with Bernanke (1983) who was the first to show that potential new entrants can avoid potential losses in a future possible bad state by waiting. Models with sunk costs of export market entry *à la* Melitz (2003) may also explain reduced entry in periods of uncertainty. On the other hand, models where demand can grow with experience in the export market from customer accumulation or habit (e.g. Fitzgerald et al. (2023), Piveteau (2021), Rodrigue and Tan (2019), Ruhl and Willis (2017)) instead generate small continuation costs.³

The research on exchange rate uncertainty and trade flows has produced inconclusive findings regarding the direction of the effect — see Bahmani-Oskooee and Hegerty (2007) for a survey. Recent contributions such as Caldara et al. (2020), Merga (2023) also generate predictions in either direction. Studies on exchange rate pass-through and pricing-to-market suggest that pass-through of exchange rate changes into prices and trade outcomes is limited to firms that account for the highest shares of trade and absorbing more of the exchange rate variation (e.g. Gopinath and Rigobon (2008), Berman et al. (2012), Amiti et al. (2014), Fitzgerald and Haller (2014), Li et al. (2015)).⁴ In the limiting case Fitzgerald and Haller (2014) find zero pass-through for Irish exports to the UK. This means that Irish exporters fully absorb exchange rate changes when prices change.

Recent empirical studies on the international elasticity puzzle find that changes in tariffs have a greater impact on export prices, revenue, entry and exit at the firm level than changes in exchange rates (Fitzgerald and Haller, 2018, Fontagné et al., 2018). Ruhl (2008) rationalises this finding in a model where exchange rate changes are temporary shocks, whereas tariff changes are permanent. At the extensive margin, temporary shocks do not result in firms changing their export status while tariff reductions induce some non-exporters to start exporting. Furthermore, Fitzgerald and Haller (2018) show that the adjustment to tariff changes takes time.

A common theme in much of the above work is that firms do respond to uncertainty, but mostly on the extensive margin. Our results on increased exit rates in the post-referendum period are in line with these predictions. What is surprising is that in our case, it is firms with the lowest export exposure to the UK where we see an effect. These are the ones most likely to be large foreign-owned and exporters to other destinations. These firms have outside options, which is why they are presumably quicker to adapt to uncertainty. Relatedly, Huang et al. (2023) shows that the

³Steinberg (2019) combines both approaches in a broader model of the macroeconomic effects of Brexit.

⁴Burstein et al. (2005) study the effects of large exchange rate changes and find that prices are slow to adjust.

Japanese affiliates in the UK reduced their sales, investment, employment, sourcing in the UK, and productivity post-referendum and before the TCA. We conclude that these more footloose firms are either quicker to adapt to or more sensitive to uncertainty. Another re-emerging theme in the above literature is that even when there is certainty on the changed conditions for trade, the adjustment takes time — both in the case of trade integration and trade dissolution. Our results document reduced export values once the TCA was (nearly) implemented, as is also shown in studies on the responses of exporters from other countries to the UK (Fernandes and Winters, 2021, Flynn et al., 2021a, Kren and Lawless, 2022, de Lucio et al., 2023). Their findings likely only capture the tip of the iceberg of what is yet to come in terms of adjustments. It makes sense that we do not observe an effect on firm fundamentals (wages, employment, sales, profitability), as such changes would unfold gradually over a medium to longer-term horizon.

Our key contribution is to examine the effects of uncertainty and trade disintegration on granular trade outcomes as well as on firm fundamentals in a unified framework. Combining these two perspectives is central to assess how trade shocks impact firm-level and economy-wide outcomes. Our research shows that the minor adjustments in terms of trade outcomes observed during the period of uncertainty after the Brexit referendum did not result in significant changes in terms of employment, sales, wages or profitability for Irish exporters by the end of the first year after the Trade and Cooperation Agreement entered into force. The key lesson from our work for policy makers is to decide on new parameters as soon as possible following disruptive events like the Brexit referendum, to provide planning security for firms.

The remainder of this paper is structured as follows: Section 2 summarises the institutional context and aggregate trends for Ireland. Section 3 provides a description of the data sets used, measurement, definitions, summary statistics and shows time series for firms with different levels of exposure to the UK market. In Section 4 we present regression results. Section 5 provides additional results and robustness checks. Section 6 concludes.

2 Brexit and the Irish Economy

2.1 Institutional Background

In a speech at Bloomberg in London on January 23, 2013, the then-UK Prime Minister, David Cameron, announced his support for a referendum on the UK's future in the EU. This referendum was held on

June 23, 2016. Opinion polls had predicted a close outcome, but the odds at betting agencies were much higher for a 'leave' than a 'remain' vote (Sampson, 2017), meaning that bookmakers considered a 'remain' vote to be much more likely. However, the referendum's outcome, with a 51.9 per cent 'leave' vote, took the public and markets by surprise and triggered sharp declines in both the UK's stock market and the value of the British pound.

Although the UK's relationship with the EU did not change immediately after the leave vote, the decision caused considerable uncertainty for more than three years. The UK went through sustained political drama involving three UK Prime Ministers and lengthy negotiations with the EU. Finally, in October 2019, a withdrawal agreement between the UK and the EU was agreed. On January 31, 2020, the UK formally left the EU and entered a transition period until December 31, 2020. Negotiations for the future relationship between the UK and the EU had to be concluded before this deadline. After much negotiation, an agreement was finally reached and ratified by both parties only a few days before the deadline of December 31, 2020. On this day, the UK officially left the EU Single Market and Customs Union, and on January 1, 2021, the new Trade and Cooperation Agreement (TCA) came into effect.

One of the major challenges in the Brexit negotiations was to establish customs procedures for Northern Ireland without constructing control posts at the border with Ireland. After Brexit, Northern Ireland was no longer part of the EU and the introduction of physical border infrastructure was considered a threat to peace in the region and a violation of the Good Friday Agreement of 1998. The eventual solution was to maintain access to both the UK and EU for Northern Ireland for customs purposes and to introduce a sea border to facilitate customs procedures for products traded between Great Britain and Northern Ireland and destined for the Republic of Ireland or the EU. The TCA maintained zero quotas and tariffs between the UK and the EU. However, the TCA also introduced several non-tariff barriers to trade, such as customs checks, sanitary and phytosanitary restrictions on trade in animal and plant products, as well as the need to provide separate regulatory compliance in the UK and the EU.

Walker (2021) provides a comprehensive timeline of important political events from the origins of the Brexit vote to the UK's exit from the EU Single Market; Dhingra and Sampson (2022) and Flynn et al. (2021a) provide shorter accounts. Lawless (2020) sets out the history and institutional background for relations between the UK and Ireland; Murphy (2022) explains the political economy background on the importance of Northern Ireland in the negotiations; O'Rourke (2019) puts Brexit

into historical context.

2.2 Ireland: Economic Trends 2010-2022

Figure 1 displays macroeconomic trends in Ireland from 2010 to 2020. Panel (a) shows Irish Modified GNI (also called GNI*) per capita in constant prices chain linked annually and referenced to the year 2021.⁵ GNI* per capita was 35,000 EUR in 2010. It declined slightly in 2012 and subsequently rose steadily each year, reaching 44,000 EUR per capita in 2019. In 2020, the first year of the COVID pandemic, GNI* declined.

Panel (b) shows the seasonally adjusted quarterly unemployment rate for 15 to 74-year-olds. Unemployment increased from 14 percent in Q1 2010 to 16 percent in Q4 2012. It subsequently decreased or remained steady in every quarter until Q4 2019 to a low of 4.8 percent. The unemployment rate increased in 2020, reaching 7.3 percent in Q4 2021. It subsequently declined to 4.1 percent in quarter 4 2022.

Panel (c) displays the daily GBP/EUR nominal exchange rate. At the start of 2010, one pound was worth 1.12 EUR. The pound strengthened against the EUR in the subsequent six years, albeit with considerable fluctuations. On 23 June, the day of the Brexit referendum, the pound was worth 1.31 EUR. The following day, the pound weakened to 1.24 EUR. It weakened further in the subsequent years, mostly fluctuating between 1.1 and 1.2. It stood at 1.13 EUR at the end of 2022.

Panel (d) shows Irish exports to the UK, to the EU 27 and to other destinations. Exports to the UK were worth 14.0 billion in 2010. Exports to the UK grew in the subsequent two years to 15.2 billion in 2012. The following two years saw declines, with exports at 13.7 billion in 2014. Exports increased to 15.6 in 2015, but declined to 15.1 in 2016. Exports to the UK grew and declined in the subsequent years, standing at 14.7 billion in 2020, 5 percent higher than they were in 2010. The years 2021 and 2022 saw considerable growth to 22.2 billion, 58 percent higher than in 2010.

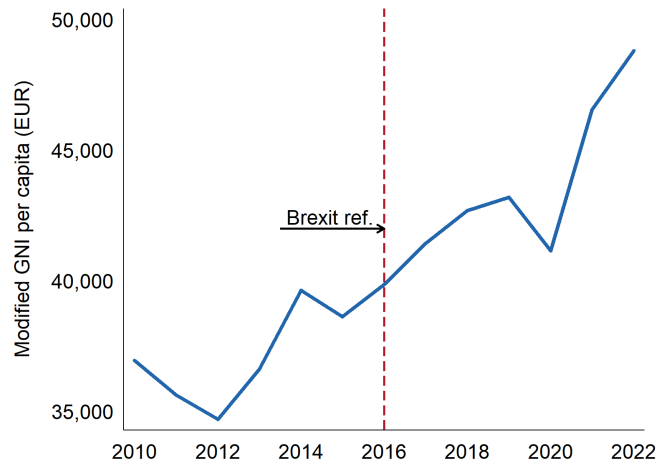
Irish exports to the EU 27 amounted to 38.7 billion EU in 2010. These increased at a greater rate than exports to the UK. With the exception of a small decline in 2013 and during 2020, exports to the EU 27 increased every year during the period and were 80.5 billion by 2022. Exports to the EU 27 were 108 percent higher in 2022 than they were in 2010.

Exports to other destinations grew the most over the period. At 38.2 billion, these were approximately the same level as exports to the EU 27 in 2010, and continued to be so until 2014. From this

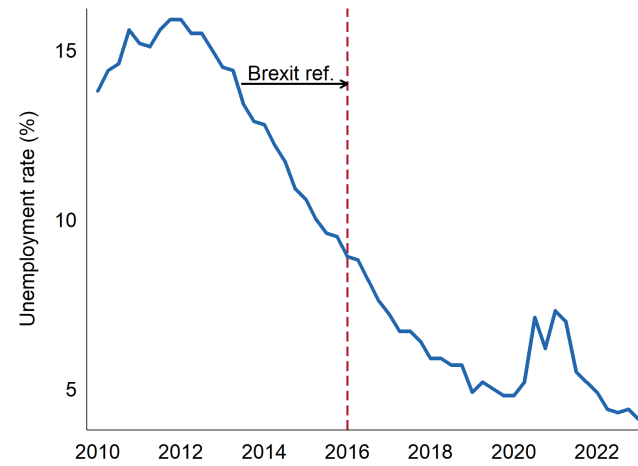
⁵GNI* reflects the income standards of Irish residents more accurately than GDP (Timoney, 2023).

year onwards, exports to other destinations grew much more rapidly than the EU 27. Exports to other destinations was worth 105.9 billion in 2022, 177 percent higher than in 2010.

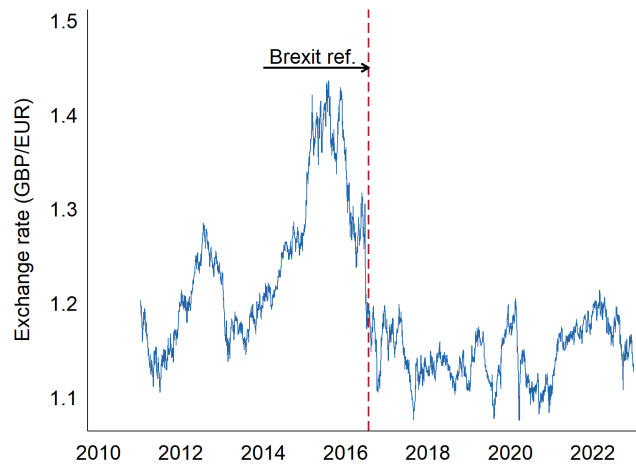
Panels (a), (b), and (d) do not point to an immediate structural break following the Brexit referendum. The drop in the Sterling/Euro exchange rate did not trigger a concurrent drop in exports or GNI*. However, it is possible that impact of the referendum unfolded gradually, or at a more granular level, which would be more difficult to detect in aggregate time series. For this reason, we perform a more systematic analysis and compare firms that were differentially exposed to the UK market before the referendum.



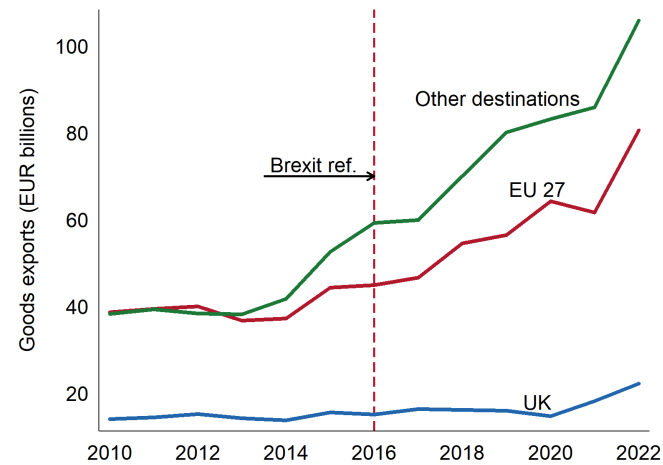
(a) Modified GNI per capita



(b) Unemployment rate



(c) Nominal exchange rate GBP/EUR



(d) Goods exports

Figure 1: Economic Trends in Ireland, 2010-2022

Notes: This figure displays macroeconomic trends in Ireland for 2010 to 2020. Modified GNI (also called GNI*) per capita is measured annually in chain linked constant prices. The quarterly unemployment rate covers 15 to 74 year-olds and is seasonally adjusted. The nominal exchange rate refers to the daily GBP/EUR rate. Sources: Central Statistics Office, Ireland and the European Central Bank (exchange rate data).

3 Data and Descriptive Statistics

Studying the impact of an external shock on Irish firms requires detailed information on a firm's potential exposure to the shock. To obtain this information, we take advantage of a unique feature of Irish administrative data, namely the possibility to link firm data with data on exports. In this section, we explain how we construct the dataset and how we measure a firm's exposure to the UK market.

3.1 Data and Estimation Sample

We use four separate confidential micro datasets provided by the Central Statistics Office (CSO) in Ireland for the period from 2012 to 2022. The first is the *Census of Industrial Production (CIP)*, which is an annual census of firms in manufacturing, mining and utilities. We use data on sales, production value and profits (gross profits before tax).⁶ We restrict the sample to firms in the mining and manufacturing sectors (NACE Rev 2.1 sectors 05 to 33).

The second data source is the customs data of Irish exports and imports, which is collected by the Irish Revenue Commissioners (tax authorities). The raw data are reported at the level of VAT numbers and are aggregated to the level of the firm by the CSO. These records provide us with the value (in EUR) and volume (in tonnes) of trade at the firm level by product category (CN 8 digits) and export destination. The data for intra-EU and extra-EU trade are collected separately through the Intrastat and Extrastat systems. The mandatory reporting threshold for intra-EU exports is 635,000 EUR per year in total shipments within the EU, the threshold for extra-EU exports is 254 EUR per transaction. The remaining intra-EU exports are captured through a regular VAT return, on which all traders are required to record the total value of goods imported from and exported to other EU countries. We only use the information on exports and aggregate over products to the firm-country-pair level. We match this data to the firms in the CIP using a firm identifier. We deflate the data on exports, wages, sales and profitability by regressing them on year dummies and use the residuals in the subsequent analysis.

Our third data source is the *CSO Business Register*, which contains information on firm characteristics. The CSO Business Register covers all firms in Ireland and is based on data collected

⁶*Production value* is computed as sales + capital work done for own use – goods for resale without further processing + change in finished goods stock + change in work in progress stock. Profits are computed as production value – intermediate consumption – labour costs.

Intermediate consumption is computed as materials acquired + fuel used + R&D services supplied to enterprises + industrial services acquired + non-industrial services acquired + change materials stocks + change in fuel stocks.

by the Irish Companies Registration Office. All firms in Ireland are required to register with the Companies Registration Office and file an annual return with them. Firms that are incorporated outside Ireland and establish a subsidiary within Ireland must also register an Irish firm with the Companies Registration Office. We use the Business Register data on whether firms are subsidiaries of foreign multi-national enterprises (MNEs) and match it with the Census of Industrial Production using a unique firm identifier. Foreign MNEs are defined as companies that are subsidiaries of a parent firm abroad with an ownership stake of more than 50 per cent.

Finally, we obtain the number of formal workers and their wages from the *SPP35* dataset, covering the years 2012 to 2018, and from the *PMOD* dataset thereafter. Wages are defined as annual real wages in euro, including benefits in kind and pension contributions. The wages are deflated using the Consumer Price Index. This administrative dataset is based on tax records that employers filed on behalf of their workers through an income tax form called P35 to the Irish Revenue Commissioners. Since 2019, the P35 dataset was replaced by the *PMOD* (PAYEModernisation) dataset, based on a real-time tax reporting system that replaced the annual P35 form. *PMOD* contains all of the variables available in the *SPP35* dataset and is comparable. We combine this information with additional worker characteristics from the Irish Department of Social Protection's *Client Record System* using a unique worker identifier. We use this dataset to count the number of workers per firm as well as to calculate hiring and separation rates and link this to the other datasets using a unique firm identifier.

We choose as our estimation sample all Irish mining and manufacturing firms that have consistently exported goods to the UK in the run-up to the referendum, between 2013-2015. The sample excludes firms that exclusively export services, although it does include firms that export both goods and services. In total, our sample consists of 639 Irish firms that exported to the UK between 2013-2015. To the extent that a firm did not exit the market at some point, we observe each firm up until 2022. We observe wages and employment until 2022. Profitability, sales and exports are available to us up to 2021. We only observe UK exports split by Northern Ireland and Great Britain until 2019.

3.2 Measuring Exposure to Brexit

To measure a firm's exposure to Brexit, we consider the percentage of its total exports that were sent to the UK before the referendum. We construct the measure based on the value of exports and take the average share of exports to the UK in total exports in the three years leading up to the referendum (2013-2015):

$$exposure_i = \frac{1}{3} \sum_{t=2013}^{2015} \frac{\text{Exports to UK}_{it}}{\text{Total exports}_{it}}. \quad (1)$$

With this measure, we consider firms that generate most of their export revenue from sales to the UK as highly exposed, whereas firms that export mostly to other destinations are considered less exposed. In the regressions, we use dummy variables based on the quintiles of this distribution as the main regressors. As we will show, firms with different levels of exposure have very different characteristics. Using dummies rather than a continuous measure helps us to analyse whether firms with different levels of exposure experienced different effects of the Brexit referendum. In robustness checks, we also present results based on quartile and tercile dummies as well as exposure as a continuous variable.

The measure in (1) may not fully capture the importance of UK exports for a given firm because it only considers the total value of exports. This means that it does not include a firm's overall sales. For instance, a firm might be considered highly exposed if all its exports go to the UK. However, these exports may reflect only a small fraction of the firm's total sales. To address this issue, we account for differences in sales volumes in our regression framework in two ways, namely by taking first differences in the outcome — after vs. before the referendum — and by controlling for firm characteristics.

Figure 2 displays the distribution of the exposure to the UK across all firms in the sample, ranging from just above 0 percent to 100 percent. The distribution appears bi-modal. For a significant share of Irish exporters, only a small share of total exports goes to the UK. There are relatively few firms with export shares of around 50 percent going to the UK. However, many firms have the UK as their only export destination. As we will show in Section 3.3, firms with high shares of exports going to the UK are usually smaller in terms of number of employees and sales, and Irish owned.

3.3 Descriptive Statistics

Table 1 presents the descriptive statistics for all 639 Irish firms that consistently exported to the UK between 2013 and 2015. To preserve confidentiality, we report the 5th and 95th percentiles of the distribution instead of the minimum and maximum. For the average firm, the total value of exports to the UK was around 9.2 million EUR, which accounts for 53 per cent of their total exports and 26 per cent of total sales. The comparison of means and medians shows that the distribution of

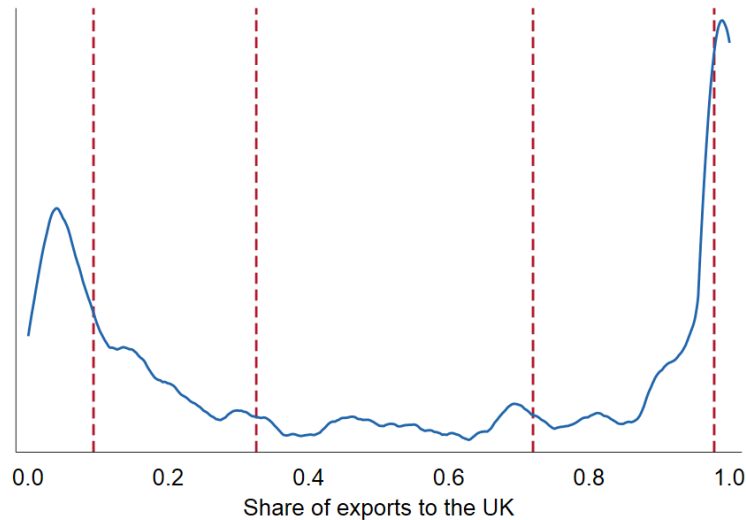


Figure 2: Pre-referendum Exposure to the UK Market

Notes: This figure displays the distribution of export exposure to the UK market defined in Section 3.2 across all 639 firms in the sample that exported to the UK in all years from 2013 to 2015. The measure is computed as the average share of UK exports to total exports in value terms between 2013 and 2015. The dashed red lines indicate the boundaries between the quintiles of the distribution. Source: Own calculations based on the data described in Section 3.1.

export values and sales is heavily right-skewed, indicating that some firms sell or export goods of very large value. The variable firm age indicates that, in 2015, the average firm in our sample had been incorporated in Ireland for 29 years, has 133 employees, pays a mean wage of 38,461 EUR, and makes an annual profit of 23m EUR. 38% of all exporters to the UK are foreign-owned. We also report profitability, which is calculated as profits divided by production value. The average firm's profitability is 12%.

Table 2 shows the average characteristics of firms in different quintiles of the exposure distribution. Several interesting patterns emerge here. Firms with a high share of exports to the UK are also on average more exposed in terms of their sales: in the lowest quintile, a mere 3% of total sales are exported to the UK, whereas in the two highest quintiles, this number stands at 40% and 43%, respectively. Another pattern is that firms in the middle quintile have the highest absolute value of exports to the UK. The value of annual exports to the UK is less than 10m EUR in quintiles 1, 4, and 5, and over 14m EUR in quintile 3. This pattern is explained by the fact that firms in higher quintiles tend to be smaller. On average, firms in quintiles 4 and 5 have fewer employees, pay lower average wages, have lower export and sales volumes, and are less likely to be foreign owned compared to firms in lower quintiles. Despite a steep gradient in profits — with more exposed firms having lower profits — there is little variation in profitability; in all quintiles, average profitability is around 35%.

Table 1: Descriptive Statistics of Firms

	Mean	SD	Median	p5	p95
UK exports/total exports	53%	39%	54%	1%	100%
UK exports/sales	26%	25%	18%	1%	79%
Total exports (1,000 EUR)	48,230	256,285	6,133	563	150,676
UK exports (1,000 EUR)	9,226	25,068	2,204	88	41,458
Sales (1,000 EUR)	80,748	375,381	13,881	1,960	282,195
Firm age (years)	29	17	27	9	64
Firm size	132	317	57	9	467
Foreign-owned firm	38%	49%	0%	0%	100%
Firm mean wage (EUR)	38,461	11,659	35,770	24,699	62,721
Profits (1,000 EUR)	23,740	177,459	1,170	-1,036	44,656
Profitability	12%	24%	10%	-7%	43%

Notes: This table shows the characteristics of firms in 2015 at the mean, standard deviation, median, fifth and 95th percentile. This refers to all 639 Irish firms that continuously exported to the UK between 2013 and 2015. Firm size refers to the number of workers in firm. Source: Own calculations based on the data described in Section 3.1.

Table 2: Descriptive Statistics of Firms by Quintile

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
UK exports/all exports	4%	21%	54%	89%	100%
UK exports/sales	3%	14%	31%	40%	43%
Total exports (1,000 EUR)	95,464	96,297	30,910	10,625	7,539
Other exports (1,000 EUR)	91,851	84,453	16,895	1,498	22
UK exports (1,000 EUR)	3,612	11,844	14,014	9,127	7,517
Sales (1,000 EUR)	144,146	158,384	47,874	27,333	25,571
Firm age (years)	29	27	30	29	31
Firm size	171	207	120	92	71
Foreign firm	70%	43%	30%	26%	20%
Firm mean wage (EUR)	43,270	39,302	36,885	36,884	35,946
Profits (1,000 EUR)	57,431	50,422	4,091	2,601	4,002
Profitability	13%	11%	12%	10%	12%

Notes: This table shows the characteristics of firms in 2015 by quintile for all 639 firms in the sample. These firms continuously exported to the UK between 2013 and 2015. Firm size refers to the number of workers in firm. Source: Own calculations based on the data described in Section 3.1.

3.4 Trends in Exporting and in Firm Fundamentals

Figures 3 and 4 illustrate trends in outcomes before and after the Brexit referendum for firms with different levels of pre-referendum exposure to the UK market. The figures are based on the estimation sample and only include Irish firms that exported to the UK in the all three years from 2013 to 2015.

Exit from the market and exporting: Figure 3 displays survival curves for the post-referendum period, which indicate the share of firms in the original sample from 2015 that still operate and/or export in a particular year after 2015. Panel (a) depicts the percentage of firms still operating in a given year. Panels (b) and (c) display survival curves for exporting to any destination and exporting to the UK, respectively. The vertical axis refers to the share of exporters active in 2015 that are still exporting in a given year.

It may be surprising that the lowest percentage of firms surviving are found in quintile 1, i.e. among the firms that were least exposed to the UK. The highest percentage of firms surviving are those in quintile 5, i.e. those most exposed to the UK. In line with business dynamics, the share of firms declines over time. As is characteristic of such plots the rates of decline flatten over time.

In Panel (a), we see the largest declines in firm survival in quintile 1, i.e., the firms least exposed to the UK. By 2022, the share of these firms present in 2015 fell to 80%. Interestingly, these firms experienced the strongest declines in firm survival every year between 2016 and 2022. In contrast, firms in quintile 5, i.e. the firms that were most exposed to the UK, had the lowest declines in firm survival. Their survival stood at 90% in 2019, and it did not fall any further during COVID or the period when Brexit actually happened. For quintile 2 and quintile 4 the share of surviving firms declined to 87% and 86% respectively, while the share of firms in quintile 3 also declined to 83%.

In Panel (b), we can see the exit of firms from exporting to any market. Here too, firms in quintile 1, i.e., the firms least exposed to the UK market have the highest rate of exit from exporting. Of the firms exporting to the UK between 2013 and 2015, 81% were still exporting in 2021. Quintile 5 had the lowest declines in exporting, falling to 90% in 2019 and remaining steady thereafter. Exit from exporting in quintile 3 was almost as high as quintile 1, falling to 80%. The share of firms exporting in quintiles 2 and 4 declined at a similar rate, to 88% and 86%, respectively.

Panel (c) displays the rate of firms exiting from exporting to the UK. In quintile 1, the firms least exposed to the UK had the highest exit rate from exporting to the UK. Only 76% of firms in quintile 1 that exported to the UK between 2013 and 2015 still exported to the UK in 2021. In contrast, 88%

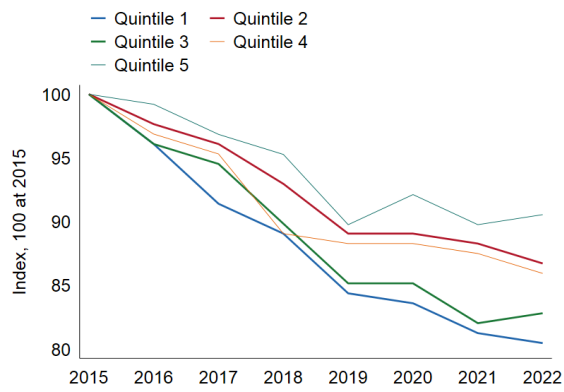
of firms in quintile 5 still exported to the UK in 2021. The level for firms in quintile 2 was 87%, in quintile 4 it was 84% and in quintile 3 it was 80%.

The survival rates do not point to a systematic effect of the Brexit referendum on market exit or exit from exporting. Given the devaluation of the pound vis-a-vis the euro and the increased uncertainty about future trade relations, one would expect the most exposed firms to have the highest cumulative exit rates. However, we observe the exact opposite: the least exposed firms had the highest cumulative exit rates over the post-referendum period. One possible explanation could be that firms at different levels of exposure had fundamental differences in their characteristics. As shown in Table 1, firms less exposed to the UK are larger and more likely to be subsidiaries of multinationals. In the regression analysis, we will control for firm characteristics to see whether the observed exit pattern prevails when we compare firms with similar observable characteristics.

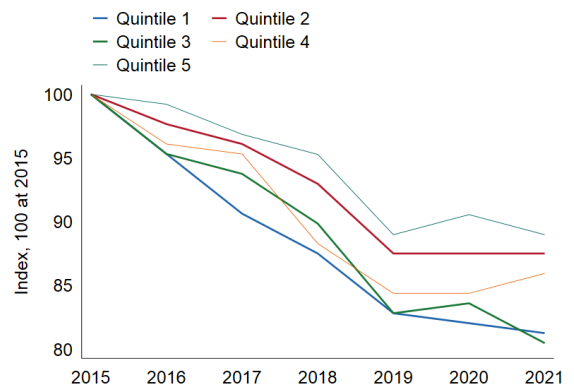
Firm fundamentals: Figure 4 displays the trends of key variables for firms in different quintiles of the exposure distribution. Each line represents the average over all firms in a given quintile. The sample includes all Irish firms that consistently exported to the UK in all years between 2013 and 2015. To make the graphs more readable, we report only the trends for the bottom, middle and top quintile. For each quintile, the value of the respective variable in 2015 is set to 100.

Panels (a) and (b) display the total value of exports to all destinations and the exports to the UK, respectively. Firms in the lowest quintile saw a pronounced spike in the value total exports in 2016, but apart from that, total exports remained stable over time. Exports to the UK remained relatively steady in the most highly exposed quintile and gradually decreased in the bottom and middle quintile until 2019, after which they increased again. Sales rose sharply in the bottom quintile between 2014 and 2016 and stabilised thereafter. In contrast, in the middle and top quintiles the trends were more steady — as shown in Panel (c). Profitability (profits divided by production value) fluctuated, as shown in Panel (d). Panel (e) reveals that firms in all quintiles increased employment, although this trend flattened somewhat after the referendum in the bottom quintile. Similarly, Panel (f) shows that average wages rose until 2017 and fluctuated thereafter. Firms in all three quintiles see a drop in 2019/2020 with a rebound for those in the middle and top quintile but not those in the bottom quintile.

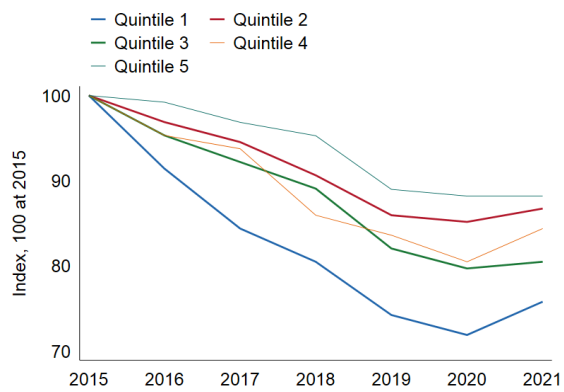
Unlike the survival curves in Figure 3, these trends do not point to a clear pattern of firms in a particular quintile doing substantially worse or better after the referendum. At the same time,



(a) Survival



(b) Exporting

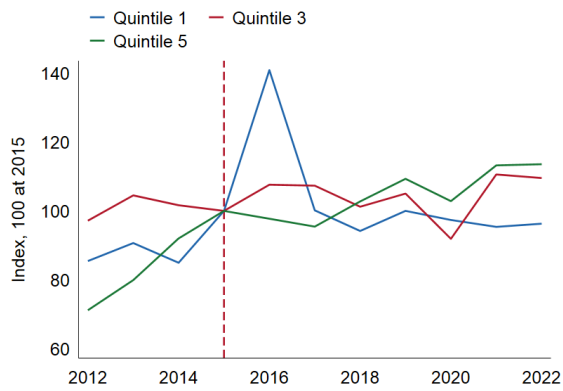


(c) Exporting to UK

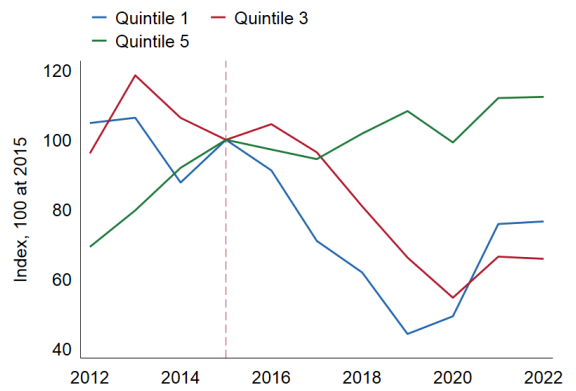
Figure 3: Survival rates for Irish exporters, 2015=100

Notes: This figure displays survival rates of Irish exporters that exported to the UK in all years between 2013 and 2015. The lines refer to different quintiles of exposure to the UK market (share of exports to the UK in total exports). Each line displays the cumulative share of firms still in operation or exporting in that year. In Panel (a), survival means operating as a firm. In Panels (b) and (c), survival means exporting in general or to the UK, respectively. Source: Own calculations based on the data described in Section 3.1.

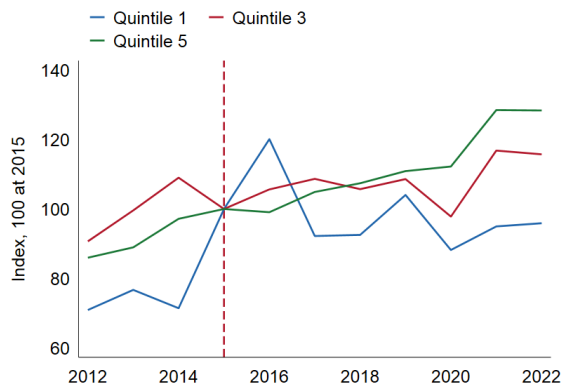
these graphs do not point to a substantial Brexit shock for Irish exporters. We do not see a drop in export volumes or sales among firms in the highest quintile or among firms in the middle quintile. If anything, exporters with the lowest level of exposure to the UK experienced the sharpest increases in export volumes, sales, and profits, whereas they saw the smallest employment growth.



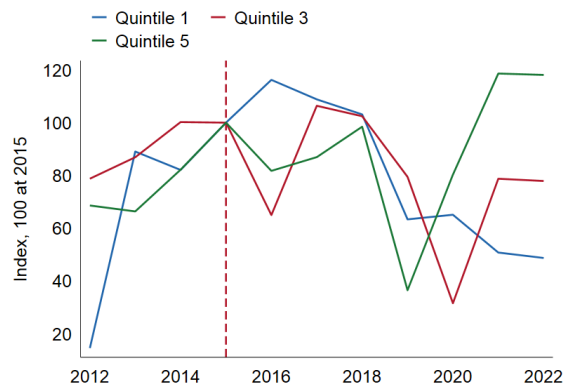
(a) Total Exports (value)



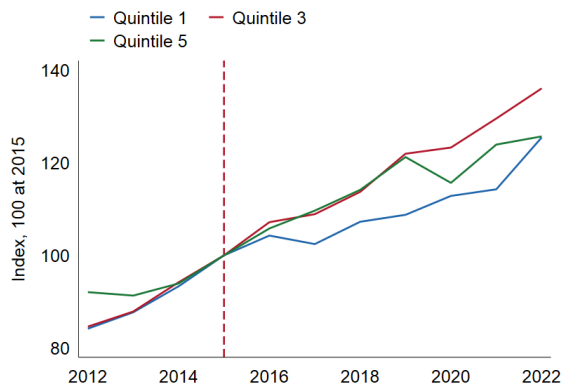
(b) Exports to the UK (value)



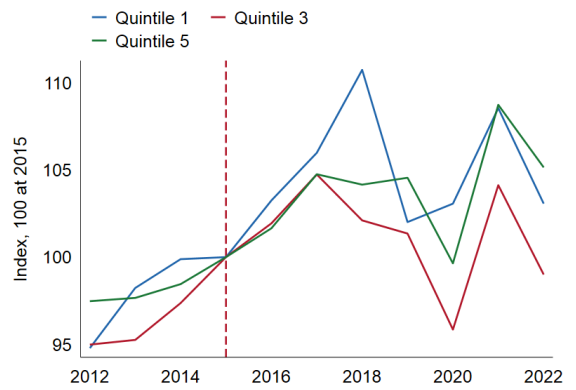
(c) Sales



(d) Profitability



(e) Employment per Firm



(f) Average wages

Figure 4: Firm fundamentals of Irish Exporters to the UK, 2015=100

Notes: This figure displays trends in firm fundamentals of Irish exporters that exported to the UK in all years between 2013 and 2015 with different levels of exposure to the UK. Exposure to the UK is measured as the average share of total exports to the UK in 2013-2015. The three lines in each figure represent the bottom, middle and top quintile of the exposure distribution. The benchmark for each quintile is the level in 2015. The series are not adjusted for firm entry and exit. This means that the average in 2012 does not include exporters that only started operating in 2013, and the averages from 2016 onward do not include firms that exited after 2015. Source: Own calculations based on the on the data described in Section 3.1.

4 The Brexit Referendum and Firm Outcomes

4.1 Empirical strategy

To analyse differences between firms that were more vs. less exposed more systematically, we run regressions that allow us to hold the pre-referendum exposure fixed and control for firm characteristics. The goal is to document the change in firm-level indicators over the post-referendum period for firms that were differentially exposed to the UK in terms of their export share before 2016. In our sample of Irish exporters, we run the following regression separately for each year t :

$$y_{it} = \beta_{1t} + \sum_{k=2}^5 \beta_{kt} D_k + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_{it}. \quad (2)$$

For each year from 2016 to 2022, we regress outcome y_{it} of firm i in year t on four quintile dummies D_2, \dots, D_5 . Each dummy equals one if a firm's average share of UK exports in total exports between 2013-2015 was in the respective quintile and zero otherwise. Firms in the lowest quintile form the base category. In some specifications, we also control for firm characteristics \mathbf{X}_i that are measured before the Brexit referendum. The error term ε_{it} summarizes all determinants of the outcome that are not included in the list of regressors. Our coefficients of interest are $\beta_{2t}, \dots, \beta_{5t}$, the coefficients on the quintile dummies in each year after 2015. Each coefficient captures the average difference in the outcome between firms in the respective quintile of the exposure distribution and firms in the bottom quintile. A statistically significant coefficient suggests that firms in quintile k have significantly different outcomes in year t compared to firms in the bottom quintile. We consider the following outcome variables: exit from exporting, exit from exporting to the UK, UK exports, total exports, average wages, employment, profitability, and sales. The interpretation of the coefficients depends on the definition of the outcome. When the outcome is an exit event — such as exiting from exporting (to the UK), or exiting from the market — the outcome equals one if a firm that was present between 2013-2015 exits in year t , and zero otherwise. Therefore, the coefficient on the omitted category β_{1t} which is captured by the constant in the regression without controls measures the probability that a firm in the bottom quintile exited in period $t + 1$ conditional on having survived until period t . The coefficients on the dummy variables $\beta_{2t}, \dots, \beta_{5t}$ measure the difference in this probability between the respective quintile and the bottom quintile.

When the outcome is a quantity — such as export volumes or average wages — we define y_{it} as the difference between the outcome in year t and in 2015. In this case, the omitted category β_{1t} —

again captured by the constant in the regressions without controls — measures the average difference in the outcome in the bottom quintile between year t and 2015. The coefficients on the dummy variables measure the change in outcome between year t and 2015 in quintile k relative to the bottom quintile. A positive coefficient β_{kt} indicates that the average outcome in quintile k increased more — or decreased less — than the average outcome in the bottom quintile.

4.2 Brexit and Exports

Table 3 displays the regression results for the extensive and intensive margin of exports. Each column represents a separate regression of the respective outcome on the exposure quintile dummies, whereby the lowest quintile is the base category. These regressions do not include controls; we report the results with controls in Appendix A.

In Panels (a) and (b), the outcome equals one if a firm stopped exporting to the UK and any destination, respectively, in a specific year, conditional on having survived until that year. The number of firms in the sample declines over time, because of all exporters to the UK present before the referendum, a certain percentage stops to export in a given year. The constant in both panels represents the base probability of exit from exporting in a given year among firms in the bottom quintile of exposure to the UK. We also report the average exit rate in each year (*mean DV*), which ranges from 2.9% to 7% for exporting from the UK, and between 2.3% and 6.7% for exporting to any destination.

The constant in Panel (a) indicates that the least exposed exporters had a base probability of exiting from exporting to the UK in a given year of between 4% and 10%. However, in the years 2016 and in 2017, the probabilities of exiting are significantly lower for the more exposed firms. In 2018 and 2020, the difference in exit rates between highly and less exposed firms is not statistically significant. Panel (b) shows a similar pattern for exit from exporting to any destination. The least exposed firms had considerably higher exit rates than average — ranging from 1% to 6.2% — while more exposed firms have lower exit rates. In each year, the base probability for the least exposed exporters, captured by the constant, is lower for Panel (b). This implies that exporters in the bottom quintile of exposure to the UK were consistently more likely to stop exporting to the UK than to stop exporting to any destination. Relative to firms in the bottom quintile, more exposed firms had lower exit rates, although the differences are not overly pronounced.

In Panels (c) and (d), the outcome is the change in the log value of exports between the year

indicated at the top and 2015 to the UK and to any destination, respectively. The mean of the dependent variable shows an interesting pattern. Exports to the UK and to any destination dropped by approximately 20-30% from 2015 to 2016 and remained constant until the onset of the COVID-19 pandemic in 2020. The coefficients on the constant in Panel (c) suggest that exports to the UK among the least exposed firms dropped by around 29 log points from 2015 to 2016 and remained fairly stable until 2019. In 2020 exports in the lowest quintile were 180 log points smaller than in 2015, which reflects the onset of COVID-19. The coefficients for quintiles 2-5 do not point to significant differences between highly and less exposed exporters. None of the coefficients are statistically significant, and the point estimates are relatively small compared to the coefficients on the constant. This suggests that although export volumes decreased across the board, there were no substantive differences between highly and less exposed firms.

Panel (d) reveals a similar pattern for the total value of exports. The coefficients for the lowest quintile are negative, indicating that exports were lower in every year after the referendum than in 2015. However, we do not find any differences in the change in exports between highly and less exposed firms. The point estimates of the coefficients on the dummy variables are small and not statistically significant.

An important consideration in the interpretation of Panels (c) and (d) is attrition. As shown in Panels (a) and (b), less exposed firms were more likely to exit from exporting, especially in 2016 and 2017. The differential attrition may explain why we do not find significant differences in export value. If the firms with the greatest decline in export values had exited instead, we would be left with firms with smaller declines in export values. Although the differential exit may explain the absence of an effect on export value to some extent, the comparison between earlier and later years suggests that it cannot fully explain the difference. In 2016, all firms are still in the sample — those that exited in 2016 are still counted in 2016 and are only absent from 2017 onwards — and we see similar differences in export value in 2016 and in other years.

Table 3: Brexit and Exports

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.055 *	-0.053 *	-0.014	-0.044	-0.053 (*)	-0.013	Quintile 2	-0.023	-0.041 *	-0.010	-0.003	-0.019	0.008
	(0.025)	(0.025)	(0.028)	(0.034)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.020)
Quintile 3	-0.039	-0.036	-0.013	-0.008	-0.015	-0.011	Quintile 3	0.000	-0.033	-0.001	0.024	-0.009	0.037 (*)
	(0.025)	(0.025)	(0.028)	(0.035)	(0.031)	(0.024)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.021)
Quintile 4	-0.039	-0.045 (*)	0.028	-0.042	0.001	-0.021	Quintile 4	-0.008	-0.041 *	0.031	-0.001	0.008	-0.001
	(0.025)	(0.025)	(0.028)	(0.035)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.021)
Quintile 5	-0.078 **	-0.053 *	-0.039	-0.029	-0.020	-0.005	Quintile 5	-0.039 (*)	-0.033	-0.026	0.004	-0.002	0.025
	(0.026)	(0.025)	(0.028)	(0.034)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.020)
Constant	0.086 **	0.077 **	0.055 **	0.095 **	0.071 **	0.040 *	Constant	0.047 **	0.057 **	0.043 *	0.062 **	0.028 (*)	0.010
	(0.018)	(0.018)	(0.020)	(0.025)	(0.023)	(0.017)		(0.016)	(0.015)	(0.018)	(0.024)	(0.015)	(0.015)
N	639	614	592	570	547	547	N	639	621	605	584	560	555
R ²	0.015	0.010	0.011	0.005	0.008	0.002	R ²	0.007	0.009	0.009	0.002	0.004	0.009
Mean DV	0.044	0.039	0.047	0.070	0.053	0.029	Mean DV	0.033	0.027	0.041	0.067	0.023	0.023
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.053	-0.016	0.055	0.076	-0.026	0.030	Quintile 2	-0.053	0.006	0.005	-0.038	0.008	0.108
	(0.077)	(0.109)	(0.124)	(0.141)	(0.170)	(0.206)		(0.055)	(0.086)	(0.121)	(0.101)	(0.115)	(0.131)
Quintile 3	0.046	0.120	0.010	0.110	0.102	0.096	Quintile 3	-0.017	0.055	0.086	-0.007	-0.027	0.185
	(0.078)	(0.109)	(0.125)	(0.142)	(0.173)	(0.209)		(0.055)	(0.087)	(0.122)	(0.102)	(0.116)	(0.134)
Quintile 4	-0.005	-0.117	-0.060	-0.020	0.032	-0.030	Quintile 4	-0.016	-0.095	-0.030	-0.092	-0.042	-0.143
	(0.078)	(0.109)	(0.126)	(0.141)	(0.172)	(0.207)		(0.055)	(0.086)	(0.123)	(0.102)	(0.116)	(0.132)
Quintile 5	0.030	-0.094	0.124	0.158	0.092	0.214	Quintile 5	-0.011	-0.099	0.170	-0.027	0.029	-0.042
	(0.077)	(0.108)	(0.123)	(0.140)	(0.169)	(0.205)		(0.055)	(0.086)	(0.121)	(0.101)	(0.114)	(0.131)
Constant	-0.289 **	-0.220 **	-0.250 **	-0.361 **	-1.789 **	-0.618 **	Constant	-0.360 **	-0.247 **	-0.362 **	-0.314 **	-0.498 **	-0.671 **
	(0.055)	(0.079)	(0.090)	(0.103)	(0.125)	(0.150)		(0.039)	(0.062)	(0.087)	(0.072)	(0.083)	(0.095)
N	611	590	564	530	518	531	N	618	604	580	545	547	542
R ²	0.003	0.010	0.005	0.004	0.002	0.004	R ²	0.002	0.008	0.006	0.002	0.001	0.014
Mean DV	-0.285	-0.242	-0.222	-0.293	-1.748	-0.554	Mean DV	-0.380	-0.274	-0.314	-0.346	-0.503	-0.652

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 639 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have the full sample's 639 observations in 2016 as the firms exiting in that year are observed doing so.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

4.3 Brexit and Firm Fundamentals

Table 4 shows the regression results for firm fundamentals which may have been indirectly affected by the Brexit referendum. Panel (a) displays the effects on average wages paid per firm. The outcome is the difference in log average wages between a given year and 2015. The mean of the dependent variable shows that average wages remained fairly stable over the sample period. The coefficients indicate that wages increased slightly among firms in the lowest exposure quintile. In higher quintiles, the coefficients tend to be negative and statistically significant. This indicates that in higher quintiles the changes in average wages relative to 2015 were either close to zero or slightly negative.

Panel (b) displays average changes in profitability, which is calculated by dividing profits by production value, between the year indicated in the table and 2015. The mean dependent variable indicates that profitability decreased from 2015 and 2016/17. In 2018, we see an unusual surge which is driven by one firm in the bottom quintile. Overall, we do not find significant differences in the changes in firm profitability between firms with high and low exposure to the UK.

In Panel (c), we examine changes in employment. The measure we use here is the difference in log employment between a given year and 2015. Over the period of the study, employment at Irish exporters showed an average increase of 2.7. Employment increased by more in the in the three most exposed groups of firms.

A similar pattern emerges in Panel (d) where we examine changes in log sales. The sales of Irish exporters decreased between 2015 and the post-referendum period. This decline is mainly driven by firms that were less exposed to the UK market in terms of exports.

In Table A.3 in Appendix A, we examine whether the overall trend in employment is driven by differential patterns in hires and separations.⁷ On the hiring side, we do not detect a difference between less and more exposed firms. Separation rates are higher among more exposed firms than among less exposed firms in 2016 and 2017, but similar thereafter.

⁷Hiring rates are defined as $\frac{hires_t}{(employment_t+employment_{t-1})/2}$; separation rates are defined as $\frac{separations_t}{(employment_t+employment_{t+1})/2}$

Table 4: Firm fundamentals

(a) Average wages ($\ln(y_{it}) - \ln(y_{i,2015})$)								(b) Profitability ($y_{it} - y_{i,2015}$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Quintile 2	-0.001 (0.014)	-0.034 * (0.016)	-0.026 (0.019)	-0.009 (0.019)	-0.021 (0.023)	-0.019 (0.022)	0.003 (0.031)	Quintile 2	-0.071 (0.077)	0.040 (0.039)	0.038 (0.051)	0.007 (0.035)	0.361 (*) (0.211)	0.046 (0.070)
Quintile 3	-0.008 (0.014)	-0.027 (*) (0.016)	-0.030 (0.019)	-0.011 (0.019)	-0.032 (0.023)	-0.012 (0.023)	-0.009 (0.031)	Quintile 3	-0.067 (0.077)	-0.007 (0.039)	-0.006 (0.051)	0.015 (0.036)	-0.030 (0.214)	0.043 (0.071)
Quintile 4	-0.023 (0.014)	-0.049 ** (0.016)	-0.040 * (0.019)	-0.009 (0.019)	-0.048 * (0.023)	-0.007 (0.022)	0.030 (0.031)	Quintile 4	-0.118 (0.077)	-0.065 (*) (0.039)	-0.035 (0.051)	0.012 (0.035)	0.022 (0.212)	0.106 (0.070)
Quintile 5	-0.007 (0.014)	-0.017 (0.016)	-0.021 (0.019)	-0.006 (0.019)	-0.029 (0.023)	0.005 (0.022)	0.018 (0.031)	Quintile 5	-0.046 (0.077)	-0.029 (0.039)	-0.007 (0.050)	-0.032 (0.035)	0.028 (0.210)	0.095 (0.070)
Constant	0.032 ** (0.010)	0.065 ** (0.012)	0.075 ** (0.013)	0.060 ** (0.014)	0.029 (*) (0.016)	0.094 ** (0.016)	0.045 * (0.022)	Constant	0.003 (0.054)	-0.036 (0.028)	0.194 ** (0.036)	-0.040 (0.025)	-0.140 (0.152)	-0.057 (0.050)
N	621	606	583	558	560	548	545	N	621	606	583	558	560	548
R ²	0.005	0.017	0.008	0.001	0.008	0.003	0.004	R ²	0.004	0.013	0.004	0.004	0.008	0.006
Mean DV	0.025	0.040	0.051	0.053	0.003	0.088	0.054	Mean DV	-0.057	-0.048	0.192	-0.040	-0.062	0.002
(c) Employment ($\ln(y_{it}) - \ln(y_{i,2015})$)								(d) Sales ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Quintile 2	0.006 (0.044)	0.065 (0.046)	0.087 (0.059)	0.133 * (0.056)	0.022 (0.065)	0.049 (0.058)	0.072 (0.081)	Quintile 2	0.055 (0.057)	0.102 (0.075)	0.027 (0.079)	0.026 (0.080)	0.160 (*) (0.093)	0.106 (0.086)
Quintile 3	0.062 (0.044)	0.059 (0.046)	0.058 (0.060)	0.094 (*) (0.057)	0.056 (0.066)	0.125 * (0.059)	0.139 (*) (0.082)	Quintile 3	0.068 (0.057)	0.049 (0.075)	0.064 (0.079)	0.091 (0.081)	0.090 (0.094)	0.220 * (0.087)
Quintile 4	0.110 * (0.044)	0.143 ** (0.046)	0.157 ** (0.060)	0.165 ** (0.056)	0.068 (0.065)	0.115 * (0.058)	0.100 (0.081)	Quintile 4	0.100 (*) (0.057)	0.150 * (0.075)	0.121 (0.080)	0.084 (0.080)	0.092 (0.093)	0.185 * (0.086)
Quintile 5	0.068 (0.044)	0.121 ** (0.046)	0.165 ** (0.059)	0.192 ** (0.056)	0.154 * (0.065)	0.167 ** (0.057)	0.139 (*) (0.080)	Quintile 5	0.136 * (0.057)	0.175 * (0.075)	0.073 (0.078)	0.019 (0.080)	0.145 (0.093)	0.222 ** (0.085)
Constant	-0.022 (0.031)	-0.019 (0.033)	-0.009 (0.043)	0.006 (0.040)	-0.013 (0.047)	0.058 (0.042)	0.062 (0.058)	Constant	-0.117 ** (0.040)	-0.249 ** (0.054)	-0.114 * (0.056)	-0.223 ** (0.057)	-0.294 ** (0.067)	-0.342 ** (0.062)
N	621	606	583	558	560	548	545	N	621	606	583	558	560	548
R ²	0.014	0.019	0.018	0.025	0.012	0.019	0.007	R ²	0.010	0.012	0.005	0.004	0.006	0.017
Mean DV	0.027	0.059	0.086	0.124	0.049	0.151	0.153	Mean DV	-0.045	-0.153	-0.057	-0.179	-0.195	-0.194

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from the market. The number of firms observed in 2016 is 621 rather than 639 due to 18 exits from the market in that year.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

5 Additional Results and Robustness Checks

5.1 Trade Diversion to Northern Ireland

In the analysis so far, we treated the UK as a single entity. However, during the period leading up to the referendum, and especially after the referendum, it became evident that Northern Ireland would have a special status when it comes to trade between the Republic of Ireland and Northern Ireland. As part of the Good Friday Agreement, an international peace treaty signed in 1998, the UK and Ireland agreed not to establish a “hard border” between the Republic of Ireland and Northern Ireland. In 2016, the most likely outcome of the negotiation process was that trade to Northern Ireland would follow the rules of the EU Common Market. This implies that Irish exporters could expect to face no trade barriers for exports to Northern Ireland whereas they could expect trade barriers for exports to Great Britain.

In Table 5, we investigate whether the special status led to trade diversion from Great Britain to Northern Ireland. We observe some evidence for trade diversion in the aggregate figures. In 2016 and 2017, the value of exports to both parts of the UK dropped vis-a-vis 2015. In 2018, exports to Great Britain remained lower than the pre-referendum level, whereas exports to Northern Ireland saw a significant increase. The change in export value to both jurisdictions was largest in the group of exporters with the lowest exposure. Exporters with small shares of exports to the UK to begin with experienced larger increases in exports Northern Ireland and larger decreases in exports to Great Britain, whereas the changes in export values of the more exposed firms are relatively modest. The regressions with controls, shown in Appendix A, do not reveal statistically significant differences between highly and less exposed firms, although the point estimates suggest that the differences could be economically significant. This result contrasts with Flynn et al. (2021b), who, analysing aggregate trade data, do not find evidence of trade diversion of Irish exports away from Great Britain to Northern Ireland for exports, although they do find this for Irish imports.

5.2 Robustness Checks

In the Appendix, we carry out a series of robustness checks to show that our results are not driven by the choice of specification.

Regressions with controls In Appendix A, we perform the same regressions as in Section 4 but with firm-level controls. These controls are potentially important because firms with high vs. low exposure have different characteristics and, thus, may respond differently to the Brexit referendum regardless of their export exposure. We include controls for firm age, average wages, an indicator of

Table 5: Exports to Northern Ireland and Great Britain: without and with controls

(a) Exports to Northern Ireland ($\ln(y_{it}) - \ln(y_{i,2015})$)					(b) Exports to Great Britain ($\ln(y_{it}) - \ln(y_{i,2015})$)				
	2016	2017	2018	2019		2016	2017	2018	2019
Quintile 2	-0.283 (0.243)	-0.444 (0.301)	0.039 (0.347)	0.930 * (0.457)	Quintile 2	-0.067 (0.095)	-0.014 (0.125)	0.077 (0.142)	0.023 (0.160)
Quintile 3	-0.067 (0.231)	-0.056 (0.286)	-0.561 (*) (0.325)	0.794 (*) (0.436)	Quintile 3	0.027 (0.096)	0.100 (0.126)	0.040 (0.142)	0.025 (0.162)
Quintile 4	-0.336 (0.217)	-0.185 (0.271)	-0.136 (0.307)	0.485 (0.398)	Quintile 4	0.070 (0.097)	-0.097 (0.126)	0.036 (0.145)	0.005 (0.164)
Quintile 5	-0.226 (0.212)	-0.056 (0.266)	-0.116 (0.298)	0.585 (0.388)	Quintile 5	-0.002 (0.099)	-0.084 (0.130)	0.128 (0.147)	0.162 (0.168)
Constant	0.090 (0.194)	0.086 (0.243)	2.283 ** (0.272)	-0.567 (0.354)	Constant	-0.268 ** (0.068)	-0.201 * (0.091)	-0.091 (0.104)	-0.324 ** (0.118)
N	225	215	202	184	N	584	564	536	500
R ²	0.019	0.020	0.032	0.028	R ²	0.004	0.006	0.002	0.003
Mean DV	-0.131	-0.053	2.112	0.014	Mean DV	-0.263	-0.218	-0.035	-0.283
(c) Exports to NI ($\ln(y_{it}) - \ln(y_{i,2015})$) - with controls					(d) Exports to GB ($\ln(y_{it}) - \ln(y_{i,2015})$) - with controls				
	2016	2017	2018	2019		2016	2017	2018	2019
Quintile 2	-0.334 (0.283)	-0.297 (0.321)	0.170 (0.385)	1.028 * (0.517)	Quintile 2	-0.100 (0.096)	-0.039 (0.132)	0.091 (0.150)	0.063 (0.167)
Quintile 3	-0.166 (0.271)	0.204 (0.315)	-0.567 (0.368)	0.697 (0.499)	Quintile 3	-0.029 (0.102)	0.071 (0.140)	0.045 (0.160)	-0.003 (0.180)
Quintile 4	-0.390 (0.254)	0.082 (0.296)	-0.029 (0.352)	0.470 (0.467)	Quintile 4	-0.045 (0.104)	-0.158 (0.143)	0.047 (0.165)	0.018 (0.182)
Quintile 5	-0.367 (0.257)	0.286 (0.302)	0.015 (0.354)	0.438 (0.479)	Quintile 5	-0.145 (0.111)	-0.119 (0.153)	0.153 (0.173)	0.198 (0.194)
Constant	-0.186 (1.601)	-1.332 (1.810)	1.182 (2.181)	-0.014 (2.893)	Constant	1.792 * (0.779)	0.509 (1.080)	2.950 * (1.231)	2.575 (*) (1.372)
N	225	215	202	184	N	584	564	536	500
R ²	0.097	0.229	0.206	0.191	R ²	0.150	0.056	0.057	0.082
Mean DV	-0.131	-0.053	2.112	0.014	Mean DV	-0.263	-0.218	-0.035	-0.283

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

foreign ownership, number of workers, and labour productivity. The results are similar to the results without controls. We find mostly insignificant differences between more vs. less exposed firms for any of the outcomes.

Alternative functional forms for exposure In Appendix C, we use alternative specifications to model differences in the exposure to the UK. Instead of measuring exposure through dummies for quintiles of the exposure distribution, we use a continuous measure of exposure, as well as tercile and quartile dummies. We perform these analyses for both measures of exposure — the share of exports to the UK in total exports, and the share of exports to the UK in total sales. The results are similar to the results based on quintile dummies, namely that we do not find an impact of export exposure on export outcomes and firm fundamentals.

Incorporating overall sales in the measure of exposure One challenge with our measure of exposure to Brexit is that it does not account for the sales volume of a firm. Many firms sell most of their production on the local market and only export a small fraction. If that small fraction is entirely exported to the UK, we would classify such firms as highly exposed even though these firms do not depend much on UK exports.

To account for total sales in measuring the exposure to Brexit, we use the average share of exports to the UK in total sales. Our alternative measure is based on exports and sales in the three years preceding the referendum, 2013-2015:

$$exposure_i = \frac{1}{3} \sum_{t=2013}^{2015} \frac{\text{Exports to UK}_{it}}{\text{Sales}_{it}}. \quad (3)$$

Firms that export most of their sales to the UK are considered highly exposed, whereas firms that export mostly to other destinations are considered less exposed. In our analysis, we use dummies based on the quintiles of this distribution rather than a continuous measure.

Figure 5 displays the distribution of the exposure to the UK across all firms in the sample based on this alternative measure. The distribution is skewed to the left, which means that most firms export only a small share of their sales to the UK. As we show in Tables B.4 and B.5 in Appendix B, the results are similar to those based on the share of total exports going to the UK.

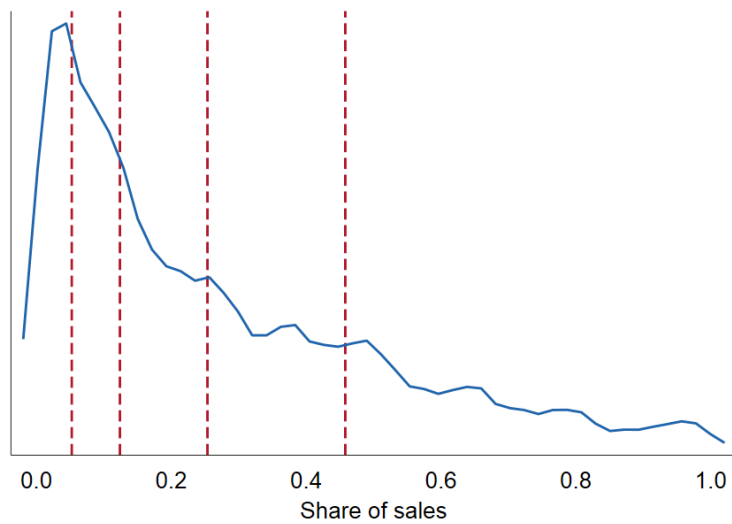


Figure 5: Pre-referendum Exposure to the UK Market (exports as share of sales)

Notes: This figure displays the distribution of export exposure to the UK market defined in Section 3.2 across all 639 firms in the sample that exported to the UK in all years from 2013 to 2015. The measure is computed as the average share of UK exports to total sales in value terms between 2013 and 2015. The dashed red lines indicate the boundaries between the quintiles of the distribution. Source: Own calculations based on the data described in Section 3.1.

6 Discussion and Conclusion

In this paper, we study the impact of the Brexit referendum in 2016 on Irish exporters. The referendum was followed by an immediate drop in the pound vis-a-vis the euro, and a great deal of uncertainty about the future terms trade between the EU and the UK. Ireland is a particularly interesting case to study because it is a small, open economy that is highly exposed to changes in the global economy, and the UK is one of Ireland's largest trading partners. We investigate whether this shock had a measurable impact on exporting and firm fundamentals. To do this, we use the universe of Irish firms that exported to the UK before the referendum and compare firms with high exposure to the UK market — with a large share of exports going to the UK — to firms with low exposure.

Our findings do not point to significant and measurable effects of the Brexit referendum on Irish exporters. In fact, we observe the greatest changes among firms that were least exposed to the UK in terms of export share. We do not find notable differences in the trajectories of export volumes, average wages, or profitability between highly and less exposed firms. The exporters that were least exposed to the UK market before the referendum exited in greater numbers from exporting and from the market overall after Brexit. They also experienced greater declines in employment and sales volume relative to 2015. However, because the UK is only a minor export destination for these large, predominantly multinational firms, we do not view these results as evidence of a strong effect of the Brexit referendum on Irish exporters.

It is uncertain from a policy standpoint whether our findings imply that Irish exporters who were most vulnerable to the consequences of an unorderly Brexit were able to absorb significant external shocks or whether they merely adopted a wait-and-see strategy. Previous estimates in related work on other countries (e.g. [Fernandes and Winters \(2021\)](#) and [de Lucio et al. \(2023\)](#)) indicate that firms only began to markedly change their export patterns once the Trade and Cooperation Agreement, which sets out the post-Brexit terms for trade between the UK and the EU, came into effect in late 2020. However, our initial findings for 2021 and 2022 do not indicate substantial differences between highly and less exposed Irish firms that export to the UK. Nonetheless, given the historically strong trade relations between Ireland and the UK, the adaptation process may be slower and more gradual.

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A Regressions with Firm-level Controls

In Section 4, we report the regression results without controls. One challenge is that these results may be driven by firm characteristics that are independent of Brexit exposure. In Table 2 we saw that firms with a high share of exports to the UK are also on average more exposed in terms of their sales, firms in the middle quintile have the highest absolute value of exports to the UK, firms in quintiles 4 and 5 have fewer employees, pay lower average wages, have lower export and sales volumes, and are less likely to be foreign owned compared to firms in lower quintiles.

In Tables A.1 and A.2, we report the corresponding results from regressions that control for firm age, average firm wages (defined as $\ln(\text{average weekly wages})$), labour productivity (defined as $\ln(\text{sales}/\text{employees})$), $\ln(\text{employment})$, a dummy variable for whether the firm is foreign owned, and indicators for NACE 2-digit sectoral codes — all measured in 2015. In the regressions where the outcome is average wages or employment, we do not control for that respective variable. When we include controls, it is no longer possible to meaningfully interpret the constant. This is because, in this case, it captures the average outcome for the omitted industry when the controls are zero.

Overall, the results are similar to the results without controls in Section 4. Table A.1 corresponds to Table 3. Panel (a) in Table A.1 shows that more exposed firms were less likely to exit exporting to the UK but that the difference in exit rates between highly and less exposed firms is not statistically significant. The one exception is for quintiles 2 and 5 in 2016 where more exposed firms were less likely to exit. Panel (b) shows that more exposed firms were less likely to exit from exporting to any destination, but that these differences are not statistically significant. Panels (c) and (d) show that more exposed firms exported a little less to the UK and globally, but these differences are not substantial. This suggests that the difference in exporting after the referendum — or the absence thereof — cannot be explained by some of the most important firm characteristics.

Table A.2 corresponds to Table 4. Table A.2 also shows that the patterns observed in the regressions without controls prevail. Firms that were more exposed to the UK experienced less pronounced decreases in average wages, employment levels and sales relative to firms with low exposure to the UK.

Table A.1: Brexit and Exports with controls

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.055 *	-0.036	-0.015	-0.030	-0.061 (*)	-0.021	Quintile 2	-0.022	-0.036 (*)	-0.013	0.009	-0.023	0.013
	(0.027)	(0.025)	(0.030)	(0.036)	(0.031)	(0.024)		(0.023)	(0.021)	(0.027)	(0.034)	(0.021)	(0.022)
Quintile 3	-0.042	-0.014	0.002	-0.005	-0.009	-0.027	Quintile 3	0.001	-0.023	0.012	0.037	-0.014	0.040 (*)
	(0.028)	(0.027)	(0.031)	(0.038)	(0.033)	(0.026)		(0.025)	(0.022)	(0.029)	(0.037)	(0.023)	(0.023)
Quintile 4	-0.034	-0.015	0.036	-0.044	-0.012	-0.040	Quintile 4	-0.001	-0.027	0.039	0.005	0.005	0.004
	(0.028)	(0.027)	(0.032)	(0.039)	(0.033)	(0.026)		(0.025)	(0.022)	(0.029)	(0.037)	(0.023)	(0.023)
Quintile 5	-0.064 *	-0.018	-0.032	-0.036	-0.014	-0.034	Quintile 5	-0.028	-0.018	-0.015	-0.002	-0.002	0.024
	(0.030)	(0.028)	(0.033)	(0.040)	(0.035)	(0.027)		(0.026)	(0.023)	(0.030)	(0.039)	(0.024)	(0.024)
Constant	-0.296	-0.389 (*)	-0.204	-0.149	0.016	0.353 (*)	Constant	-0.314 (*)	-0.236	-0.226	-0.295	-0.044	0.134
	(0.210)	(0.201)	(0.237)	(0.288)	(0.251)	(0.198)		(0.184)	(0.167)	(0.218)	(0.277)	(0.174)	(0.177)
N	634	609	589	567	544	544	N	634	616	602	581	557	552
R ²	0.073	0.048	0.041	0.073	0.128	0.050	R ²	0.061	0.031	0.042	0.064	0.045	0.035
Mean DV	0.044	0.036	0.048	0.071	0.053	0.029	Mean DV	0.033	0.024	0.042	0.067	0.023	0.024
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.096	-0.073	0.028	0.053	-0.081	0.005	Quintile 2	-0.036	0.020	-0.016	-0.013	0.043	0.162
	(0.077)	(0.115)	(0.130)	(0.145)	(0.175)	(0.220)		(0.056)	(0.091)	(0.127)	(0.105)	(0.119)	(0.138)
Quintile 3	-0.021	0.036	-0.046	0.006	-0.026	-0.042	Quintile 3	-0.015	0.067	0.084	0.053	0.056	0.283 (*)
	(0.082)	(0.121)	(0.138)	(0.156)	(0.189)	(0.236)		(0.059)	(0.096)	(0.135)	(0.112)	(0.127)	(0.149)
Quintile 4	-0.109	-0.203 (*)	-0.081	-0.059	-0.071	-0.122	Quintile 4	-0.010	-0.065	-0.026	-0.029	0.070	-0.022
	(0.083)	(0.123)	(0.141)	(0.156)	(0.190)	(0.236)		(0.060)	(0.097)	(0.138)	(0.112)	(0.128)	(0.148)
Quintile 5	-0.063	-0.176	0.099	0.135	0.059	0.147	Quintile 5	0.007	-0.055	0.210	0.123	0.237 (*)	0.133
	(0.086)	(0.127)	(0.144)	(0.162)	(0.195)	(0.247)		(0.063)	(0.102)	(0.142)	(0.118)	(0.133)	(0.154)
Constant	0.790	-0.051	2.254 *	1.383	-2.464 (*)	0.673	Constant	0.335	0.615	2.352 *	0.081	-1.484	-2.743 *
	(0.616)	(0.910)	(1.040)	(1.161)	(1.402)	(1.794)		(0.450)	(0.727)	(1.028)	(0.852)	(0.969)	(1.129)
N	606	587	561	527	514	528	N	613	601	577	542	544	539
R ²	0.081	0.052	0.071	0.080	0.081	0.042	R ²	0.078	0.042	0.058	0.072	0.088	0.071
Mean DV	-0.279	-0.240	-0.220	-0.290	-1.746	-0.555	Mean DV	-0.376	-0.273	-0.314	-0.345	-0.503	-0.651

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

Table A.2: Firm fundamentals with controls

(a) Average wages ($\ln(y_{it}) - \ln(y_{i,2015})$)								(b) Profitability ($y_{it} - y_{i,2015}$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Quintile 2	-0.007 (0.015)	-0.042 * (0.016)	-0.026 (0.020)	-0.019 (0.020)	-0.014 (0.023)	-0.033 (0.023)	-0.007 (0.015)	Quintile 2	-0.073 (0.080)	0.032 (0.041)	0.024 (0.053)	0.025 (0.036)	0.304 (0.219)	0.034 (0.074)
Quintile 3	-0.013 (0.016)	-0.044 * (0.017)	-0.031 (0.021)	-0.029 (0.021)	-0.013 (0.025)	-0.027 (0.025)	-0.013 (0.016)	Quintile 3	-0.093 (0.084)	-0.018 (0.043)	-0.013 (0.056)	0.047 (0.038)	0.004 (0.233)	0.033 (0.079)
Quintile 4	-0.025 (0.016)	-0.053 ** (0.017)	-0.042 * (0.021)	-0.021 (0.021)	-0.015 (0.025)	-0.016 (0.025)	-0.025 (0.016)	Quintile 4	-0.135 (0.085)	-0.088 * (0.044)	-0.054 (0.057)	0.039 (0.039)	0.060 (0.234)	0.093 (0.079)
Quintile 5	-0.012 (0.016)	-0.025 (0.018)	-0.025 (0.022)	-0.020 (0.022)	0.004 (0.026)	0.000 (0.026)	-0.012 (0.016)	Quintile 5	-0.053 (0.089)	-0.041 (0.046)	-0.010 (0.059)	0.014 (0.040)	0.042 (0.243)	0.072 (0.083)
Constant	0.021 (0.042)	0.089 (*) (0.046)	0.093 (*) (0.056)	0.102 (*) (0.059)	-0.098 (0.070)	0.210 ** (0.069)	0.021 (0.042)	Constant	-0.067 (0.639)	-0.534 (0.326)	-0.326 (0.425)	-0.941 ** (0.292)	-1.495 (1.781)	-0.840 (0.604)
N	616	602	580	555	557	545	616	N	616	602	580	555	557	545
R ²	0.062	0.069	0.051	0.052	0.116	0.076	0.062	R ²	0.059	0.075	0.074	0.059	0.092	0.049
Mean DV	0.025	0.039	0.052	0.054	0.003	0.088	0.054	Mean DV	-0.054	-0.047	0.193	-0.037	-0.060	0.003
(c) Employment ($\ln(y_{it}) - \ln(y_{i,2015})$)								(d) Sales ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Quintile 2	-0.001 (0.047)	0.039 (0.046)	0.047 (0.062)	0.128 * (0.058)	0.068 (0.067)	0.069 (0.060)	0.104 (0.084)	Quintile 2	0.048 (0.056)	0.074 (0.068)	0.004 (0.076)	0.061 (0.077)	0.159 (*) (0.090)	0.124 (0.087)
Quintile 3	0.055 (0.049)	0.054 (0.049)	0.006 (0.066)	0.082 (0.062)	0.119 (*) (0.072)	0.169 ** (0.064)	0.174 (*) (0.090)	Quintile 3	0.087 (0.059)	0.065 (0.071)	0.067 (0.081)	0.118 (0.082)	0.149 (0.096)	0.264 ** (0.093)
Quintile 4	0.097 (*) (0.050)	0.108 * (0.049)	0.094 (0.067)	0.148 * (0.062)	0.143 * (0.072)	0.165 * (0.064)	0.141 (0.090)	Quintile 4	0.098 (*) (0.060)	0.103 (0.072)	0.118 (0.082)	0.129 (0.082)	0.172 (*) (0.096)	0.231 * (0.093)
Quintile 5	0.038 (0.052)	0.069 (0.052)	0.079 (0.069)	0.160 * (0.065)	0.215 ** (0.075)	0.195 ** (0.067)	0.150 (0.094)	Quintile 5	0.159 * (0.062)	0.160 * (0.076)	0.094 (0.085)	0.135 (0.086)	0.296 ** (0.100)	0.272 ** (0.097)
Constant	0.297 (*) (0.166)	0.283 (*) (0.163)	0.340 (0.224)	-0.094 (0.214)	-0.889 ** (0.249)	-0.160 (0.222)	-0.312 (0.310)	Constant	0.348 (0.449)	0.028 (0.542)	1.156 (*) (0.616)	0.877 (0.619)	-0.722 (0.731)	-1.510 * (0.710)
N	616	602	580	555	557	545	542	N	616	602	580	555	557	545
R ²	0.042	0.073	0.073	0.098	0.091	0.087	0.090	R ²	0.135	0.173	0.201	0.200	0.209	0.129
Mean DV	0.028	0.063	0.084	0.123	0.049	0.150	0.154	Mean DV	-0.040	-0.143	-0.057	-0.178	-0.193	-0.192

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 634 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have 634 observations in 2016 as the firms exiting in that year are observed doing so. The full sample of observations is 639. Five of these are dropped when including controls.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

Firm wages and employment are not included as controls when these variables are the dependent variable.

Table A.3: Hires and separations

(a) Rate of hires ($y_{it} - y_{i,2015}$)							(b) Rate of separations ($y_{it} - y_{i,2015}$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.014 (0.018)	-0.009 (0.018)	-0.008 (0.018)	-0.015 (0.019)	-0.017 (0.020)	-0.010 (0.019)	Quintile 2	0.021 (0.019)	0.045 (*) (0.023)	-0.012 (0.020)	0.037 * (0.017)	-0.016 (0.019)	0.001 (0.025)
Quintile 3	-0.002 (0.019)	0.004 (0.018)	-0.007 (0.019)	0.029 (0.019)	0.029 (0.020)	0.014 (0.020)	Quintile 3	0.037 (*) (0.019)	0.051 * (0.023)	-0.008 (0.020)	0.026 (0.017)	-0.035 (*) (0.019)	-0.004 (0.025)
Quintile 4	0.005 (0.019)	-0.004 (0.018)	-0.012 (0.019)	-0.005 (0.019)	-0.023 (0.020)	0.004 (0.019)	Quintile 4	0.022 (0.019)	0.046 * (0.023)	-0.002 (0.020)	0.031 (*) (0.017)	-0.005 (0.019)	0.040 (0.025)
Quintile 5	-0.010 (0.018)	-0.003 (0.018)	0.003 (0.018)	0.001 (0.019)	0.006 (0.020)	0.006 (0.019)	Quintile 5	0.028 (0.019)	0.034 (0.023)	-0.003 (0.020)	0.029 (*) (0.017)	-0.013 (0.019)	0.009 (0.025)
Constant	-0.006 (0.013)	0.002 (0.013)	0.003 (0.013)	0.001 (0.013)	0.006 (0.014)	0.000 (0.014)	Constant	-0.015 (0.014)	-0.033 * (0.016)	0.016 (0.014)	-0.013 (0.012)	0.034 * (0.014)	0.021 (0.018)
N	621	606	583	554	547	547	N	606	583	554	547	547	543
R ²	0.002	0.001	0.002	0.011	0.015	0.003	R ²	0.007	0.011	0.001	0.010	0.007	0.008
Mean DV	-0.011	-0.001	-0.002	0.003	0.004	0.003	Mean DV	0.007	0.003	0.011	0.012	0.020	0.030
(c) Rate of hires ($y_{it} - y_{i,2015}$) with controls							(d) Rate of separations ($y_{it} - y_{i,2015}$) with controls						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.013 (0.019)	-0.007 (0.019)	-0.003 (0.019)	-0.010 (0.019)	-0.015 (0.021)	-0.012 (0.020)	Quintile 2	0.023 (0.018)	0.043 (*) (0.024)	-0.017 (0.022)	0.030 (*) (0.018)	-0.021 (0.020)	0.001 (0.026)
Quintile 3	0.007 (0.020)	0.009 (0.020)	0.001 (0.021)	0.039 (*) (0.021)	0.032 (0.023)	0.016 (0.021)	Quintile 3	0.026 (0.019)	0.057 * (0.026)	-0.020 (0.023)	0.013 (0.019)	-0.040 (*) (0.022)	0.001 (0.028)
Quintile 4	0.004 (0.021)	-0.005 (0.020)	-0.007 (0.021)	0.002 (0.021)	-0.018 (0.023)	0.002 (0.021)	Quintile 4	0.023 (0.019)	0.049 (*) (0.026)	-0.011 (0.023)	0.019 (0.019)	-0.011 (0.021)	0.051 (*) (0.028)
Quintile 5	-0.012 (0.022)	-0.005 (0.021)	0.011 (0.022)	0.004 (0.022)	0.005 (0.024)	-0.006 (0.022)	Quintile 5	0.035 (*) (0.020)	0.049 (*) (0.027)	-0.010 (0.024)	0.022 (0.020)	-0.017 (0.022)	0.028 (0.030)
Constant	-0.209 (0.155)	0.056 (0.153)	0.022 (0.156)	-0.101 (0.157)	-0.108 (0.173)	0.054 (0.164)	Constant	-0.134 (0.143)	-0.457 * (0.196)	0.128 (0.174)	0.207 (0.148)	-0.140 (0.165)	0.450 * (0.216)
N	621	606	583	554	547	547	N	606	583	554	547	547	543
R ²	0.071	0.047	0.054	0.095	0.059	0.094	R ²	0.245	0.057	0.024	0.061	0.037	0.068
Mean DV	-0.011	-0.001	-0.002	0.003	0.004	0.003	Mean DV	0.007	0.003	0.011	0.012	0.020	0.030

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of firms observed in 2016 is 621 rather than 639 due to 18 exits from the market in that year.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, ln(average weekly wages), ln(sales/employee), ln(employment), foreign-owned, NACE 2-digit fixed effects.

Rate of hires is calculated as $\text{hires}_t / (\text{employment}_t + \text{employment}_{t-1}) / 2$.

Rate of separations is calculated as $\text{separations}_t / (\text{employment}_t + \text{employment}_{t+1}) / 2$.

B Measuring Exposure: Exports as a Share of Total Sales

Table B.4 in Appendix B displays the regression results for the extensive and intensive margin of exports, where quintiles are defined using exports as the share of sales (see Equation 3). Panels (a) and (b) show the results on the extensive margin. Firms that are more exposed are less likely to exit from exporting to the UK. Similar to Table 3, the constant in Panel (a) shows that the least exposed exporters had a base probability of exiting from exporting to the UK in a given year of between 3% and 10%. Similar to the results with the main exposure definition, in the referendum year 2016, more exposed firms had lower probabilities of exiting. The results for the following years are not statistically different from each other. We observe a similar pattern for Panel (b). The least exposed also had a higher exit rate than average (between 2% and 6%).

In Panels (c) and (d), the outcome is the change in the log value of exports between the year indicated at the top and 2015 to the UK and overall, respectively.

The coefficients on the constant in Panel (c) suggest a similar pattern to the alternative measure. Exports to the UK among the least exposed firms dropped by around 27% after Brexit, recovering somewhat before declining further in 2021. With the exception of firms in quantile 2, there is little evidence of differences between highly and less exposed exporters. Panel (d) shows that total exports for the most exposed declined by 37% in 2016, recovering somewhat in subsequent years before declining further in the COVID years of 2020 and 2021. In 2021, exports were 50% less than where they were in 2015.

Table B.5 corresponds to Table 4. It shows the regression results for firm fundamentals that may have been indirectly affected by the Brexit referendum. Panel (a) displays the effects on average wages paid per firm. The outcome is the difference in log average wages between a given year and 2015. The mean of the dependent variable indicates that average wages remained fairly stable over the sample period, with the exception of 2020. Similar to the results in Table 4, the results suggest that in higher quintiles the changes in average wages relative to 2015 were either no different from zero or slightly negative. Regression results for profitability tend not to be statistically significant (Panel (b)). This is consistent with the results in Table 4. Results for employment (Panel (c)) tend to be statistically significant, and positive. This is similar to the results in Table 4, which are based on exports to the UK as a share of total exports. Panel (d) considers changes in log sales. Again, like Table 4, the overall decline in sales among exports was mainly driven by firms that were less exposed to the UK (i.e. in quintile 1).

Table B.6 contains results for the export regressions with controls. The results are largely similar to those in Table C.15, which are based on measuring exposure to Brexit as the share of UK exports in total exports and include firm-level controls. Panel (a) in Table B.6 shows that the probability of exit from exporting to the UK is lower for more exposed firms. Panel (b) shows that more and less exposed firms have a similar probability of exiting from exporting overall. Only in Panel (c) do we see differences between the two measures. Whereas the results based on the share UK exports in total exports are small and statistically insignificant, the results based on UK exports as a share of total sales are large and statistically significant. The results suggest that exporters with the lowest exposure experienced the highest increases in export volumes to the UK after Brexit, whereas the volumes were considerably lower for firms with more exposure. The effects on total export volumes, shown in Panel (d) are similar with both measures.

Table B.4: Brexit and Exports (share of sales)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.070 **	-0.029	-0.022	-0.045	-0.047	-0.004	Quintile 2	-0.039 (*)	-0.009	-0.018	-0.037	-0.020	-0.002
	(0.025)	(0.025)	(0.028)	(0.034)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.021)
Quintile 3	-0.055 *	-0.052 *	-0.039	-0.054	-0.047	0.005	Quintile 3	-0.023	-0.025	-0.026	-0.037	-0.011	-0.002
	(0.025)	(0.025)	(0.028)	(0.034)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.021)
Quintile 4	-0.055 *	-0.036	-0.030	-0.011	-0.046	0.005	Quintile 4	-0.016	-0.024	-0.026	0.013	-0.020	0.016
	(0.025)	(0.025)	(0.028)	(0.034)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.021)
Quintile 5	-0.070 **	-0.028	0.011	-0.061 (*)	-0.045	-0.012	Quintile 5	-0.031	-0.009	0.024	-0.044	-0.019	0.008
	(0.026)	(0.025)	(0.028)	(0.035)	(0.031)	(0.023)		(0.022)	(0.021)	(0.026)	(0.033)	(0.020)	(0.021)
Constant	0.094 **	0.068 **	0.064 **	0.105 **	0.091 **	0.030 (*)	Constant	0.055 **	0.041 **	0.050 **	0.088 **	0.037 *	0.019
	(0.018)	(0.018)	(0.020)	(0.025)	(0.023)	(0.017)		(0.016)	(0.015)	(0.018)	(0.023)	(0.015)	(0.015)
N	639	614	592	570	547	547	N	639	621	605	584	560	555
R ²	0.016	0.007	0.008	0.009	0.006	0.001	R ²	0.006	0.003	0.009	0.009	0.003	0.002
Mean DV	0.044	0.039	0.047	0.070	0.053	0.029	Mean DV	0.033	0.027	0.041	0.067	0.023	0.023
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.023	-0.198 (*)	-0.231 (*)	-0.236 (*)	-0.358 *	-0.509 *	Quintile 2	0.038	0.034	0.024	-0.066	-0.004	-0.175
	(0.077)	(0.108)	(0.124)	(0.141)	(0.171)	(0.205)		(0.055)	(0.086)	(0.121)	(0.101)	(0.115)	(0.132)
Quintile 3	-0.005	-0.067	-0.138	-0.017	-0.187	-0.270	Quintile 3	-0.023	0.057	0.105	-0.028	0.067	-0.116
	(0.078)	(0.108)	(0.124)	(0.140)	(0.171)	(0.206)		(0.055)	(0.086)	(0.121)	(0.101)	(0.115)	(0.132)
Quintile 4	-0.031	-0.185 (*)	-0.176	-0.142	-0.271	-0.377 (*)	Quintile 4	-0.046	-0.148 (*)	-0.031	-0.178 (*)	-0.165	-0.303 *
	(0.078)	(0.109)	(0.124)	(0.142)	(0.171)	(0.206)		(0.055)	(0.086)	(0.121)	(0.102)	(0.115)	(0.133)
Quintile 5	-0.025	-0.045	-0.056	-0.006	-0.237	-0.082	Quintile 5	-0.015	0.063	0.128	-0.061	-0.196 (*)	-0.142
	(0.078)	(0.109)	(0.125)	(0.141)	(0.172)	(0.207)		(0.055)	(0.086)	(0.123)	(0.102)	(0.116)	(0.134)
Constant	-0.268 **	-0.141 (*)	-0.099	-0.211 *	-1.531 **	-0.299 *	Constant	-0.370 **	-0.275 **	-0.359 **	-0.280 **	-0.444 **	-0.502 **
	(0.056)	(0.079)	(0.090)	(0.103)	(0.126)	(0.150)		(0.039)	(0.061)	(0.087)	(0.073)	(0.083)	(0.096)
N	611	590	564	530	518	531	N	618	604	580	545	547	542
R ²	0.000	0.009	0.008	0.009	0.009	0.016	R ²	0.004	0.014	0.004	0.007	0.015	0.010
Mean DV	-0.285	-0.242	-0.222	-0.293	-1.748	-0.554	Mean DV	-0.380	-0.274	-0.314	-0.346	-0.503	-0.652

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2, where shares are defined in Equation 3. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/sales) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 639 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have the full sample's 639 observations in 2016 as the firms exiting in that year are observed doing so.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table B.5: Firm fundamentals (share of sales)

(a) Average wages ($\ln(y_{it}) - \ln(y_{i,2015})$)								(b) Profitability ($y_{it} - y_{i,2015}$)						
	2016	2017	2018	2019	2020	2021	2022	2016	2017	2018	2019	2020	2021	
Quintile 2	-0.007 (0.014)	-0.027 (*) (0.016)	-0.037 * (0.019)	0.005 (0.019)	-0.027 (0.023)	-0.006 (0.022)	-0.011 (0.031)	0.031 (0.077)	-0.011 (0.039)	-0.039 (0.050)	-0.030 (0.035)	0.030 (0.211)	0.074 (0.070)	
Quintile 3	-0.003 (0.014)	-0.040 * (0.016)	-0.035 (*) (0.018)	-0.004 (0.019)	-0.027 (0.023)	-0.010 (0.022)	-0.015 (0.031)	-0.035 (0.077)	-0.016 (0.039)	-0.031 (0.050)	0.013 (0.035)	0.321 (0.211)	0.057 (0.070)	
Quintile 4	-0.009 (0.014)	-0.035 * (0.016)	-0.038 * (0.019)	0.006 (0.019)	-0.047 * (0.023)	0.014 (0.022)	0.060 (*) (0.031)	-0.001 (0.077)	-0.038 (0.039)	-0.085 (*) (0.050)	0.006 (0.035)	0.004 (0.211)	0.124 (*) (0.070)	
Quintile 5	-0.021 (0.014)	-0.028 (*) (0.016)	-0.049 ** (0.019)	-0.007 (0.019)	-0.055 * (0.023)	-0.002 (0.023)	-0.016 (0.031)	-0.108 (0.077)	-0.047 (0.039)	-0.026 (0.051)	0.015 (0.036)	0.003 (0.214)	0.116 (0.071)	
Constant	0.033 ** (0.010)	0.066 ** (0.011)	0.083 ** (0.013)	0.053 ** (0.014)	0.034 * (0.016)	0.089 ** (0.016)	0.050 * (0.022)	-0.035 (0.054)	-0.026 (0.028)	0.228 ** (0.036)	-0.041 (0.025)	-0.136 (0.152)	-0.073 (0.051)	
N	621	606	583	558	560	548	545	621	606	583	558	560	548	
R ²	0.004	0.012	0.013	0.001	0.012	0.002	0.017	0.006	0.003	0.005	0.004	0.006	0.007	
Mean DV	0.025	0.040	0.051	0.053	0.003	0.088	0.054	-0.057	-0.048	0.192	-0.040	-0.062	0.002	
(c) Employment ($\ln(y_{it}) - \ln(y_{i,2015})$)								(d) Sales ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021	2022	2016	2017	2018	2019	2020	2021	
Quintile 2	0.101 * (0.044)	0.152 ** (0.046)	0.147 * (0.059)	0.108 (*) (0.056)	0.040 (0.065)	0.062 (0.058)	0.000 (0.081)	0.122 * (0.057)	0.155 * (0.075)	-0.005 (0.078)	-0.022 (0.079)	0.073 (0.093)	-0.024 (0.086)	
Quintile 3	0.046 (0.044)	0.140 ** (0.046)	0.192 ** (0.059)	0.175 ** (0.056)	0.084 (0.065)	0.095 (0.058)	0.096 (0.081)	0.066 (0.057)	0.148 * (0.075)	0.132 (*) (0.078)	0.121 (0.079)	0.190 * (0.093)	0.108 (0.086)	
Quintile 4	0.100 * (0.044)	0.147 ** (0.046)	0.164 ** (0.059)	0.127 * (0.057)	-0.015 (0.065)	0.072 (0.058)	-0.018 (0.081)	0.091 (0.057)	0.123 (0.075)	0.041 (0.078)	0.126 (0.080)	0.157 (*) (0.093)	0.119 (0.086)	
Quintile 5	0.099 * (0.044)	0.158 ** (0.046)	0.220 ** (0.060)	0.197 ** (0.057)	0.094 (0.066)	0.146 * (0.059)	0.100 (0.082)	0.103 (*) (0.057)	0.132 (*) (0.075)	0.112 (0.079)	0.150 (*) (0.080)	0.081 (0.094)	0.159 (*) (0.087)	
Constant	-0.043 (0.031)	-0.061 (*) (0.033)	-0.059 (0.042)	0.002 (0.040)	0.008 (0.047)	0.075 (*) (0.042)	0.118 * (0.059)	-0.122 ** (0.040)	-0.266 ** (0.053)	-0.113 * (0.056)	-0.254 ** (0.057)	-0.297 ** (0.067)	-0.266 ** (0.062)	
N	621	606	583	558	560	548	545	621	606	583	558	560	548	
R ²	0.013	0.027	0.028	0.026	0.008	0.012	0.008	0.009	0.009	0.009	0.015	0.009	0.013	
Mean DV	0.027	0.059	0.086	0.124	0.049	0.151	0.153	-0.045	-0.153	-0.057	-0.179	-0.195	-0.194	

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2, where shares are defined in Equation 3. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from the market. The number of firms observed in 2016 is 621 rather than 639 due to 18 exits from the market in that year.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table B.6: Brexit and Exports with controls (share of sales)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.064 *	-0.010	-0.025	-0.049	-0.070 *	-0.014	Quintile 2	-0.031	0.000	-0.018	-0.041	-0.030	-0.001
	(0.026)	(0.025)	(0.029)	(0.036)	(0.031)	(0.024)		(0.023)	(0.021)	(0.027)	(0.034)	(0.021)	(0.022)
Quintile 3	-0.055 *	-0.030	-0.039	-0.057	-0.065 *	-0.005	Quintile 3	-0.019	-0.016	-0.025	-0.042	-0.013	-0.001
	(0.027)	(0.026)	(0.030)	(0.036)	(0.032)	(0.025)		(0.024)	(0.021)	(0.027)	(0.035)	(0.022)	(0.022)
Quintile 4	-0.042	0.002	-0.018	-0.005	-0.070 *	-0.012	Quintile 4	-0.003	-0.008	-0.013	0.016	-0.030	0.017
	(0.028)	(0.027)	(0.031)	(0.038)	(0.033)	(0.026)		(0.025)	(0.022)	(0.029)	(0.036)	(0.023)	(0.023)
Quintile 5	-0.065 *	-0.008	0.020	-0.062	-0.065 *	-0.035	Quintile 5	-0.024	-0.006	0.033	-0.048	-0.026	0.008
	(0.028)	(0.027)	(0.031)	(0.038)	(0.033)	(0.026)		(0.025)	(0.022)	(0.028)	(0.036)	(0.023)	(0.023)
Constant	-0.251	-0.388 (*)	-0.220	-0.098	0.165	0.360 (*)	Constant	-0.302	-0.234	-0.234	-0.246	0.008	0.147
	(0.212)	(0.205)	(0.241)	(0.293)	(0.255)	(0.201)		(0.186)	(0.170)	(0.221)	(0.281)	(0.177)	(0.181)
N	634	609	589	567	544	544	N	634	616	602	581	557	552
R ²	0.075	0.048	0.039	0.079	0.131	0.050	R ²	0.061	0.027	0.043	0.072	0.045	0.029
Mean DV	0.044	0.036	0.048	0.071	0.053	0.029	Mean DV	0.033	0.024	0.042	0.067	0.023	0.024
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quintile 2	-0.087	-0.212 (*)	-0.242 (*)	-0.233	-0.442 *	-0.585 **	Quintile 2	0.013	0.036	-0.004	-0.044	-0.018	-0.156
	(0.077)	(0.114)	(0.129)	(0.146)	(0.175)	(0.217)		(0.055)	(0.090)	(0.127)	(0.105)	(0.119)	(0.138)
Quintile 3	-0.094	-0.125	-0.232 (*)	-0.118	-0.335 (*)	-0.396 (*)	Quintile 3	-0.047	0.050	0.019	-0.044	0.026	-0.127
	(0.079)	(0.116)	(0.131)	(0.147)	(0.177)	(0.223)		(0.057)	(0.091)	(0.129)	(0.107)	(0.121)	(0.141)
Quintile 4	-0.169 *	-0.239 *	-0.252 (*)	-0.288 (*)	-0.452 *	-0.567 *	Quintile 4	-0.099 (*)	-0.151	-0.122	-0.199 (*)	-0.201	-0.266 (*)
	(0.082)	(0.121)	(0.137)	(0.154)	(0.186)	(0.232)		(0.059)	(0.096)	(0.135)	(0.112)	(0.127)	(0.148)
Quintile 5	-0.092	-0.091	-0.121	-0.090	-0.332 (*)	-0.247	Quintile 5	-0.016	0.080	0.080	-0.033	-0.162	-0.090
	(0.081)	(0.120)	(0.138)	(0.154)	(0.186)	(0.232)		(0.059)	(0.095)	(0.136)	(0.111)	(0.127)	(0.148)
Constant	1.007	0.164	2.673 *	1.786	-1.579	1.581	Constant	0.466	0.670	2.583 *	0.384	-0.934	-2.201 (*)
	(0.625)	(0.925)	(1.058)	(1.179)	(1.421)	(1.813)		(0.455)	(0.734)	(1.049)	(0.863)	(0.986)	(1.151)
N	606	587	561	527	514	528	N	613	601	577	542	544	539
R ²	0.083	0.051	0.076	0.085	0.094	0.058	R ²	0.085	0.051	0.055	0.075	0.091	0.066
Mean DV	-0.279	-0.240	-0.220	-0.290	-1.746	-0.555	Mean DV	-0.376	-0.273	-0.314	-0.345	-0.503	-0.651

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{5t}$ from Equation 2, where shares are defined in Equation 3. The outcome listed at the top of each panel is regressed on indicators for quintiles 2-5 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 634 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have 634 observations in 2016 as the firms exiting in that year are observed doing so. The full sample of observations is 639. Five of these are dropped when including controls.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

C Alternative Specifications

To this point, our analysis has been based on firms grouped by exposure quintile. As a robustness check, we present the results by quartile, tercile and finally the share of exports as a continuous variable.

C.1 Quartile Dummies

The analysis using quartile dummies yields very similar results to the analysis using quintiles. Table C.7 corresponds to Table 3. Panels (a) and (b) in Table C.7 show that firms in more exposed quartiles were marginally less likely to exit from both the UK export market and from exporting in general. Panels (b) and (c) show that firms in more exposed quartiles also tended to reduce their exports both to the UK and overall relative to firms in the least exposed quartile. These results align with those in Table 3.

Table C.8 corresponds to Table 4. More exposed firms have relatively lower growth in average wages, greater reductions in profitability, and less pronounced declines in employment and sales relative to firms with low exposure to the UK.

Table C.9 corresponds to Table A.1. Panel (a) shows exposed firms were less likely to exit from exporting to the UK and other destination, and that their exports to the UK and elsewhere declined relative to less exposed firms (Table C.9).

Table C.7: Brexit and Exports (quartiles)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quartile 2	-0.050 *	-0.029	-0.017	-0.034	-0.033	-0.025	Quartile 2	-0.025	-0.026	-0.015	-0.003	-0.015	-0.001
	(0.023)	(0.022)	(0.025)	(0.031)	(0.027)	(0.020)		(0.020)	(0.019)	(0.023)	(0.029)	(0.018)	(0.018)
Quartile 3	-0.013	-0.028	0.032	-0.010	0.035	-0.031	Quartile 3	0.012	-0.032 (*)	0.033	0.022	0.022	0.000
	(0.023)	(0.022)	(0.025)	(0.031)	(0.028)	(0.021)		(0.020)	(0.019)	(0.023)	(0.030)	(0.018)	(0.019)
Quartile 4	-0.062 **	-0.029	-0.024	-0.028	-0.006	-0.011	Quartile 4	-0.031	-0.014	-0.014	-0.003	-0.001	0.006
	(0.023)	(0.022)	(0.025)	(0.030)	(0.027)	(0.020)		(0.020)	(0.018)	(0.023)	(0.029)	(0.018)	(0.018)
Constant	0.075 **	0.061 **	0.050 **	0.089 **	0.055 **	0.046 **	Constant	0.044 **	0.045 **	0.041 *	0.063 **	0.022 (*)	0.022 (*)
	(0.016)	(0.016)	(0.018)	(0.022)	(0.020)	(0.015)		(0.014)	(0.013)	(0.016)	(0.021)	(0.013)	(0.013)
N	639	614	592	570	547	547	N	639	621	605	584	560	555
R ²	0.016	0.004	0.010	0.003	0.012	0.005	R ²	0.010	0.006	0.009	0.002	0.008	0.000
Mean DV	0.044	0.039	0.047	0.070	0.053	0.029	Mean DV	0.033	0.027	0.041	0.067	0.023	0.023
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quartile 2	-0.035	0.076	-0.016	0.091	0.083	0.061	Quartile 2	-0.111 *	-0.014	-0.038	-0.044	0.040	0.131
	(0.069)	(0.097)	(0.110)	(0.124)	(0.150)	(0.182)		(0.049)	(0.077)	(0.108)	(0.090)	(0.102)	(0.117)
Quartile 3	0.044	-0.007	-0.080	0.030	0.125	-0.030	Quartile 3	-0.000	-0.076	-0.066	-0.067	0.007	-0.101
	(0.069)	(0.097)	(0.112)	(0.127)	(0.154)	(0.185)		(0.049)	(0.077)	(0.110)	(0.092)	(0.104)	(0.119)
Quartile 4	0.018	-0.068	0.084	0.120	0.117	0.220	Quartile 4	-0.045	-0.095	0.124	-0.060	-0.020	-0.092
	(0.069)	(0.096)	(0.109)	(0.124)	(0.149)	(0.182)		(0.049)	(0.077)	(0.108)	(0.090)	(0.102)	(0.117)
Constant	-0.291 **	-0.242 **	-0.221 **	-0.356 **	-1.831 **	-0.619 **	Constant	-0.340 **	-0.227 **	-0.321 **	-0.304 **	-0.510 **	-0.637 **
	(0.049)	(0.070)	(0.080)	(0.091)	(0.109)	(0.132)		(0.035)	(0.055)	(0.077)	(0.064)	(0.073)	(0.084)
N	611	590	564	530	518	531	N	618	604	580	545	547	542
R ²	0.002	0.004	0.004	0.002	0.002	0.004	R ²	0.011	0.004	0.006	0.001	0.001	0.009
Mean DV	-0.285	-0.242	-0.222	-0.293	-1.748	-0.554	Mean DV	-0.380	-0.274	-0.314	-0.346	-0.503	-0.652

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{4t}$ based on Equation 2 but using quartiles rather than quintiles. The outcome listed at the top of each panel is regressed on indicators for quartiles 2-4 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 639 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have the full sample's 639 observations in 2016 as the firms exiting in that year are observed doing so.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table C.8: Firm fundamentals (quartiles)

(a) Average wages ($\ln(y_{it}) - \ln(y_{i,2015})$)								(b) Profitability ($y_{it} - y_{i,2015}$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Quartile 2	-0.005 (0.013)	-0.027 (*) (0.014)	-0.014 (0.017)	-0.003 (0.017)	-0.024 (0.020)	0.003 (0.020)	0.002 (0.027)	Quintile 2	-0.019 (0.068)	0.036 (0.035)	0.027 (0.045)	0.011 (0.031)	0.283 (0.187)	0.079 (0.062)
Quartile 3	-0.009 (0.013)	-0.036 * (0.015)	-0.033 (*) (0.017)	-0.009 (0.017)	-0.036 (*) (0.021)	-0.008 (0.020)	0.016 (0.028)	Quintile 3	0.018 (0.069)	-0.052 (0.035)	-0.038 (0.046)	0.022 (0.032)	-0.019 (0.191)	0.121 (*) (0.063)
Quartile 4	-0.014 (0.013)	-0.022 (0.014)	-0.018 (0.017)	-0.009 (0.017)	-0.043 * (0.020)	0.011 (0.020)	0.014 (0.027)	Quintile 4	-0.098 (0.068)	-0.040 (0.035)	-0.009 (0.045)	-0.019 (0.031)	0.022 (0.187)	0.105 (*) (0.062)
Constant	0.032 ** (0.009)	0.061 ** (0.010)	0.067 ** (0.012)	0.058 ** (0.012)	0.029 (*) (0.015)	0.086 ** (0.014)	0.046 * (0.020)	Constant	-0.032 (0.049)	-0.034 (0.025)	0.196 ** (0.032)	-0.043 (*) (0.022)	-0.136 (0.134)	-0.075 (*) (0.044)
N	621	606	583	558	560	548	545	N	621	606	583	558	560	548
R ²	0.002	0.011	0.006	0.001	0.009	0.002	0.001	R ²	0.005	0.013	0.004	0.003	0.006	0.008
Mean DV	0.025	0.040	0.051	0.053	0.003	0.088	0.054	Mean DV	-0.057	-0.048	0.192	-0.040	-0.062	0.002
(c) Employment ($\ln(y_{it}) - \ln(y_{i,2015})$)								(d) Sales ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Quartile 2	-0.002 (0.040)	0.037 (0.041)	0.032 (0.053)	0.078 (0.050)	0.048 (0.058)	0.045 (0.051)	0.042 (0.072)	Quartile 2	0.010 (0.051)	0.036 (0.067)	0.002 (0.070)	0.054 (0.071)	0.130 (0.083)	0.158 * (0.076)
Quartile 3	0.073 (*) (0.040)	0.094 * (0.042)	0.066 (0.054)	0.066 (0.051)	0.088 (0.059)	0.086 (*) (0.052)	0.080 (0.073)	Quartile 3	0.103 * (0.051)	0.097 (0.067)	0.047 (0.071)	0.086 (0.072)	0.086 (0.084)	0.204 ** (0.077)
Quartile 4	0.073 (*) (0.039)	0.121 ** (0.041)	0.142 ** (0.053)	0.161 ** (0.050)	0.139 * (0.057)	0.146 ** (0.051)	0.129 (*) (0.072)	Quartile 4	0.087 (*) (0.050)	0.158 * (0.067)	0.068 (0.070)	0.011 (0.071)	0.105 (0.082)	0.218 ** (0.076)
Constant	-0.009 (0.028)	-0.004 (0.029)	0.025 (0.038)	0.047 (0.036)	-0.021 (0.041)	0.080 * (0.037)	0.089 (*) (0.052)	Constant	-0.095 ** (0.036)	-0.226 ** (0.048)	-0.086 (*) (0.050)	-0.217 ** (0.051)	-0.276 ** (0.059)	-0.340 ** (0.055)
N	621	606	583	558	560	548	545	N	621	606	583	558	560	548
R ²	0.011	0.017	0.014	0.018	0.011	0.016	0.006	R ²	0.010	0.011	0.002	0.003	0.005	0.018
Mean DV	0.027	0.059	0.086	0.124	0.049	0.151	0.153	Mean DV	-0.045	-0.153	-0.057	-0.179	-0.195	-0.194

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{4t}$ based on Equation 2 but using quartiles rather than quintiles. The outcome listed at the top of each panel is regressed on indicators for quartiles 2-4 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from the market. The number of firms observed in 2016 is 621 rather than 639 due to 18 exits from the market in that year.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table C.9: Brexit and Exports with controls (quartiles)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quartile 2	-0.047 *	-0.015	-0.010	-0.026	-0.034	-0.038 (*)	Quartile 2	-0.021	-0.024	-0.011	0.009	-0.015	-0.003
	(0.024)	(0.023)	(0.026)	(0.032)	(0.028)	(0.022)		(0.021)	(0.019)	(0.024)	(0.031)	(0.019)	(0.020)
Quartile 3	-0.010	-0.002	0.043	-0.006	0.026	-0.048 *	Quartile 3	0.014	-0.017	0.043 (*)	0.028	0.020	0.000
	(0.025)	(0.024)	(0.028)	(0.034)	(0.030)	(0.023)		(0.022)	(0.020)	(0.026)	(0.033)	(0.021)	(0.021)
Quartile 4	-0.050 (*)	0.007	-0.013	-0.042	-0.002	-0.039	Quartile 4	-0.023	0.004	-0.002	-0.015	0.001	0.001
	(0.027)	(0.025)	(0.030)	(0.036)	(0.031)	(0.024)		(0.024)	(0.021)	(0.027)	(0.035)	(0.022)	(0.022)
Constant	-0.300	-0.401 *	-0.200	-0.129	0.033	0.356 (*)	Constant	-0.303 (*)	-0.251	-0.211	-0.263	-0.040	0.171
	(0.209)	(0.200)	(0.236)	(0.287)	(0.250)	(0.196)		(0.183)	(0.166)	(0.217)	(0.276)	(0.173)	(0.177)
N	634	609	589	567	544	544	N	634	616	602	581	557	552
R ²	0.074	0.046	0.041	0.073	0.128	0.055	R ²	0.064	0.031	0.043	0.065	0.047	0.027
Mean DV	0.044	0.036	0.048	0.071	0.053	0.029	Mean DV	0.033	0.024	0.042	0.067	0.023	0.024
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Quartile 2	-0.057	0.013	-0.039	0.042	0.048	0.011	Quintile 2	-0.091 (*)	-0.019	-0.057	-0.020	0.104	0.183
	(0.069)	(0.102)	(0.115)	(0.129)	(0.155)	(0.196)		(0.050)	(0.081)	(0.113)	(0.094)	(0.106)	(0.124)
Quartile 3	-0.045	-0.083	-0.098	-0.025	0.008	-0.095	Quintile 3	-0.005	-0.054	-0.063	-0.010	0.097	-0.010
	(0.074)	(0.108)	(0.124)	(0.139)	(0.169)	(0.210)		(0.053)	(0.086)	(0.122)	(0.101)	(0.114)	(0.133)
Quartile 4	-0.070	-0.148	0.080	0.103	0.124	0.178	Quintile 4	-0.036	-0.068	0.162	0.059	0.172	0.054
	(0.078)	(0.115)	(0.129)	(0.145)	(0.175)	(0.223)		(0.056)	(0.092)	(0.128)	(0.106)	(0.120)	(0.140)
Constant	0.809	-0.031	2.200 *	1.346	-2.536 (*)	0.585	Constant	0.386	0.642	2.409 *	0.135	-1.472	-2.620 *
	(0.614)	(0.909)	(1.034)	(1.157)	(1.394)	(1.785)		(0.446)	(0.725)	(1.022)	(0.850)	(0.966)	(1.128)
N	606	587	561	527	514	528	N	613	601	577	542	544	539
R ²	0.078	0.046	0.071	0.078	0.081	0.043	R ²	0.084	0.038	0.058	0.069	0.085	0.065
Mean DV	-0.279	-0.240	-0.220	-0.290	-1.746	-0.555	Mean DV	-0.376	-0.273	-0.314	-0.345	-0.503	-0.651

Notes: This table displays the coefficients $\beta_{2t}, \dots, \beta_{4t}$ from Equation 2 but using quartiles rather than quintiles. The outcome listed at the top of each panel is regressed on indicators for quartiles 2-4 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 634 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have 634 observations in 2016 as the firms exiting in that year are observed doing so. The full sample of observations is 639. Five of these are dropped when including controls.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

C.2 Tercile Dummies

Here we present alternative results whereby we split the exposure variable into terciles. The results here are also similar to those when we use quintile dummies and are, by and large, statistically insignificant. Table C.10 corresponds to Table 3. Panels (a) and (b) in Table C.10 shows that firms in more exposed terciles are slightly less likely to exit from exporting to the UK and overall. Panel (c) show that, of the firms remaining in each year, those in higher terciles export relatively more to the UK. Panel (d) presents a more ambiguous picture with firms in tercile 2 exporting relatively more and those in tercile 3 exporting relatively less. Only few of the results are statistically significant.

Table C.14 corresponds to Table 4. Panel (a) in Table C.14 suggests that average wages grow less for more exposed firms. Panel (b) suggests that profit outcomes are a little worse for more exposed firms. However, employment and sales growth is relatively higher for more exposed firms, particularly in Tercile 3 (Panels (c) and (d)).

Table C.12 corresponds to Table A.1. Panels (a) and (b) in Table C.12 suggest that more exposed firms are slightly more likely to exit from exporting to the UK but less likely to exit from exporting overall. Panels (c) and (d) shows that more exposed firms have declines in exporting to both the UK and overall relative to those which are less exposed. These results also tend not to be statistically significant.

Table C.10: Brexit and Exports (terciles)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Tercile 2	-0.014 (0.020)	-0.011 (0.019)	-0.007 (0.022)	0.007 (0.026)	0.009 (0.024)	-0.022 (0.018)	Tercile 2	0.009 (0.017)	-0.019 (0.016)	-0.000 (0.020)	0.035 (0.025)	0.000 (0.016)	0.011 (0.016)
Tercile 3	-0.038 ^(*) (0.020)	-0.021 (0.019)	-0.008 (0.021)	-0.009 (0.026)	-0.004 (0.024)	-0.007 (0.018)	Tercile 3	-0.009 (0.017)	-0.015 (0.016)	0.004 (0.020)	0.009 (0.025)	0.005 (0.016)	0.010 (0.016)
Constant	0.061 ^{**} (0.014)	0.050 ^{**} (0.014)	0.052 ^{**} (0.015)	0.071 ^{**} (0.019)	0.051 ^{**} (0.017)	0.039 ^{**} (0.013)	Constant	0.033 ^{**} (0.012)	0.039 ^{**} (0.011)	0.040 ^{**} (0.014)	0.052 ^{**} (0.018)	0.022 ^(*) (0.011)	0.016 (0.011)
N	639	614	592	570	547	547	N	639	621	605	584	560	555
R ²	0.006	0.002	0.000	0.001	0.001	0.003	R ²	0.002	0.003	0.000	0.004	0.000	0.001
Mean DV	0.044	0.039	0.047	0.070	0.053	0.029	Mean DV	0.033	0.027	0.041	0.067	0.023	0.023
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Tercile 2	0.043 (0.060)	0.103 (0.083)	0.016 (0.095)	0.052 (0.108)	0.168 (0.131)	0.060 (0.158)	Tercile 2	-0.013 (0.043)	0.009 (0.066)	0.052 (0.094)	0.020 (0.078)	0.050 (0.089)	0.079 (0.102)
Tercile 3	0.041 (0.059)	-0.046 (0.083)	0.072 (0.095)	0.112 (0.107)	0.140 (0.128)	0.205 (0.157)	Tercile 3	-0.006 (0.042)	-0.083 (0.066)	0.145 (0.093)	-0.009 (0.078)	0.014 (0.088)	-0.067 (0.101)
Constant	-0.313 ^{**} (0.042)	-0.261 ^{**} (0.060)	-0.252 ^{**} (0.068)	-0.349 ^{**} (0.077)	-1.853 ^{**} (0.093)	-0.644 ^{**} (0.113)	Constant	-0.373 ^{**} (0.030)	-0.249 ^{**} (0.047)	-0.380 ^{**} (0.066)	-0.350 ^{**} (0.055)	-0.524 ^{**} (0.063)	-0.654 ^{**} (0.072)
N	611	590	564	530	518	531	N	618	604	580	545	547	542
R ²	0.001	0.006	0.001	0.002	0.004	0.003	R ²	0.000	0.004	0.004	0.000	0.001	0.004
Mean DV	-0.285	-0.242	-0.222	-0.293	-1.748	-0.554	Mean DV	-0.380	-0.274	-0.314	-0.346	-0.503	-0.652

Notes: This table displays the coefficients β_{2t} and β_{3t} based on Equation 2 but using terciles rather than quintiles. The outcome listed at the top of each panel is regressed on indicators for terciles 2 and 3 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 639 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have the full sample's 639 observations in 2016 as the firms exiting in that year are observed doing so.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, ^(*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table C.11: Firm fundamentals (terciles)

(a) Average wages ($\ln(y_{it}) - \ln(y_{i,2015})$)								(b) Profitability ($y_{it} - y_{i,2015}$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Tercile 2	0.000	-0.018	-0.016	-0.009	-0.028	-0.003	-0.009	Tercile 2	0.034	-0.016	0.014	-0.003	-0.233	0.074
	(0.011)	(0.013)	(0.014)	(0.015)	(0.018)	(0.017)	(0.024)		(0.059)	(0.030)	(0.039)	(0.027)	(0.164)	(0.054)
Tercile 3	-0.009	-0.017	-0.018	-0.008	-0.040 *	0.000	0.025	Tercile 3	-0.045	-0.049	-0.043	-0.028	-0.192	0.085
	(0.011)	(0.013)	(0.014)	(0.015)	(0.018)	(0.017)	(0.024)		(0.059)	(0.030)	(0.039)	(0.027)	(0.162)	(0.053)
Constant	0.028 **	0.052 **	0.063 **	0.058 **	0.026 *	0.089 **	0.048 **	Constant	-0.054	-0.026	0.202 **	-0.030	0.080	-0.051
	(0.008)	(0.009)	(0.010)	(0.010)	(0.013)	(0.012)	(0.017)		(0.042)	(0.022)	(0.028)	(0.019)	(0.115)	(0.038)
N	621	606	583	558	560	548	545	N	621	606	583	558	560	548
R ²	0.002	0.004	0.003	0.001	0.010	0.000	0.004	R ²	0.003	0.004	0.004	0.002	0.004	0.005
Mean DV	0.025	0.040	0.051	0.053	0.003	0.088	0.054	Mean DV	-0.057	-0.048	0.192	-0.040	-0.062	0.002
(c) Employment ($\ln(y_{it}) - \ln(y_{i,2015})$)								(d) Sales ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021	2022		2016	2017	2018	2019	2020	2021
Tercile 2	0.015	0.045	0.019	0.057	0.052	0.082 (*)	0.108 (*)	Tercile 2	0.068	0.075	0.084	0.115 (*)	0.108	0.201 **
	(0.034)	(0.036)	(0.046)	(0.044)	(0.050)	(0.045)	(0.063)		(0.044)	(0.058)	(0.061)	(0.062)	(0.072)	(0.066)
Tercile 3	0.061 (*)	0.102 **	0.117 *	0.137 **	0.110 *	0.125 **	0.093	Tercile 3	0.093 *	0.135 *	0.095	0.049	0.103	0.178 **
	(0.034)	(0.036)	(0.046)	(0.043)	(0.050)	(0.044)	(0.062)		(0.044)	(0.058)	(0.061)	(0.061)	(0.071)	(0.065)
Constant	0.002	0.010	0.040	0.059 (*)	-0.006	0.081 *	0.086 (*)	Constant	-0.099 **	-0.224 **	-0.117 **	-0.234 **	-0.265 **	-0.320 **
	(0.024)	(0.025)	(0.033)	(0.031)	(0.036)	(0.032)	(0.044)		(0.031)	(0.041)	(0.043)	(0.043)	(0.051)	(0.047)
N	621	606	583	558	560	548	545	N	621	606	583	558	560	548
R ²	0.006	0.013	0.013	0.018	0.009	0.015	0.006	R ²	0.008	0.009	0.005	0.006	0.005	0.020
Mean DV	0.027	0.059	0.086	0.124	0.049	0.151	0.153	Mean DV	-0.045	-0.153	-0.057	-0.179	-0.195	-0.194

Notes: This table displays the coefficients β_{2t} and β_{3t} based on Equation 2 but using terciles rather than quintiles. The outcome listed at the top of each panel is regressed on indicators for terciles 2 and 3 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from the market. The number of firms observed in 2016 is 621 rather than 639 due to 18 exits from the market in that year.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table C.12: Brexit and Exports with controls (terciles)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Tercile 2	-0.012	0.007	0.003	0.009	0.015	-0.035 (*)	Tercile 2	0.014	-0.010	0.009	0.043	0.000	0.011
	(0.021)	(0.020)	(0.024)	(0.028)	(0.025)	(0.019)		(0.019)	(0.017)	(0.022)	(0.027)	(0.017)	(0.017)
Tercile 3	-0.023	0.010	0.002	-0.016	-0.007	-0.027	Tercile 3	0.002	0.001	0.018	0.005	0.002	0.007
	(0.023)	(0.022)	(0.025)	(0.031)	(0.026)	(0.021)		(0.020)	(0.018)	(0.023)	(0.029)	(0.018)	(0.019)
Constant	-0.323	-0.410 *	-0.221	-0.163	0.019	0.362 (*)	Constant	-0.331 (*)	-0.248	-0.236	-0.296	-0.045	0.159
	(0.210)	(0.201)	(0.237)	(0.287)	(0.251)	(0.197)		(0.184)	(0.167)	(0.218)	(0.276)	(0.174)	(0.177)
N	634	609	589	567	544	544	N	634	616	602	581	557	552
R ²	0.065	0.045	0.030	0.071	0.121	0.052	R ²	0.058	0.026	0.033	0.067	0.040	0.028
Mean DV	0.044	0.036	0.048	0.071	0.053	0.029	Mean DV	0.033	0.024	0.042	0.067	0.023	0.024
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
Tercile 2	-0.007	0.049	-0.005	-0.007	0.112	0.010	Tercile 2	-0.015	0.013	0.052	0.052	0.116	0.142
	(0.062)	(0.091)	(0.103)	(0.115)	(0.139)	(0.175)		(0.045)	(0.072)	(0.102)	(0.084)	(0.095)	(0.111)
Tercile 3	-0.037	-0.090	0.068	0.092	0.137	0.178	Tercile 3	-0.003	-0.054	0.187 (*)	0.092	0.182 (*)	0.080
	(0.066)	(0.097)	(0.110)	(0.122)	(0.148)	(0.186)		(0.048)	(0.078)	(0.109)	(0.090)	(0.101)	(0.118)
Constant	0.785	-0.074	2.204 *	1.366	-2.622 (*)	0.556	Constant	0.349	0.641	2.334 *	0.071	-1.541	-2.700 *
	(0.615)	(0.910)	(1.037)	(1.158)	(1.396)	(1.785)		(0.448)	(0.725)	(1.025)	(0.852)	(0.967)	(1.131)
N	606	587	561	527	514	528	N	613	601	577	542	544	539
R ²	0.077	0.046	0.068	0.078	0.081	0.042	R ²	0.077	0.039	0.055	0.069	0.087	0.062
Mean DV	-0.279	-0.240	-0.220	-0.290	-1.746	-0.555	Mean DV	-0.376	-0.273	-0.314	-0.345	-0.503	-0.651

Notes: This table displays the coefficients β_{2t} and β_{3t} from Equation 2 but using terciles rather than quintiles. The outcome listed at the top of each panel is regressed on indicators for terciles 2 and 3 of the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 634 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have 634 observations in 2016 as the firms exiting in that year are observed doing so. The full sample of observations is 639. Five of these are dropped when including controls.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

C.3 Exposure as a Continuous Variable

Here we run our analysis using exposure to the UK as a continuous variable. In Tables C.13, C.14 and C.15, the outcomes are regressed on the distribution of firms' exposure to the UK defined as exports as a share of total exports prior to Brexit. Table C.13 corresponds to Table 3. The results are not statistically significant. Panels (a) and (b) show higher exposure is associated with greater probability of exporting from the UK and overall.

Table C.14 corresponds to Table 4. Higher exposure is associated with relatively lower wage growth, and profitability, while increased employment and sales. The results for employment and sales are statistically significant. Table C.15 shows export outcomes controlling for firm characteristics and corresponds to Table A.1. Here the results are not statistically significant. Higher exposed firms are less likely to exit from exporting to the UK and overall, while they tend to increase export to the UK and have little difference in overall exports.

In sum, the fact that we find very few statistically significant effects of Brexit exposure confirms our findings when using quintile, quartile or tercile dummies. The data do not reveal that the Brexit referendum had measurable effects on Irish exporters.

Table C.13: Brexit and Exports (continuous dep. variable, UK share of total exports)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
UK exp. shr.	-0.040 (*)	-0.029	-0.001	-0.012	0.015	-0.007	UK exp. shr.	-0.010	-0.018	0.010	0.009	0.013	0.012
	(0.021)	(0.021)	(0.023)	(0.029)	(0.025)	(0.019)		(0.019)	(0.017)	(0.021)	(0.027)	(0.017)	(0.017)
Constant	0.065 **	0.054 **	0.048 **	0.077 **	0.045 **	0.033 **	Constant	0.038 **	0.037 **	0.036 *	0.062 **	0.016	0.017
	(0.014)	(0.014)	(0.015)	(0.019)	(0.017)	(0.013)		(0.012)	(0.011)	(0.014)	(0.018)	(0.011)	(0.011)
N	639	614	592	570	547	547	N	639	621	605	584	560	555
R ²	0.005	0.003	0.000	0.000	0.001	0.000	R ²	0.000	0.002	0.000	0.000	0.001	0.001
Mean DV	0.044	0.039	0.047	0.070	0.053	0.029	Mean DV	0.033	0.027	0.041	0.067	0.023	0.023
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
UK exp. shr.	0.050	-0.100	0.041	0.069	0.107	0.110	UK exp. shr.	0.010	-0.106	0.119	-0.045	-0.014	-0.162
	(0.064)	(0.090)	(0.103)	(0.116)	(0.140)	(0.170)		(0.046)	(0.072)	(0.101)	(0.084)	(0.095)	(0.110)
Constant	-0.312 **	-0.188 **	-0.244 **	-0.331 **	-1.806 **	-0.613 **	Constant	-0.385 **	-0.217 **	-0.378 **	-0.323 **	-0.496 **	-0.565 **
	(0.042)	(0.059)	(0.068)	(0.077)	(0.092)	(0.112)		(0.030)	(0.047)	(0.066)	(0.055)	(0.062)	(0.072)
N	611	590	564	530	518	531	N	618	604	580	545	547	542
R ²	0.001	0.002	0.000	0.001	0.001	0.001	R ²	0.000	0.004	0.002	0.001	0.000	0.004
Mean DV	-0.285	-0.242	-0.222	-0.293	-1.748	-0.554	Mean DV	-0.380	-0.274	-0.314	-0.346	-0.503	-0.652

Notes: This table displays the coefficient on UK share of exports based on Equation 2 but using the continuous variable rather than quintiles. The outcome listed at the top of each panel is regressed on the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 639 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have the full sample's 639 observations in 2016 as the firms exiting in that year are observed doing so.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table C.14: Firm fundamentals (continuous dep. variable, UK share of total exports)

(a) Average wages ($\ln(y_{it}) - \ln(y_{i,2015})$)							
	2016	2017	2018	2019	2020	2021	2022
UK exp. shr.	-0.014 (0.012)	-0.021 (0.014)	-0.025 (0.016)	-0.008 (0.016)	-0.039 * (0.019)	0.005 (0.018)	0.023 (0.026)
Constant	0.032 ** (0.008)	0.051 ** (0.009)	0.065 ** (0.010)	0.057 ** (0.010)	0.024 (*) (0.012)	0.085 ** (0.012)	0.041 * (0.017)
N	621	606	583	558	560	548	545
R ²	0.002	0.004	0.004	0.000	0.008	0.000	0.002
Mean DV	0.025	0.040	0.051	0.053	0.003	0.088	0.054
(b) Profitability ($y_{it} - y_{i,2015}$)							
	2016	2017	2018	2019	2020	2021	2022
UK exp. shr.	-0.061 (0.064)	-0.075 * (0.033)	-0.043 (0.042)	-0.018 (0.029)	-0.162 (0.175)	0.099 (*) (0.058)	
Constant	-0.025 (0.042)	-0.008 (0.021)	0.215 ** (0.028)	-0.030 (0.019)	0.025 (0.115)	-0.051 (0.038)	
N	621	606	583	558	560	548	
R ²	0.001	0.009	0.002	0.001	0.002	0.005	
Mean DV	-0.057	-0.048	0.192	-0.040	-0.062	0.002	
(c) Employment ($\ln(y_{it}) - \ln(y_{i,2015})$)							
	2016	2017	2018	2019	2020	2021	2022
UK exp. shr.	0.093 * (0.037)	0.123 ** (0.039)	0.141 ** (0.050)	0.143 ** (0.047)	0.128 * (0.054)	0.150 ** (0.048)	0.115 (*) (0.067)
Constant	-0.023 (0.024)	-0.007 (0.025)	0.010 (0.032)	0.048 (0.031)	-0.020 (0.035)	0.070 * (0.031)	0.091 * (0.044)
N	621	606	583	558	560	548	545
R ²	0.010	0.017	0.014	0.016	0.010	0.018	0.005
Mean DV	0.027	0.059	0.086	0.124	0.049	0.151	0.153
(d) Sales ($\ln(y_{it}) - \ln(y_{i,2015})$)							
	2016	2017	2018	2019	2020	2021	2022
UK exp. shr.	0.113 * (0.047)	0.147 * (0.063)	0.096 (0.066)	0.030 (0.066)	0.078 (0.077)	0.197 ** (0.071)	
Constant	-0.106 ** (0.031)	-0.232 ** (0.041)	-0.108 * (0.043)	-0.196 ** (0.043)	-0.237 ** (0.051)	-0.299 ** (0.047)	
N	621	606	583	558	560	548	
R ²	0.009	0.009	0.004	0.000	0.002	0.014	
Mean DV	-0.045	-0.153	-0.057	-0.179	-0.195	-0.194	

Notes: This table displays the coefficient on UK share of exports based on Equation 2 but using the continuous variable rather than quintiles. The outcome listed at the top of each panel is regressed on the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from the market. The number of firms observed in 2016 is 621 rather than 639 due to 18 exits from the market in that year.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, (*) p < 0.10, * p < 0.05, ** p < 0.01.

Table C.15: Brexit and Exports with controls (continuous dep. variable, UK share of total exports)

(a) Exit from exporting to the UK							(b) Exit from exporting (to any destination)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
UK exp. shr.	-0.069 ^(*)	0.004	0.056	-0.032	-0.063	-0.042	UK exp. shr.	-0.030	-0.005	0.073 ^(*)	-0.022	-0.031	0.016
	(0.037)	(0.035)	(0.041)	(0.050)	(0.043)	(0.034)		(0.033)	(0.029)	(0.038)	(0.048)	(0.030)	(0.030)
Constant	-0.296	-0.402 [*]	-0.265	-0.144	0.080	0.354 ^(*)	Constant	-0.305 ^(*)	-0.246	-0.276	-0.259	-0.016	0.157
	(0.210)	(0.201)	(0.238)	(0.288)	(0.251)	(0.197)		(0.184)	(0.167)	(0.218)	(0.277)	(0.174)	(0.178)
N	634	609	589	567	544	544	N	634	616	602	581	557	552
R ²	0.069	0.044	0.033	0.070	0.123	0.049	R ²	0.058	0.025	0.039	0.062	0.042	0.027
Mean DV	0.044	0.036	0.048	0.071	0.053	0.029	Mean DV	0.033	0.024	0.042	0.067	0.023	0.024
(c) UK exports ($\ln(y_{it}) - \ln(y_{i,2015})$)							(d) Total exports ($\ln(y_{it}) - \ln(y_{i,2015})$)						
	2016	2017	2018	2019	2020	2021		2016	2017	2018	2019	2020	2021
UK exp. shr.	-0.065	0.022	0.036	0.024	-0.160	0.076	UK exp. shr.	-0.018	0.089	0.151	-0.013	-0.271	-0.032
	(0.106)	(0.157)	(0.180)	(0.200)	(0.240)	(0.302)		(0.078)	(0.126)	(0.179)	(0.147)	(0.165)	(0.194)
Constant	0.801	-0.143	2.237 [*]	1.410	-2.269	0.655	Constant	0.356	0.532	2.410 [*]	0.184	-1.050	-2.510 [*]
	(0.616)	(0.915)	(1.042)	(1.163)	(1.400)	(1.795)		(0.449)	(0.727)	(1.031)	(0.854)	(0.969)	(1.137)
N	606	587	561	527	514	528	N	613	601	577	542	544	539
R ²	0.077	0.041	0.067	0.076	0.080	0.039	R ²	0.077	0.038	0.051	0.067	0.086	0.059
Mean DV	-0.279	-0.240	-0.220	-0.290	-1.746	-0.555	Mean DV	-0.376	-0.273	-0.314	-0.345	-0.503	-0.651

Notes: This table displays the coefficient on UK share of exports based on Equation 2 but using the continuous variable rather than quintiles. The outcome listed at the top of each panel is regressed on the distribution of firms' exposure to the UK (UK exports/total exports) pre-Brexit.

The number of observations declines by year due to exits from exporting. Panels (c) and (d) have less than 634 observations in 2016 due to exits from exporting to each respective market in that year. Panels (a) and (b) have 634 observations in 2016 as the firms exiting in that year are observed doing so. The full sample of observations is 639. Five of these are dropped when including controls.

Mean DV refers to the mean value of the dependent variable. Standard errors in parentheses, ^(*) $p < 0.10$, ^{*} $p < 0.05$, ^{**} $p < 0.01$.

Controls (all 2015 values): firm age, $\ln(\text{average weekly wages})$, $\ln(\text{sales/employee})$, $\ln(\text{employment})$, foreign-owned, NACE 2-digit fixed effects.

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