Non-tariff barriers and consumer prices: Evidence from Brexit*

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Abstract

After decades of supporting free trade and European integration, the UK formally left the European Union in 2020, increasing non-tariff barriers (NTBs) to trade. We analyse the causal impact of this reversal of deep economic integration on consumer prices using CPI microdata matched to trade flows for food products. Products more reliant on EU imports experienced 12% higher price growth after Brexit. These increases began before new trade barriers were implemented and were concentrated in products with higher NTBs. We develop a simple theoretical framework to rationalise these patterns, motivated by qualitative and survey evidence, in which expectations of future NTBs generate cost and price increases. The welfare consequences are substantial: households lost $14.8 billion, domestic producers gained $13.3 billion, and $1.5 billion was lost as deadweight loss in food markets. Because food accounts for a larger share of expenditure among poorer households, the lowest income decile experienced a 52% larger increase in the cost of living than the top decile. Our results highlight the costs of undoing deep economic integration, suggesting that NTB-related uncertainty may be more damaging than tariff uncertainty, an important insight for an increasingly unstable geopolitical environment.

JEL codes: E31, F13, F15, Q11

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"These non-tariff barriers are just as bad as tariffs—maybe worse."

Donald J. Trump, President of the United States, April 2025

1 Introduction

The cost (and benefits) of economic nationalism have been at the heart of economics since Adam Smith and David Ricardo, and the rise in geopolitical tension and the return of protectionist policies has pushed them once more to the centre of economic policy debates. While most debates surround tariffs, many policymakers now recognize the importance of non-tariff barriers (NTBs). Despite this, scientific evidence on their effects on consumer prices remains scant.

To fill this gap, this paper exploits the most substantial reversal of deep economic integration in a generation – the United Kingdom's (UK) decision to leave the European Union (EU). The UK public voted to leave the EU in June 2016 and, after years of intense debate and negotiation, effectively withdrew in January 2021. The UK left the Single Market and Customs Union, with trade between the UK and the EU now regulated by the Trade and Cooperation Agreement (TCA). The TCA ensures tariff and quota free trade, but does not provide any provisions for deep integration, hence, it has given rise to a regulatory and customs border between the EU and the UK that involves NTBs.

In this paper, we provide the first causal evidence on the cost of unraveling deep integration on consumers: Brexit resulted in substantial price increases that started materialising even before trade costs increased and were concentrated in high NTB products. As a result consumers experienced significant welfare losses. These results highlight the underlying mechanisms: the rise in NTBs as well as expectations about future NTB increases. In line with these anticipatory effects, qualitative and survey evidence from firms and governments suggests firms invested resources into logistical and administrative capabilities to deal with

future NTBs prior to any barriers coming into force. Motivated by this qualitative evidence we develop a conceptual framework where expectations about future NTBs can lead to real price effects prior to the rise in any trade barriers. These anticipatory effects highlight that the cost of uncertainty surrounding NTBs is likely higher than tariff uncertainty, an important insight given the increasingly unstable geopolitical environment.

To carry out the analysis we proceed in three steps. First, we document qualitative and survey evidence from a wide range of industry bodies, consultancies, think tanks and governments, documenting firm responses to both the anticipation and actual implementation of new trade barriers under the post-Brexit trading regime. We then use this evidence to guide our conceptual framework. The conceptual framework allows for flexible pass-throughs of cost increases and features logistical and administrative capabilities necessary to comply with NTBs. These capabilities take time to build and draw on shared resources with production and distribution, such that changes in the expectations of future NTBs lead to capability investments today which in turn increase the marginal cost of production.

Second, we exploit variation in the exposure of products to Brexit and NTBs to estimate the causal impact on consumer prices utilising a unique dataset. We leverage the representative micro data on consumer prices of food products that underlies the Consumer Price Index and create a novel crosswalk to the Harmonized System to link it to data on trade flows, NTB measures and Sanitary and Phytosanitary (SPS) counts.[1] We show that UK food products that are more heavily imported from the EU experience larger price increases after Brexit. This effect began to materialise from December 2019, when it became clear that the UK was going to leave the EU Single Market and the Customs Union, which meant that a regulatory border between the EU and the UK was going to arise. We find that leaving the European Union increased the price of food products by 4% per year, leading to a 12.0% increase over a three-year period. We carry out a wide range of robustness checks to show that these effects

[1]SPS measures are one of the key NTBs related to the agri-food sector.

are not driven by Covid, EU food consumer and export prices, expected or realised tariffs, stockpiling and perishability, and exchange rate fluctuations. We additionally conduct a placebo exercise in which we iteratively replace our main exposure variable with import shares from each of the UK's other major trading partners. The estimated effect in our baseline specification of EU exposure emerges as a clear outlier relative to this distribution which is closely centred around zero.

To provide evidence on the underlying mechanism driving these price increases, we exploit three different datasets measuring NTBs. The first two provide estimates for ad-valorem equivalent (AVE) rate of NTBs for each product, collected by the World Bank and the Global Trade Analysis Project (GTAP), which capture a combination of technical barriers to trade (TBTs), SPS measures, customs procedures, red tape and licensing requirements associated with importing products. The third data source provides counts of SPS measures by food products from UNCTAD TRAINS. SPS measures are rules, measures and regulations to ensure food is safe for consumption and thus are generally considered to be the most important NTB for food products. We find that the relative price increases following Brexit are substantially larger for food products with higher AVE NTBs and more SPS measures, while products with low NTB exposure exhibit much smaller, and often statistically insignificant, relative price increases. This heterogeneity also serves as a placebo test: if the effects were driven by Covid-related global shocks or broader EU food price inflation, we would expect price increases even among low-NTB products, which we do not observe.

Third, we quantify the welfare effects of the observed changes in prices and quantities based on our conceptual framework. We embed the estimated Brexit-induced price increases into a demand model for food products that captures how consumers substitute across items within the food basket. This allows us to recover an estimate of the demand-price elasticity and construct counterfactual post-Brexit consumer welfare losses using a standard compensating variation measure. The Brexit-induced rise in NTBs for food products caused sizeable wel-

fare effects, with households losing $14.8 billion (or $536 per household), domestic producers gaining $13.3 billion, and a deadweight loss of $1.5 billion over 2020-2023. This deadweight loss is considerably higher than the loss from an equivalent increase in tariffs as no government revenue is generated, and at least in the short run there have not been any significant deviation from EU standards and therefore no domestic benefits from the increase in regulatory flexibility. Due to the differences in the food expenditure share between high and low income households, households in the lowest decile experienced an increase in the cost of living that is 52% higher than a household in the top decile.

This paper contributes to several literatures. First and foremost we add to the literature on the effects of the rise of economic nationalism and specifically the economics of international disintegration following Brexit. Several papers document the economic effects of the Brexit referendum: Breinlich et al. (2022) study the pass-through of the Sterling depreciation into consumer prices, Costa et al. (2024) the effects on workers, Breinlich et al. (2020) the effects on foreign direct investment, Bloom et al. (2019) the effects on productivity and investment, and Born et al. (2019) the effects on GDP. Dhingra and Sampson (2022) summarise the literature on the economic effects of Brexit that materialised in the time between the referendum and the UK leaving the EU. The literature on the effects of the actual implementation of Brexit is much less developed, with Freeman et al. (2024), who study the effects of trade flows, being the notable exception. We contribute to this literature by documenting the cost to UK consumers from leaving the EU through one important and well-identified mechanism: the rise of NTBs. More broadly we add to the literature that aims to quantify the economic effects of populist policies such as Amiti et al. (2019), Fajgelbaum et al. (2020) and Funke et al. (2023).

We also contribute to the macro and trade literature on the consumer price and welfare effects of changes in trade costs that has largely focused on tariffs and exchange rates, while we study a rise in NTBs. The recent literature on the pass through of tariffs into consumer

prices finds consistently high pass-through rates (Amiti et al., 2019; Flaaen et al., 2020; Fajgelbaum et al., 2020), but no anticipatory effects. The estimates on the pass-through of exchange rate movements into consumer prices are more mixed. Most studies have found low pass-through rates (see Burstein and Gopinath (2014) for a review). However, Breinlich et al. (2022) find high rates of pass-through and cannot reject complete pass through of the Sterling depreciation following the Brexit vote into consumer prices. Similarly, Burstein et al. (2005) find high pass-through rates in various large devaluations. We add to this literature by studying the effects of changes in NTBs. We document that NTBs are conceptually different as changes in expectations about future NTBs lead firms to incur costs and raise prices today, since firms require logistical and administrative capabilities in order to comply with NTBs. These investments are most cost-effectively built over time and draw on shared resources with production and distribution. This has important implications for measuring the pass-through of NTBs, which is conceptually harder, as the cost of compliance depends on the investments firms make in logistical and administrative capabilities, and this may be heterogeneous across firms. As such, unlike tariffs which have a consistent marginal cost change across all firms, NTBs represent a significant departure from this.

These insights also add to a small but growing literature that aims to quantify the role of NTBs for trade flows, such as Dhingra et al. (2021), who quantify the effects of deep trade agreements, Conconi et al. (2018) who study the effects of rules of origin, Carballo et al. (2021) who quantify the cost of import processing times, and Atkin et al. (2022) who study firm responses to non-automatic import licenses.

The remainder of this paper is structured as follows. Section 2 provides an overview of the timeline of the UK leaving the EU, qualitative and survey evidence on firms preparing for the changing trade relations as well as the conceptual framework. Section 3 introduces the data and the empirical strategy while section 4 discusses the main results and explores the resulting welfare implications, and section 5 concludes.

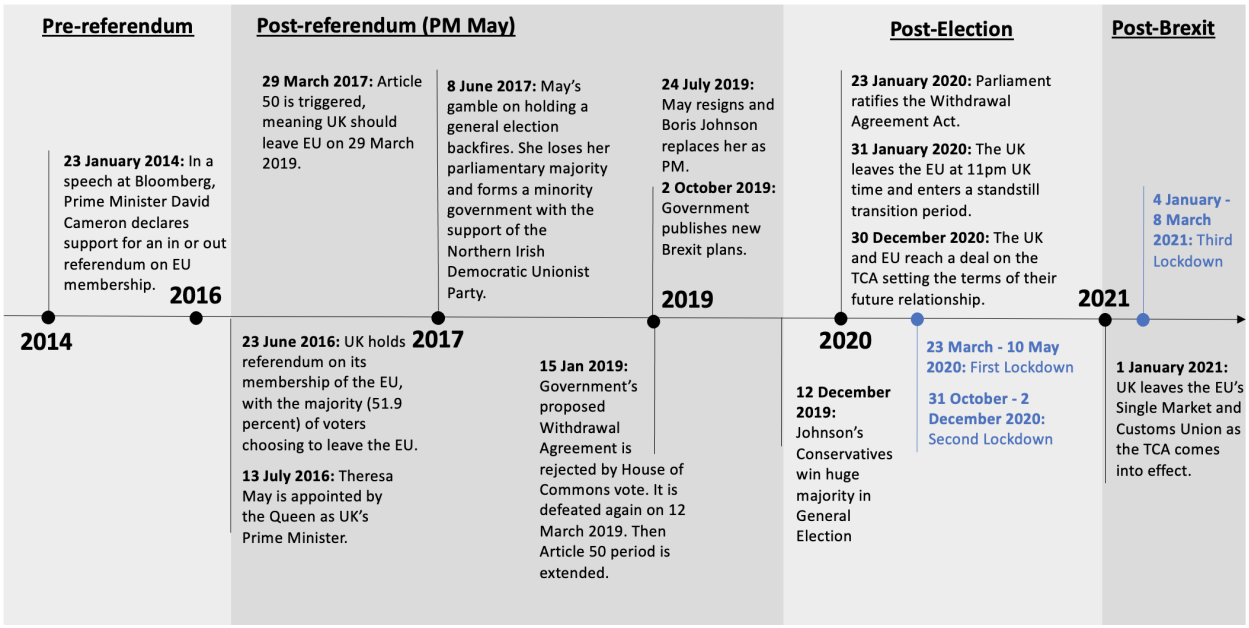
2 The Brexit Shock

2.1 Timeline

The EU is one of the largest trading blocs in the world. It is also one of the deepest trade agreements, going beyond the elimination of tariffs to include minimising NTBs via mutual recognition of standards, a common external tariff, and free movement of people and capital. Given the geographical proximity, the economic size of the bloc, and the reduction of trade barriers, it is not surprising that the UK became heavily integrated in the EU economy. In 2015, 53.4% of UK goods imports were from the European Union. For food products, the focus of this paper, the share was even higher, at 77.5%.

The UK unexpectedly voted to leave the EU in June 2016, but new trading relationships were not implemented until 2021. The period between the referendum and the eventual separation of the UK from the EU was politically and economically turbulent for the UK. Figure 1 provides a summary of key events.

Figure 1: Timeline of key Brexit events



Note: The figure presents the timeline of key Brexit events (black) and also includes UK specific dates for COVID "lockdowns" (blue).

Article 50, which stated that the UK would leave the EU within two years, was formally triggered on 29th March 2017. However, the negotiations on the future Brexit agreement proved difficult, complicated by weak parliamentary majorities and domestic disputes over the details of the type of Brexit agreement that should be pursued. An extension was requested in March 2019, with the leaving date postponed to October 2019. Twice in early 2019, the government's proposed Withdrawal Agreement which specified a "soft" Brexit (continued membership of the Customs Union), was rejected by the UK Parliament. This prompted, then Prime Minister, Theresa May to resign on 24th May 2019. A further extension was announced in October, with the new date proposed to be 31st January 2020.

Boris Johnson, who had actively campaigned to leave the EU in the lead-up to the referendum, replaced May as Prime Minister in July 2019. In October 2019, Johnson's government published its proposed Brexit deal and subsequently called a General Election for December 2019. The Conservative Party campaigned with its proposed Brexit deal and the slogan "Get Brexit Done". They won the election with a huge majority, therefore all but confirming that the UK would leave on 31st January 2020 with a "hard" Brexit - withdrawing membership of both the Customs Union and Single Market. The UK left the EU on 31st January 2020, beginning a Transition Period whereby current laws would remain in place until the end of 2020.[2]

The UK left the Single Market and Customs Union on 1st January 2021, marking the end of the transition period and the introduction of new relations outlined by the EU–UK Trade and Cooperation Agreement (TCA). Under the TCA, goods continue to be traded without tariffs and quotas but the regulatory and customs framework for trade has changed, causing an increase in trade frictions. The new measures include comprehensive customs checks, rules of origin requirements, technical barriers to trade (TBT) such as the need to prove regulatory compliance in each jurisdiction separately, sanitary and phytosanitary (SPS) measures for

[2]For more details, see Dhingra and Sampson (2022) and `https://commonslibrary.parliament.uk/research-briefings/cbp-7960/`

trade in animals and plants, and limitations on the freedom of movement for business travel, among other restrictions.

Despite hard policy change not occurring until 2021, from at least 2019, firms on both the EU and UK sides of the Channel were being actively encouraged by governments, regulators, and industry bodies to prepare for a post-Brexit trading environment characterised by substantial increases in NTBs. Government guidance and preparedness checklists published in 2019-2020 at EU level and within member states explicitly framed Brexit as a shift to third-country trading conditions and urged firms to audit supply chains, documentation requirements, certification status, and regulatory exposure well in advance of formal implementation (European Commission, 2019; Ministère du Travail, 2019). Parallel industry guidance translated these expectations into concrete operational steps and this was particularly prominent for more heavily regulated industries such as agri-food (Bord Bia, 2020a,b), chemicals (House of Commons Library, 2020), medical devices (UK Government, 2020b), pharmaceuticals (Barber, 2019) and financial services (Christie, 2020). As early as 2019, firm-level surveys already documented active engagement with compliance capacity: in Ireland, around 20% of Brexit-exposed SMEs had hired customs agents or begun internal training in customs procedures, indicating direct resource expenditure on compliance capability before any new border regime was in force (Department of Business, Enterprise and Innovation, 2019).

Crucially, these preparations required firms to build organisational and logistical capability. Industry reports, such as from the Irish Food Board, emphasised sustained investment of time, money, and managerial effort into scenario planning, risk management, and skill development in anticipation of trading with the UK as a third country (Bord Bia, 2020c). Subsequent surveys and qualitative reports confirm that these expectations translated into hard resource commitments: firms hired additional staff, paid higher intermediary fees, invested in customs and border-management software, and reallocated internal IT and managerial capacity toward compliance tasks, with the largest increases in employment expansion and

software purchases occurring in 2020-2021, but remaining elevated thereafter (Global Counsel and ClearBorder, 2021, 2022, 2023). Large EU food exporters to the UK, such as Arla or Ornua, as well as logistics providers such as FreshLinc and Maersk made investments into logistics infrastructure and documentation management already in 2020 (Arla Foods UK, 2020; Cold Chain Federation, 2020; Ornua Co-operative Limited, 2021; Meat Industry Ireland, 2020). These individual examples are mirrored in aggregate patterns in warehouse expansion and rising demand for customs-sector intermediary expertise before the new trading regime took effect. By mid-2020, nearly 60% of customs sector intermediaries had already committed resources through hiring, training, and IT changes, and capacity expansion continued into 2022 (HM Revenue & Customs, 2020, 2022). At the same time warehouse space leased by the food industry increased by almost 100% from 2019 to 2020 in the UK, while warehouse space in Ireland grew by 50% from the second to the third quarter of 2020 alone (Bloomberg, 2020).

In addition to the above, the precise timing and scope of NTBs remained highly uncertain, and this was particularly pronounced for the agri-food industry. While firms were repeatedly told to expect SPS and regulatory controls from January 2021, implementation was deferred multiple times through short, rolling delays, with export health certification and physical checks postponed from January 2021 to October 2021, then to July 2022, before being reset again under the Border Target Operating Model to January–April 2024 in a different form (UK Government, 2020a, 2021, 2022, 2023; National Audit Office, 2021). Thus, from the last quarter of 2019 agri-food exporters from the EU to the UK were hit with a sequence of shocks both in terms of the introduction of NTBs as well as to expectations about the severity and timing of future NTBs.

2.2 Conceptual Framework

Guided by the qualitative evidence from subsection 2.1, this section develops a framework linking Brexit-related increases in NTBs as well as changes in expectations about future NTBs to (i) price increases that can start even before the new border regime is fully in force, (ii) flexible pass-through of cost shocks into consumer prices and (iii) enables estimation of the within-food basket demand elasticity, lending itself to calculating consumer welfare effects (see Section B in the Appendix for a more detailed discussion). In line with the industry reports outlined above, the key ingredient is that firms must build compliance and logistical capability in advance (e.g., customs brokerage integration, certification processes, IT systems, training, and coordination), and that these activities draw on the same scarce operational inputs used for current production and distribution (e.g. managerial capacity gets diverted from production problem solving to capability building, shared inputs such as IT personnel work on integration of new customs software rather than production-related tasks).

Let CP_t denote a representative firm's stock of compliance and logistical capability to deal with NTB-related tasks, which evolves according to the following law of motion:

$$CP_{t+1} = (1-\delta)CP_t + a_t, \qquad \delta \in (0,1), \tag{1}$$

where a_t is capability-building effort (investment) at time t and δ is the depreciation rate. Production and distribution of current output q_t and capability-building a_t use common operational resources. We capture this via an operating cost that is convex in total operational intensity $(q_t + a_t)$ such that total costs are given by:[3]

$$C(q_t, a_t) = w(q_t + a_t) + \frac{\chi}{2}(q_t + a_t)^2 + \frac{\psi}{2}a_t^2, \qquad w > 0,\ \chi > 0,\ \psi > -\chi, \tag{2}$$

[3]The mechanism generalizes beyond the functional form below and only requires $C_{aq} > 0$ and that optimal capability adjustment is not instantaneous, e.g. because of convex costs ($C_{aa} > 0$) or lagged effects of investment ($CP_t(a_{t-1})$).

where χ governs congestion in shared inputs (managerial attention, compliance staff, IT capacity, logistics coordination) and ψ captures convex costs that make rapidly adjusting capability-building increasingly costly. Because output and capability-building draw on the same operational inputs, effort can be reallocated one-for-one between the two activities, implying perfect substitutability in the use of shared resources such as labour and managerial attention. A direct implication is that $\partial^2 C/(\partial q_t \, \partial a_t) = \chi > 0$: raising a_t increases the marginal cost of supplying output today.

After Brexit implementation date T, selling one unit entails an additional iceberg NTB cost $\tau(CP_t)$ that is decreasing in capability, i.e. $\partial\tau/\partial CP_t < 0$. Before T, firms may receive information that changes expected post-T frictions (in our setting, the December 2019 election materially shifted beliefs towards a "hard" Brexit). Such belief revisions increase the expected marginal value of capability and induce firms to raise a_t prior to implementation.

The firm's dynamic problem chooses (q_t, a_t) to maximize discounted profits, trading off current revenues against operating costs, capability-building costs, and (post-T) NTB costs:

$$V(CP_t; \Omega_t) = \max_{q_t \geq 0, \; a_t \geq 0} \Big\{ P_t(q_t) q_t - C(q_t, a_t) - \tau(CP_t; \theta) \mathbf{1}\{t \geq T\} \, q_t + \beta \mathbb{E}_t \big[V(CP_{t+1}; \Omega_{t+1}) \big] \Big\}, \tag{3}$$

subject to $CP_{t+1} = (1-\delta) CP_t + a_t$, where Ω_t collects exogenous states (e.g. demand shifters and beliefs about future NTBs θ). $P_t(q_t)$ is the inverse demand function faced by the firm with $P_t'(q_t) < 0$. Optimal prices therefore depend on both beliefs about future NTBs, the current level of NTB-compliance capabilities which is determined by past beliefs about the path of NTBs and the actual level of NTBs. The change in consumer prices from a change

in beliefs about future trade barriers at time t_0 (θ_{t_0}) is given by:[4]

$$dP_t = \underbrace{\frac{\partial P_t}{\partial MC_t}}_{\text{MC pass-through}} \cdot \underbrace{\frac{\partial MC_t}{\partial a_t}}_{=\chi} \cdot \underbrace{\frac{\partial a_t}{\partial(\theta_{t_0})}}_{\text{Euler channel}} d\theta_{t_0} \tag{4}$$

where the first term gives the standard pass-through of a change in marginal cost ($MC_t = \frac{\partial C_t}{\partial q_t}$) into prices governed by the elasticity and curvature of demand (Weyl and Fabinger, 2013), the second term captures the increase in marginal cost due to an increase in a_t governed by χ. The last term (the "Euler channel") captures the optimal adjustment path of investment in period t after a shock to beliefs in period t_0 that derives from the optimal intertemporal adjustment of efforts. Note that the pass-through we estimate can therefore not as easily be mapped to demand parameters as an increase in tariffs could be. Another key difference to tariff changes is that announced changes in NTBs can lead to price increases through imposing real resource costs even before they are introduced as firms need to make the necessary investments in logistical capabilities in order to comply. As such the dynamics of NTB policy decisions with respect to announcements and reversal of policies would likely result in different impacts on trade and consumer prices than tariff changes. Given the increased volatility of trade policy announcement in recent years, this channel is likely to be of growing importance in a more unstable geopolitical environment.

The pass-through of an increase in NTBs, holding investment in capabilities constant, is given by:

$$dp_t|_{da_t=0} = \frac{\partial P_t}{\partial MC_t} \frac{\partial MC_t}{\partial \tau_t} d\tau \tag{5}$$

Importantly, the experienced change in trade costs is state dependent: since capabilities mitigate the effect of NTBs on marginal costs, the effect of a rise in trade barriers depends

[4]The timing is as follows: t_0 is the period of the shock to expectations, while NTBs will be introduced at some point in the future (T), and t is any period satisfying $t > t_0$

on the capabilities available at time t. Since $\frac{\partial MC_t}{\partial \tau_t}$ is decreasing in CP_t (i.e., higher capability lowers the effective barrier), identical policy changes translate into smaller realised increases in trade costs if firms have already built up capabilities following an earlier change in beliefs (θ_{t_0}). This effect is unique to NTBs as the effect of tariffs on marginal costs is constant. Given the institutional setting of a gradual introduction of trade costs and frequent changes to the announced future time path of NTBs, our empirical estimates below will identify a combination of changes in actual trade barriers and anticipatory investments into capabilities following news about future NTBs.

3 Data and Empirical Strategy

3.1 Data sources

We use detailed microdata on consumer prices matched with data on international trade flows of goods at the monthly level from January 2011 to January 2023. Unlike most studies of trade and prices which use at-the-border unit values,[5] we use price data measured at the point of purchase by consumers, accounting for price changes by exporters, importers and retailers and which are the welfare-relevant price changes for consumers.

Information on prices comes from the Office for National Statistics (ONS). We use the representative microdata collected by the ONS every month on prices and expenditure weights, which is then used to construct the UK Consumer Price Index.[6] We use the expenditure weights in the CPI data as a measure of expenditure by product, and compute quantity estimates by combining price and expenditure information.[7] We use data on UK import quantities (in kilograms) from 2015 by product-country from the UN Comtrade database at

[5]Notable exception are studies based on survey data such as the Nielsen scanner data (such as Borusyak and Jaravel, 2021).

[6]For more information see Section C in the Online Appendix and Davies (2021)

[7]Data for CPI weights is missing for some months (January to October 2017 and January to August 2019). We linearly impute data on the missing months. The results for price, quantity, and expenditure are very similar when estimated on the restricted sample without imputing.

the HS 6 digit level to construct measures of EU trade exposure.

Product descriptions are used to match the price and trade data at the product level. The match was conducted manually and independently by two researchers before a final match was constructed by harmonising the small number of discrepancies between the independently-constructed concordances. As part of the process, they made systematic use of the UK government's online trade tariff classification tool (the "Find a commodity" service), which is the official search interface used for tariff assignment. This tool allows text searches that do not appear verbatim in HS6 or CN8 descriptions (e.g. "naan bread"), and returns the appropriate commodity codes together with detailed classification guidance.[8] Table A.13 in the online appendix contains the full list of matches, with the associated CPI product number identifiers and descriptions, as well as the equivalent HS6 codes and descriptions. In total there are 194 unique food and beverage items from the CPI used, which match to 70 HS6 codes, and in total represents 8% of total consumer expenditure (including housing).

In addition to the matched price and trade data, we draw on three datasets for information on NTBs. First, we obtain ad-valorem tariff equivalent (AVE) estimates of NTBs based on the methodology of Kee et al. (2008) and Kee and Nicita (2022). These estimates are produced at the HS6 digit level and are available through the World Bank.[9] Since these are only available unilaterally, meaning that they do not vary by the exporting country, we assume that the imports to the UK from the EU can be proxied by the EU unilateral measure. Since the UK imposed NTBs equivalent to those of the EU and the NTB AVE estimates are based on 2012-2016 data, these average EU NTBs are likely a good proxy for

[8] In a small number of cases where the CPI description was too ambiguous to allow a reliable mapping (e.g. "Oven ready joint"), no trade code was assigned. These items are therefore excluded from the analysis.

[9] See `https://datacatalog.worldbank.org/search/dataset/0040437`

UK NTBs.[10]

Second, the Global Trade Analysis Project (GTAP) provides bilateral AVE estimates but only at a much aggregated product classification (Bown et al., 2016). We use GTAP data on NTBs between EU and Canada because we believe that the UK-EU TCA is most similar to the EU-Canada Trade Agreement, since both belong to the EU's "new generation" of trade agreements and each has a self-standing chapter on sanitary and phytosanitary (SPS) measures and technical barriers to trade (TBT). Furthermore, neither grants automatic market access, nor do they provide the kind of mutual recognition that would make SPS checks disappear. Since the starting point for NTBs for UK imports are the NTBs imposed by the EU, we use the NTBs imposed by the EU on imports from Canada.

Third, we collect information on SPS measures applied on each 6-digit product from UNCTAD TRAINS.[11] TRAINS provides data on all NTBs applied by the EU, including the type of measure and the HS codes of products which it applies to. We use this data to construct the count of SPS measures applied by the EU on each food product as a proxy for the likely stringency of future SPS measures between the UK and EU after Brexit. All products in the sample are exposed to some SPS measures, with the minimum exposure being 5 measures, the median 22, and the maximum 81. Each of these three data sources provides a proxy for variation in the level of NTBs applying to each food product, which is the key estimating variation necessary to identify whether changes in prices are concentrated among products with high NTBs. Section C in the Online Appendix reports these NTB and SPS measures for each product.

Lastly, we rely on several data sources to create our control variables. We create an EU export

[10]While the data is available at the 6 digit HS level, there are numerous missing values which cannot be estimated due to lack of precision. To account for these missing values and to minimise measurement error in the detailed estimates, we aggregate to the 4 digit level (and 2 digit level where necessary), taking the mean.

[11]See `https://trainsonline.unctad.org/home`

price index from Comtrade value and quantity data;[12] product-specific exchange rates using Comtrade trade flow data and monthly exchange rate data from the UK Government;[13] a control for the UK's MFN published tariff schedule in March 2019;[14] EU consumer price controls from the European Commission;[15] a lockdown dummy which equals 1 if the UK was in a Covid-19 lockdown; the New York Fed global supply chain pressure index;[16] a self-defined dummy for perishable food items; and a Brexit trade uncertainty measure from (Graziano et al., 2021, 2023).

We restrict our analysis to food products for several reasons. First, food products are precisely and narrowly defined in both the trade and price data, allowing for a detailed and accurate match. Second, imported food is generally directly consumed and not used as an intermediate input: 81% of food imports to the UK are directly consumed by households compared with only 26% for all other products (for non-food manufactured products the proportion is 29%).[17] Therefore, we can estimate the pass-through from trade barriers into prices without needing to make demanding assumptions on the UK production structure.[18] Third, food products generally face higher NTBs and a higher variance in exposure across products allowing for clean identification of a quantitatively relevant effect. The average NTB AVE in food is 17, compared to 9 for non-food products with a standard deviation of 77 and 42 respectively. The difference in SPS measures is even starker with food products on average facing 28 measure while non-food products only face 1 with standard deviations

[12]This is simply the average unit value of the EU exports to other countries excluding the UK

[13]The data is available at `https://www.gov.uk/government/collections/exchange-rates-for-customs-and-vat`.

[14]This is a time-invariant tariff rate and is included in the regression by interacting with the post dummies. The data is available at `https://www.gov.uk/government/publications/temporary-rates-of-customs-duty-on-imports-after-eu-exit` and we used the UNCTAD method to convert any tariff rates that were not ad-valorem to ad-valorem equivalents.

[15]Unlike the unit price controls described above, these data have the advantage of being consumer prices but the disadvantage that they are only available at a higher level of aggregation `https://ec.europa.eu/eurostat/cache/website/economy/food-price-monitoring/`

[16]The data is available at `https://www.newyorkfed.org/research/policy/gscpi#/overview`.

[17]Calculations based on the World Input-Output Database for 2014.

[18]We focus only on the relationship between imports of final goods and consumer prices due to the highly aggregated nature of existing input-output tables.

of 35 and 3, respectively. Fourth, food items are generally relatively homogeneous and the food wholesale and retail sector in the UK is competitive which allows us to abstract from various complications such as variable mark-ups.[19] Lastly, food products are a necessity good consumed by all households and comprise an economically relevant share of expenditure, especially for poorer households.

The matched dataset contains 9,388 product-month observations for 70 unique HS6 food products (comprising 194 food products in the CPI data) covering January 2011 to January 2023. The average price of a product is £2.835.

3.2 Empirical Strategy

The source of identifying variation in the analysis is the exposure of products to imports from the EU in the year before the Brexit referendum. For each product i, we compute the share of imports in 2015 that are from the EU, where imports are measured in quantity, defined as $M^{EU}_{i,2015}/M^{Total}_{i,2015}$.

The pattern of imports across countries is determined by global comparative advantage patterns, which are likely to be persistent over time. Products for which the UK was more reliant on imports from the EU before the Brexit referendum will be more exposed to future changes in trade costs. For these products, adjustment costs to sourcing from other countries are expected to be relatively high, meaning that we expect a significant increase in cost due to rising trade barriers, or expected trade barriers, that could be passed through into prices. The average EU import share is 0.76 and the standard deviation is 0.29. Some products, such as fresh pork, are only imported from the EU while others, such as frozen lamb, have an EU import share less than 0.1.

We estimate changes in consumer prices due to increases in trade costs introduced by Brexit.

[19] See, for example Competition Commission (April 2008) and Competition and Markets Authority (April 2015).

Our baseline event study strategy relates (the log of) consumer prices for product p with (the log of) exposure to EU imports in 2015. The equation is specified as:

$$\log(P_{it}) = \sum_{k \notin J}^{K} \beta^k \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{t = k\} + \delta_h t \mathbb{1}\{t < \text{Dec 2019}\} + \gamma X_{it} + \alpha_i + \tau_t + \varepsilon_{it} \quad (6)$$

where P_{it} is the mean consumer price of product i at time t, $\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}$ is the share of imports of product i from the EU in 2015 measured in quantity terms, α_i is a product fixed effect, τ_t is a time (month-year) fixed effect, ε_{it} is an error term, and J is the set of normalising periods in the event study (January 2011 and January 2014). We include a linear time trend for aggregated product codes at the 2-digit HS level (h) in the pre-period in order to account for more aggregate trends as well as potential anticipation effects driving food prices (as suggested by Freyaldenhoven et al. (2021)). Since some food prices may be very seasonal, we also estimate a version where we replace α_i with the product-month fixed effect $\alpha_i \times \gamma_m$. We estimate this equation with and without a number of control variables (X_{it}: product-specific exchange rate deviations, EU export price index, Brexit trade uncertainty, stockpiling dummy, UK tariffs) to address a number of potential confounders that we discuss in detail along additional robustness specifications in Section 4.2.

In addition to the event study, we estimate the impact of increased trade barriers on consumer prices in a difference-in-differences framework. We define two post periods. The first post period covers the period after Prime Minister Johnson wins the General Election up to the implementation of the TCA. We label this period as Post-Election, and define the dummy variable $Post_t^E$ which equals 1 for months between (and including) December 2019 and December 2020, and 0 otherwise. Prior to Johnson securing an overwhelming majority and a mandate for his proposal of a hard Brexit, there was still the possibility that the UK might be part of the Single Market and the Customs Union, which would have meant no regulatory border between the EU and the UK and hence no increase in trade costs. The second post period is the period after the new trading arrangements are imposed under the

TCA. We call this period Post-Brexit, defining the variable $Post_t^B$ to equal 1 in all months after and including January 2021, and 0 otherwise. The difference-in-differences specification is defined as:

$$\begin{aligned}\log(P_{it}) = \quad & \beta^E \times Post_t^E \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \\ & + \beta^B \times Post_t^B \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \\ & + \delta_h t \mathbb{1}\{t < \text{Dec 2019}\} + \gamma X_{it} + \alpha_i + \tau_t + \varepsilon_{it}\end{aligned} \tag{7}$$

Given the time and product fixed effects, β^B and β^E are identified from within-time cross-product variation in exposure. They capture differential (relative) price changes for more EU-exposed products compared to less exposed products after treatment occurs, netting out any aggregate inflation common to all products in month t. Recent econometric research has highlighted a number of issues with difference-in-differences estimators, particularly for settings with staggered treatment timing (Borusyak and Jaravel, 2017; Sun and Abraham, 2021; Goodman-Bacon, 2021; Callaway and Sant'Anna, 2021). While our setting has simultaneous treatment, and thus does not suffer from many of the issues raised, we adopt the recommendation from Borusyak and Jaravel (2017) to normalise the pre-trends in the event-study to two periods. Specifically, the set J in equation (6) contains both January 2011 and January 2014.

To quantify the welfare effects of the rise in NTBs of food imports in the UK, as detailed in section 4.3, we further estimate the effects on quantity and expenditure (in logs) based on equation (7) and incorporate these in a simple partial equilibrium framework to evaluate changes in consumer surplus, producer surplus and the deadweight loss resulting from the policy. The weight variable in the ONS data gives the expenditure share of each product.

We define quantity as the expenditure weight divided by the price.[20]

As detailed in section 2.2, we propose that the mechanism through which Brexit affected consumer prices was via announcements shifting expectations about future rises in NTB-related trade barriers, as well as the TCA increasing actual NTBs, and especially SPS measures faced by UK importers. Producers and importers must adapt their products and procedures to these new barriers, facing an increase in costs of exporting and at least part of these new costs may be passed on to consumers. Some of the costs are likely to have been incurred once it had become clear that a regulatory border between the UK and the EU was going to happen but prior to its actual implementation, i.e. after the election in 2019 and prior to the introduction of the TCA.

To test this mechanism, we add a further interaction in the difference-in-differences specification for the extent of NTBs for food product i. We define NTB_i to be a dummy variable that splits products into high (above median) and low (below median) values of NTBs. We use three measures: (1) estimated NTB AVE from the World Bank; (2) estimated NTB AVE from GTAP; and (3) counts of SPS measures applying to a given product from UNCTAD TRAINS.[21]

If higher NTBs after Brexit drive the effects on prices, we expect the estimated coefficient on the interactions with $\mathbb{1}\{NTB_i > NTB^{p50}\}$ to be higher than on the interactions with $\mathbb{1}\{NTB_i \leq NTB^{p50}\}$, when estimating specification (8). We estimate this specification with and without the trend and the additional control variables.

[20]The expenditure weights capture the share of each product in total UK consumer expenditure and are updated over time. Our dependent variable for quantity is computed as the log expenditure weight minus log price. As we identify within-product changes over time, this provides a valid measure of changes in quantity consumed.

[21]We choose to use only the ordinal information in the NTB variables as it is notoriously difficult to estimate the AVE of NTBs and the number of SPS measures is an imperfect proxy for the cost of such measures, which are also highly skewed across products. Additionally, being consistent across measures also allows for better comparison across estimated coefficients and the coefficients are more easily interpretable (compared with an interaction of two continuous variables).

While each of these measures are imperfect proxies of importers' exposure to NTBs, testing them together provides a robust test of the mechanism that exposure to more NTBs was the cause of the price rises. Furthermore, even though the measures of NTBs are not direct measures of those that are imposed on EU imports by the UK after Brexit, they are likely to be correlated with importers' expectations on the extent of future NTBs. That is, if a product was previously subject to more NTBs by the UK and EU before Brexit, it is reasonable to expect that importers predict that the product is more likely to face NTBs after Brexit.

$$
\begin{aligned}
\log(P_{it}) = \quad & \beta_H^E \times Post_t^E \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i > NTB^{p50}\} \\
& + \beta_L^E \times Post_t^E \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i \leq NTB^{p50}\} \\
& + \beta_H^B \times Post_t^B \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i > NTB^{p50}\} \\
& + \beta_L^B \times Post_t^B \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i \leq NTB^{p50}\} \\
& + Post_t^E \times NTB_i + Post_t^B \times NTB_i + \delta_h t \mathbb{1}\{t < \text{Dec 2019}\} + \gamma X_{it} \\
& + \alpha_i + \tau_t + \varepsilon_{it}
\end{aligned}
\tag{8}
$$

Identification of the impact of new trade barriers imposed by Brexit on consumer prices relies on two assumptions. First, we require that trends in consumer prices are unrelated to exposure to EU imports in the absence of Brexit. The event study estimates show this to be the case in the pre-period. Second, we require that factors correlated with both the timing of Brexit and the pre-period share of imports from the EU are not correlated with changes in consumer prices.

Possible violations of the second include the striking of new strategic trade agreements by the UK government or, conversely, the inability to roll over existing trade agreements the UK had through the EU with non-EU countries. In practice, the UK was able to negotiate

to roll over with 63 of the 70 countries that it had trade agreements with as a member of the Customs Union. Additionally, since Brexit, the UK has signed only three new trade agreements but none had entered into force in our sample period.[22]

Another factor of concern is the Covid-19 pandemic and associated lockdowns, which has disrupted global production and consumption of food products. We control for aggregate macroeconomic conditions with the year-month fixed effect, but if the impacts of Covid-19 on prices is correlated with the EU import share then this would impact the estimates of the βs. To highlight that our estimates of β^k are uncorrelated with key Covid-19 outbreaks and lockdowns in the UK, we indicate those time periods in the event study. We also provide a number of robustness tests directly controlling for different implications of the pandemic such as lockdowns and supply chains disruptions as well as excluding the time periods during the pandemic, which we discuss in more detail in Section 4.2. We further control for a wide-range of possible confounders and other Brexit-related mechanisms which may differentially effect product-prices including: EU consumer price and export price trends, perishability, exchange rate deviations, trade uncertainty and import tariffs. Lastly, we carry out a placebo exercise using import shares from other countries from which the UK imports food.

4 Results

4.1 The impact of Brexit on prices

Figure 2 presents the estimated coefficients and associated 95% confidence intervals from equation 6.[23] We estimate the event study at the monthly level and aggregate the coefficients

[22] Agreements with Australia and New Zealand were signed in December 2021 and February 2022, respectively, with both coming in to force in May 2023, while a digital trade agreement was signed with Singapore in February 2022 (Webb, 2022).

[23] Figure 2 displays the specification without control variables. In the Online Appendix, we show additional event studies containing the additional controls (Figure A.1), without the aggregate time trend (Figure A.2), measuring exposure in levels instead of logs (Figure A.3), and estimated on quarterly instead of monthly data (Figure A.4).

to the quarterly level.[24]

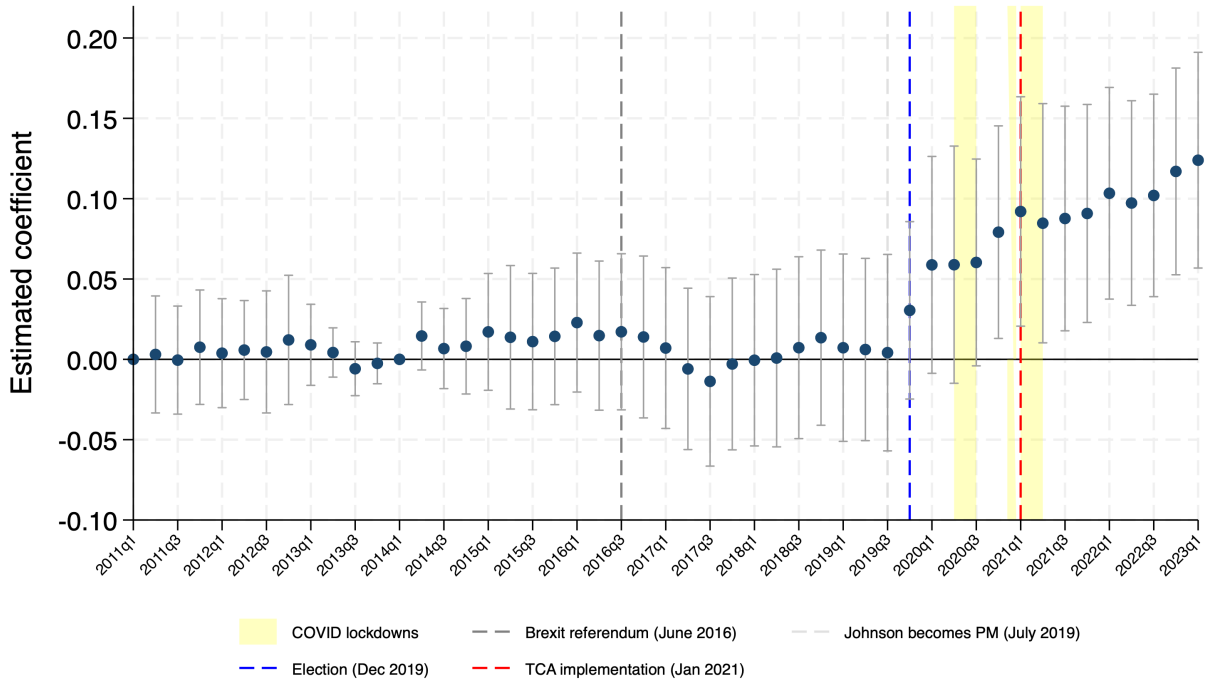
There is no evidence of differential pre-trends in prices of products more exposed to increased trade barriers from Brexit either before the referendum in June 2016 or in the aftermath of the referendum. The event study estimates show that there was a trend break after the 2019 General Election. At this point, it was clear that the UK would leave the Customs Union and Single Market. Therefore, firms would be expecting higher trade costs and making investments in order to comply with future trade barriers. The evidence suggests that they immediately began to pass this on to consumers. The relative price increases of more exposed products become even more pronounced from the implementation of the TCA in January 2021.

The timing of the relative changes in prices of products more exposed to imports from the EU is uncorrelated with key Covid-19 outbreaks and associated lockdowns (highlighted in yellow in the event study). First, there is an increase in average prices of products more exposed to the EU in December 2019, before the Covid-19 outbreak had become a concern. Second, throughout 2020 and 2021, there is no correlation between Covid-19 outbreaks and lockdowns with the relative changes in prices of products with greater EU exposure. For example, in the UK, the first lockdown was imposed on 26th March 2020 and was eased in June 2020, while the second national lockdown only covered November 2020. We discuss more formal tests for the role of Covid extensively in Section 4.2.

The results of the difference-in-differences estimates from equation 7 are presented in Table 1. The estimated coefficient on the interaction with the post-Brexit variable suggests that a doubling of the share of imports from the EU in the pre-period is associated with a 9.0% higher consumer price after the TCA was introduced relative to before December 2019 (column 1). In the period after the General Election and before the introduction of the TCA,

[24] Where the coefficient effect for the quarter q is the mean of the associated monthly k coefficients, $\hat{\beta^q} = \frac{1}{3}\sum_{k \in q} = \hat{\beta^k}$. We present the event study estimated on quarterly data in Figure A.4 in the Online Appendix. Results are unchanged.

Figure 2: The impact of Brexit on consumer prices: event study estimates



Notes: This figure presents the estimates of $\hat{\beta^k}$ from equation 6 and 95% confidence intervals based on standard errors clustered at the product-pre/post Dec 2019 level. Estimates are normalised against January 2011 and 2014. The vertical lines indicate the timing of the referendum to leave the EU in June 2016 (dark grey, dashed), when Boris Johnson becomes Prime Minister in July 2019, (light grey, dashed), the UK General Election in December 2019 (blue, solid), and implementation of the TCA in January 2021 (red, dashed) and the highlighted yellow areas indicate Covid lockdowns.

a doubling of the EU share of imports is associated with a 5.6% higher consumer price. The estimates are slightly lower when dropping the trend[25] (column 2) and are similar when including a product-month fixed effect to control for product-specific seasonality (column 3). The baseline specification is shown in column (4), which additionally includes controls for EU export price, trade uncertainty, exchange rate, UK tariffs and perishability increases the estimates. In this specification, a doubling of the EU import share is associated with 12.1% higher consumer prices after the implementation of the TCA.[26]

Given the mean EU import share for food products is 0.75, a back-of-the-envelope calculation

[25]The corresponding event study can be found in the Online Appendix (Figure A.2)

[26]The estimates of $\hat{\beta^E}$ and $\hat{\beta^B}$ are very similar when estimated using equal weighting of the dynamic treatment effects, as discussed in 3.2.

implies that a product with full EU import exposure would experience 7.5% more inflation in 2020 and 12.0% higher inflation over 2021 - 2023 in comparison to a product with no EU import exposure.[27] Thus, Brexit increased average food prices by approximately 4.5% annually on average.

Table 1: The impact of Brexit on consumer prices: difference-in-differences estimates

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
Log EU Share × Post Brexit	0.0904***	0.0701***	0.0895***	0.124***
	(0.0230)	(0.0121)	(0.0243)	(0.0199)
Log EU Share × Post Election	0.0562**	0.0366***	0.0548**	0.0816***
	(0.0251)	(0.0131)	(0.0265)	(0.0228)
Observations	9388	9388	9388	8418
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Notes: This table presents the estimates of equation 7. 'Additional controls' include product-time-specific EU export price index, Brexit trade uncertainty and exchange rate deviations, as well as interactions of stockpiling dummy and UK tariffs with the post dummies. Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 Robustness

To show that these results are not driven by other contemporaneous shocks, we implement a number of robustness checks and a placebo exercise. First, we include a number of controls in our baseline specification to absorb other shocks (Table 1, Column 4).[28] To ensure that our estimates are not driven by imported food price inflation arising from EU-wide demand or supply shocks that are correlated with a product's EU import share, we control for the EU export price index to other destinations, which captures changes in the underlying prices of EU-produced food products. We also control for product-specific exchange rate deviations, constructed as a weighted average of bilateral exchange rates with trading partners, where

[27] As the point estimate relates to an elasticity one can calculate the semi-elasticity accordingly: $0.056 = \frac{\%\Delta\ Price}{\%\Delta\ Exposure} = \frac{\Delta Price}{\Delta Exposure}\frac{Exposure}{Price}$, substituting in $\overline{Exposure} = 0.75$ and rearranging gives $\frac{\%\Delta\ Price}{\%\ Exposure} = 0.056/0.75 = 0.075$.

[28] We report estimated coefficients on controls, as well as results when including them individually in Table A.1. Note that the exchange rate and uncertainty data is not available in 2011 so the number of observations drops.

the weights are given by each partner's import share in 2015.[29] This control accounts for differential exchange rate movements across products and ensures that our estimated effects are not biased by currency fluctuations. To rule out stockpiling-related mechanisms, we include an indicator for whether a product is perishable and interact it with the post-period dummy. Finally, to address the possibility that our results reflect uncertainty surrounding the imposition of tariffs rather than NTBs, we include UK MFN tariffs at the product level, interacted with the post dummy as well as the uncertainty measure by Graziano et al. (2021, 2023) that combines the probability of Brexit and expected tariffs.[30] The event study with controls is presented in Figure A.1.

We also provide additional robustness checks in the Online Appendix. One important empirical concern is the onset of the global COVID-19 pandemic in March 2020. To make sure our results are not driven by the effects of the pandemic we present several pieces of evidence. First, we explicitly control for UK lockdowns and its interaction with the log EU import share (see Table A.2 in the Appendix), which does not affect our coefficients of interest. Since the pandemic not only affected global trade through local lockdowns but also led to global supply chain disruptions, we present results explicitly controlling for the pressure on global supply chains, as measured by the New York Fed Global Supply Chain Pressure Index, that spiked during the pandemic (Table A.3) and our results remain unchanged. Lastly, since these different control variables can only imperfectly account for the various dimensions of the pandemic effects, we also present results for different subsamples that exclude the time periods of the pandemic. In Table A.4, we present results only including data up to February 2020, as well as specifications where we exclude March 2020 – May 2022 (by which the Covid-related emergency legislation had lapsed in the UK and major European countries) and March 2020 – November 2022 (when the European Council removed any guidance on travel restrictions). Our main coefficients of interest are very stable and remain statistically

[29] Specifically $XR_{it} = \sum_c xr_{ct} \times \frac{import_{ic2015}}{import_{i2015}}$

[30] Our conceptual framework predicts that tariffs would not generate anticipatory effects of the kind studied here, in contrast to NTBs, which can affect behaviour prior to their formal implementation.

significant across these sample restrictions. The results are also very similar when excluding the period after the Brexit referendum which might have been more subject to anticipation effects (see Table A.5 in the Online Appendix). While we control for product-specific EU export prices in our baseline specification, to ensure that our results are not driven by imported inflation, we conduct additional analysis based on EU consumer prices in Table A.6. Our results are robust to controlling for EU-wide (column 2) and all 27 country-specific prices (column 3) controls, and to defining the dependent variable as the log ratio between UK and EU prices (column 4). While not directly being related to Covid, this robustness check also makes it less likely that our results are driven by Covid-related European food price increases.

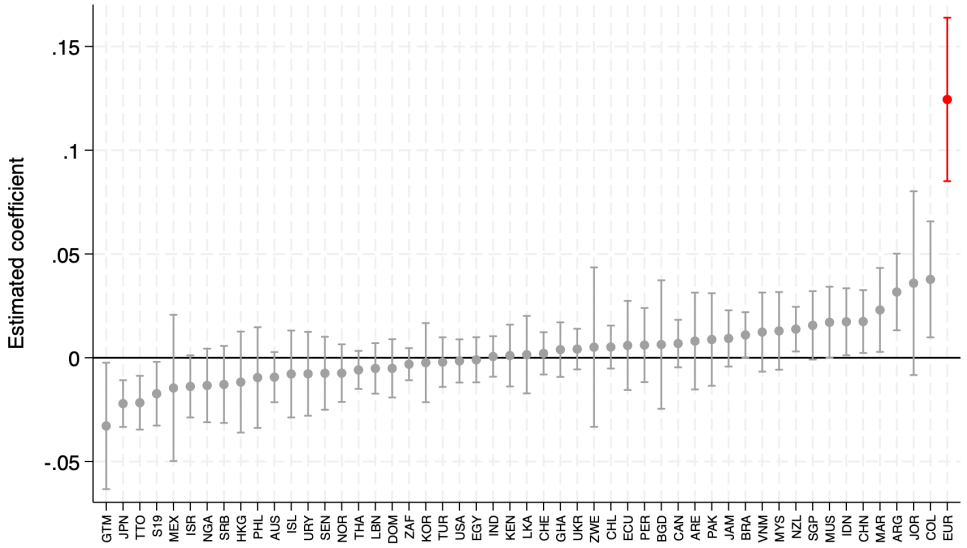
The results are also robust to specifying the treatment variable as the level of the share instead of the log of the share (see equation A.1 for the event study specification, Figure A.3 for the event study results, and Table A.7 for the difference-in-differences estimates).[31] The estimated coefficients are also uncorrelated with the Euro-Pound exchange rate. Figure A.5 in the Online Appendix plots the baseline event study with the exchange rate between the Euro and Pound superimposed. It shows that there is no correlation between the fluctuations in the exchange rate and the estimated effects on prices. We test this correlation formally, finding that it is not statistically significantly different from 0 at the 10% level.

To further strengthen the argument that our main coefficient of interest estimates pick up a change in trade costs between the UK and the EU, we conduct a falsification exercise based on import shares from *other* origin countries.[32] Specifically, we re-estimate our baseline price specification (equation 7) repeatedly, each time replacing the EU import share with the import share from a single non-EU origin country, holding fixed the sample, controls,

[31] The implied economic effects across the two specifications are very similar but the estimates are more precisely estimated when using log-exposure, suggesting it may be a better approximation of the underlying relationship.

[32] We do this for all countries that export at least 10 food products to the UK and have one or more products with at least 0.1% UK import shares among the food products in the sample.

Figure 3: Falsification test using non-EU import shares: Post-Brexit coefficients



Notes: The figure plots coefficient estimates and 95% confidence intervals from re-estimating the baseline price specification (equation 7) while replacing the EU import share with the import share from a single non-EU origin country (grey). In red we report the estimates from the baseline specification using the EU import share. In all cases, the sample, controls, fixed effects, and event-time structure are identical to the baseline; standard errors are clustered at the product level. Country codes denote the origin country used to construct the placebo import share.

and event-time structure. The results for the post-Brexit coefficients are displayed in Figure 3 and for the post-election coefficients in Figure A.6 in the Online Appendix. The resulting "placebo" coefficients are tightly centered around zero and are seldom statistically distinguishable from zero across origins (Figure 3). By contrast, the estimate using the EU import share is substantially larger and lies in the extreme right tail of the distribution of estimates. This pattern indicates that our main price effects are not driven by a generic import channel or correlated global shocks (such as the Covid pandemic), but rather by exposure to EU-sourced trade, consistent with a Brexit-related increase in border frictions that disproportionately affected imports from the EU. These results are unchanged both qualitatively and quantitatively under the inclusion of any of the controls discussed above.

4.3 Welfare Effects

Table 2 presents estimates from our baseline difference-in-difference specification (equation 7) but looking at the impacts on quantity and expenditure. The estimates suggest a sizeable,

precisely estimated fall in quantity consumed and total expenditure of products that were more exposed to Brexit.

Table 2: The impact of Brexit on quantity and expenditure

	(1)	(2)	(3)	(4)
Panel A: Log Quantity				
Log EU Share × Post Brexit	-0.159***	-0.146***	-0.158***	-0.222***
	(0.0435)	(0.0309)	(0.0458)	(0.0444)
Log EU Share × Post Election	-0.120***	-0.107***	-0.118***	-0.175***
	(0.0340)	(0.0236)	(0.0360)	(0.0366)
Observations	9228	9228	9216	8271
Panel B: Log Expenditure				
Log EU Share × Post Brexit	-0.0692*	-0.0756**	-0.0689*	-0.100**
	(0.0382)	(0.0298)	(0.0401)	(0.0465)
Log EU Share × Post Election	-0.0645**	-0.0700**	-0.0645*	-0.0949**
	(0.0325)	(0.0288)	(0.0342)	(0.0391)
Observations	9228	9228	9216	8271
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of equation 7 for different outcome variables on a sample that is consistent across variables. Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To quantify the welfare effects of the rise in NTBs on UK food imports, we embed the estimated reduced-form impacts of Brexit into our conceptual framework (see Section B in the Online Appendix for a detailed discussion). Policy impacts are then calculated in a similar vein to Bakker and Datta (2025).

We model consumer demand as quasi-linear across non-food and food products and as a multinomial logit across different products within the food basket. Assuming that mean indirect utility is linear in log prices we can then recover year-month-product level mean utilities. Using the differential exposure to EU trade as an instrument of log prices we estimate the marginal utility of price from variation in the indirect utility across product-year-months. This yields an estimate of the price coefficient governing substitution within the food basket and an implied demand elasticity across food products of -1.74.

The Brexit-induced price changes (i.e. β^B in equation 7) are mapped into changes in mean indirect utilities using the estimated price coefficient from the multinomial logit demand structure (i.e. α in equation A.13). Welfare effects are computed using the standard compensating variation formula for logit demand, comparing expected utility under pre-Brexit prices to the counterfactual with higher NTB-induced prices. The resulting welfare loss is expressed in money-metric terms and scaled by total food expenditure. For the formal and more detailed exposition of this see Section B in the appendix.

The results imply that Brexit caused a reduction of consumer surplus of \$536.54 for the average household over three years, or \$14.8 billion overall, when looking at its impact on the food market alone. Since poorer households spend a larger fraction of their income on food, these effects are unequally distributed across the income distribution (Office for National Statistics, 2022). Specifically, the increase in the cost of living is 52% higher for a household in the lowest decile of the income distribution compared to a household in the top decile.[33]

Domestic producers on the other hand benefit from the price increases. We assume that domestic supply is inelastic at the time horizon we study. Empirically, there is no statistically significant difference in the impact of Brexit on total imports and consumption (see Table A.8 in the online Appendix),[34] suggesting that the domestic supply curve is highly inelastic in the short-to medium run. This is also in line with government reports that agricultural supply is inelastic and subject to long production lags (Food Standards Agency, 2023a; Department for Environment, Food & Rural Affairs, 2024), industry evidence that production involves multi-year planning and investment cycles (National Farmers' Union, 2023; Bakker et al., 2020),

[33]It is a 0.7% increase for the top decile and a 1.1% increase for the bottom one.

[34]We formally test for the statistical difference on the coefficients using a t-test: $\frac{\hat{\beta}_{imp}-\hat{\beta}_{cons}}{\sqrt{V(\hat{\beta}_{imp}-\hat{\beta}_{cons})}}$ where $V(\hat{\beta}_{imp}-\hat{\beta}_{cons}) = V(\hat{\beta}_{cons}) + V(\hat{\beta}_{imp}) - 2Cov(\hat{\beta}_{cons},\hat{\beta}_{imp})$. To calculate the covariance matrix we run a system of seemingly unrelated regressions based on equation (7) with import and consumed quantity as dependent variables which gives a covariance of 0.00002 for both treatments, which yields t-statistics of 0.84 and 0.65 for post-election and post-Brexit respectively.

and the absence of any meaningful reduction in the UK's reliance on imported food between 2021 and 2023 despite substantial price movements (Department for Environment, Food & Rural Affairs, 2024). It is also consistent with documented post-Brexit labour shortages that constrained effective production capacity in agriculture and food processing (House of Commons Environment, Food and Rural Affairs Committee, 2022; Shropshire, 2023; Food Standards Agency, 2023b). Hence, changes in domestic producer surplus are just given by the initial quantity multiplied by the Brexit-induced price change (β^B).

The estimated change in producer surplus is given by \$478.15 per household or \$13.3 billion. The implied deadweight loss of the rise in NTBs for food is therefore \$58.39 per household, or \$1.5 billion. Note that this deadweight loss is significantly larger compared to an equivalent rise in tariffs, as tariffs would generate government revenue. If the NTBs had raised standards for consumers then the amount of deadweight loss would be reduced but, at least in the medium run, regulations have remained very similar and the increase in barriers is purely frictional and administrative.

4.4 The role of higher NTBs in rising prices

Table 3 presents the results from estimating equation (8), testing for the importance of NTBs in generating the observed price effects, using the three different NTB measures. Panel A shows the using NTB AVE estimates from the World Bank while Panel B uses NTB AVE estimates from GTAP and Panel C uses the counts of SPS measures. As in Table 1, column (1) presents the results of the specification without additoinal controls, column (2) drops the trend, column (3) additionally controls for product-month FE to take out any seasonality, and the baseline specification in column (4) adds our time-varying control variables.[35]

For all three measures of NTBs, products with high exposure to NTBs had much larger relative increases in prices than products with low exposure. The results in Panel A, using

[35]Tables A.9, A.10, and A.11 show the results when sequentially adding controls.

the NTB AVEs from the World Bank, show that only products with a high NTB AVE value experienced significant price increases after the election and after Brexit, while that is not the case for products with low exposure. In the specifications with NTB measures from GTAP (Panel B) or using the count of SPS measures (Panel C), only products exposed to high numbers of SPS measures experienced relative price rises after the election. After Brexit, there is some evidence of an increase in prices for food products with lower NTB AVEs or that are exposed to fewer (but still some) SPS measures, but it is notably smaller than the increase for high exposure products.

Together, these results provide strong evidence in support of the mechanism that EU exporters and/or UK importers face higher costs due to the Brexit-induced rise in NTBs and pass at least part of these costs on to consumers through higher prices. It also provides suggestive evidence that the estimated effects are not driven by other mechanisms such as Covid related shocks as these would affect both low- and high-NTB products.

If we treated our estimates as if they only picked up changes in NTBs, rather than also the necessary investments, and abstracted from the fact that trade barriers were only introduced gradually and some measures have not come into effect, these estimates can be used to yield a pass-through of NTBs given by:

$$\rho = \frac{\hat{\beta_H^B} - \hat{\beta_L^B}}{\overline{NTB_H} - \overline{NTB_L}} \tag{9}$$

The calculated pass-through is sensitive to a few products with very large NTBs, we therefore report a range of pass-through rates (for estimates from Panel A) for different ways of accommodating these outliers. First, if we truncate the distribution of NTB AVEs at the 95th percentile, the implied pass-through rate is 80%. Second, we winsorize at the 95% instead which yields a pass-through of 57%. Lastly, we compare the median AVE of the high and low NTB groups which yields a pass-through of 92%. While these individual numbers

Table 3: The effect of NTBs on prices

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
Panel A: NTB AVE World Bank				
Low NTB × Log EU Share × Post Brexit	-0.0227	-0.00734	-0.0254	0.0423
	(0.0301)	(0.0246)	(0.0312)	(0.0443)
High NTB × Log EU Share × Post Brexit	0.135***	0.0956***	0.134***	0.139***
	(0.0149)	(0.0115)	(0.0157)	(0.0176)
Low NTB × Log EU Share × Post Election	-0.0496*	-0.0343*	-0.0525**	-0.0133
	(0.0255)	(0.0188)	(0.0265)	(0.0348)
High NTB × Log EU Share × Post Election	0.101***	0.0623***	0.0995***	0.102***
	(0.0185)	(0.00751)	(0.0196)	(0.0193)
Observations	9388	9388	9388	8418
Panel B: NTB AVE GTAP				
Low NTB × Log EU Share × Post Brexit	0.0365	0.0489*	0.0342	0.0772**
	(0.0287)	(0.0254)	(0.0298)	(0.0315)
High NTB × Log EU Share × Post Brexit	0.136***	0.0844***	0.136***	0.148***
	(0.0141)	(0.0109)	(0.0147)	(0.0135)
Low NTB × Log EU Share × Post Election	0.00280	0.0153	-0.000110	0.0196
	(0.0258)	(0.0210)	(0.0267)	(0.0299)
High NTB × Log EU Share × Post Election	0.102***	0.0529***	0.102***	0.117***
	(0.0196)	(0.00798)	(0.0202)	(0.0152)
Observations	9388	9388	9388	8418
Panel C: SPS Measures				
Low SPS × Log EU Share × Post Brexit	0.0472	0.0563	0.0460	0.119***
	(0.0357)	(0.0365)	(0.0375)	(0.0308)
High SPS × Log EU Share × Post Brexit	0.111***	0.0726***	0.110***	0.127***
	(0.0220)	(0.0101)	(0.0233)	(0.0216)
Low SPS × Log EU Share × Post Election	-0.00555	0.00341	-0.00734	0.0433
	(0.0267)	(0.0260)	(0.0283)	(0.0292)
High SPS × Log EU Share × Post Election	0.0905***	0.0523***	0.0891***	0.102***
	(0.0233)	(0.00990)	(0.0249)	(0.0223)
Observations	9388	9388	9388	8418
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Notes: This table presents the estimates of equation 8. Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

should be interpreted with caution as they are estimated from a combination of changes in NTBs and changes in beliefs about future NTBs, the high degree of inferred pass-through suggests that cost of NTBs are substantial and are passed on to consumers to a significant

degree.

5 Conclusion

This paper quantifies the consumer-price consequences of a major reversal of deep integration: the United Kingdom's exit from the European Union. Combining UK CPI microdata with product-level measures of pre-Brexit EU import exposure and multiple indicators of non-tariff barrier (NTB) intensity, we show that the post-Brexit inflation experience in food is systematically shaped by trade frictions. Products that were more reliant on EU imports experienced relative price increases emerging around the December 2019 election and then strengthening after the Trade and Cooperation Agreement (TCA) took effect.

The magnitudes are economically large. Products more reliant on imports from the EU experienced a 12% higher price growth. Using a partial equilibrium framework we show that the welfare implications are substantial: households lost $14.8 billion, domestic producers gained $13.3 billion, and $1.5 billion was lost as deadweight loss in food markets. Because food accounts for a larger share of expenditure among poorer households, the lowest income decile experienced a 52% larger increase in the cost of living than the top decile.

The price increases are concentrated in products facing high NTBs suggesting that the observed effects are driven by higher NTBs as well as expectations about future increases in NTBs. This paper highlights a novel distinction between tariffs and NTBs: Complying with NTBs requires capabilities that are most cost-effectively build over time. Therefore expectations about future NTBs can lead to price increases today if investments into these capabilities draw on shared resources with production and distribution. In an era in which trade policy is increasingly volatile and shaped by political and geopolitical risk, these findings underscore the value of stable and credible policy design especially with respect to NTBs.

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Online Appendix

Non-tariff barriers and consumer prices: Evidence from Brexit

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A Additional tables and figures

Table A.1: The impact of Brexit on consumer prices: additional controls

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price	(5) Log Price	(6) Log Price	(7) Log Price	(8) Log Price
Log EU Share × Post Brexit	0.0895***	0.0952***	0.0915***	0.110***	0.0942***	0.0895***	0.0914***	0.124***
	(0.0243)	(0.0224)	(0.0234)	(0.0217)	(0.0247)	(0.0237)	(0.0241)	(0.0199)
Log EU Share × Post Election	0.0548**	0.0604**	0.0564**	0.0702***	0.0556**	0.0548**	0.0578**	0.0816***
	(0.0265)	(0.0236)	(0.0267)	(0.0235)	(0.0272)	(0.0255)	(0.0260)	(0.0228)
Brexit trade uncertainty		-11.40***						-11.44***
		(2.577)						(2.344)
EU export price			0.0218***					0.0187***
			(0.00473)					(0.00446)
Log exchange rate deviation				0.168***				0.172***
				(0.0475)				(0.0459)
Post Brexit=1 × Perishable (strict)=1					-0.0297			-0.0262
					(0.0344)			(0.0322)
Post election=1 × Perishable (strict)=1					-0.0000381			-0.000456
					(0.0309)			(0.0297)
Post Brexit=1 × Perishable=1						0.0160		
						(0.0373)		
Post election=1 × Perishable=1						0.0267		
						(0.0338)		
Post Brexit=1 × UK posted MFN tariff							0.00133	0.000653
							(0.00105)	(0.000956)
Post election=1 × UK posted MFN tariff							0.00204**	0.00169**
							(0.000860)	(0.000826)
Observations	9388	8567	9211	8673	9388	9388	9388	8418
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	No	No	No	No	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of the baseline difference-in-differences equation 7, adding controls individually, as well as displaying the estimated coefficients from Table 1, column (4). Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

$$\log(P_{it}) = \sum_{k \notin J}^{K} \beta^k \frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}} \times \mathbb{1}\{t = k\} + \delta_h t \mathbb{1}\{t < \text{Dec 2019}\} + \gamma X_{it} + \alpha_i + \tau_t + \varepsilon_{it} \quad \text{(A.1)}$$

Table A.2: The impact of Brexit on consumer prices: interaction with Covid lockdown

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
Log EU Share × Post Brexit	0.0912***	0.0709***	0.0907***	0.126***
	(0.0227)	(0.0122)	(0.0239)	(0.0199)
Lockdown × Log EU Share × Post Brexit	-0.00672	-0.00680	-0.0102	-0.0111
	(0.0132)	(0.0132)	(0.0140)	(0.0157)
Log EU Share × Post Election	0.0571**	0.0377***	0.0559**	0.0829***
	(0.0246)	(0.0128)	(0.0261)	(0.0224)
Lockdown × Log EU Share × Post Election	-0.00407	-0.00481	-0.00466	-0.00550
	(0.00595)	(0.00568)	(0.00533)	(0.00522)
Observations	9388	9388	9388	8418
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Notes: The table replicates the results from equation 7 and Table 1 additionally controlling for Covid lockdowns. 'Additional Controls' are listed in the note to Table 1 in the paper. Robust standard errors are clustered at the product-pre/post Dec 2019 level. Key: *** significant at 1%; ** 5%; * 10%.

Table A.3: The impact of Brexit on consumer prices: Controlling for supply chain disruptions

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
Log EU Share × Post Brexit	0.0895***	0.104***	0.124***	0.137***
	(0.0243)	(0.0208)	(0.0199)	(0.0208)
Log EU Share × Post Election	0.0548**	0.0635***	0.0816***	0.0898***
	(0.0265)	(0.0230)	(0.0228)	(0.0200)
Log EU Share × Supply Chain Pressure		-0.00501		-0.00428
		(0.00400)		(0.00422)
Observations	9388	9388	8418	8418
Trend	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of equation 7, additionally controlling for the New York Fed Global Supply Chain Pressure Index (GSCPI). Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: The impact of Brexit on consumer prices: excluding Covid periods (various definitions)

	(1)	(2)	(3)	(4)
	Log Price	Log Price	Log Price	Log Price
Log EU Share × Post Brexit	0.124***		0.137***	0.150***
	(0.0199)		(0.0171)	(0.0218)
Log EU Share × Post Election	0.0816***	0.0747**	0.0708**	0.0736**
	(0.0228)	(0.0306)	(0.0303)	(0.0307)
Observations	8418	6116	6646	6247
Sample	Baseline	exc. 03/2020+	exc. 03/2020-05/2022	exc. 03/2020-11/2022
Trend	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of equation 7, excluding various subperiods affected by the Covid pandemic. Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: The impact of Brexit on consumer prices: excluding the period between post referendum and pre election

	(1)	(2)	(3)	(4)
	Log Price	Log Price	Log Price	Log Price
Log EU Share × Post Brexit	0.0860***	0.0769***	0.0858***	0.133***
	(0.0275)	(0.0170)	(0.0293)	(0.0234)
Log EU Share × Post Election	0.0517*	0.0429**	0.0511*	0.0902***
	(0.0286)	(0.0199)	(0.0306)	(0.0253)
Observations	6671	6671	6671	5736
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table replicates the results from equation 7 and Table 1 when omitting the post-referendum and pre-election period from the sample. 'Additional Controls' are listed in the note to Table 1 in the paper. Robust standard errors are clustered at the product-pre/post Dec 2019 level. Key: *** significant at 1%; ** 5%; * 10%.

Table A.6: The impact of Brexit on consumer prices: Controlling for EU domestic prices

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log ($Price^{UK}$ / $Price^{EU}$)
Log EU Share × Post Brexit	0.0895***	0.0896***	0.103***	0.0898***
	(0.0243)	(0.0228)	(0.0208)	(0.0200)
Log EU Share × Post Election	0.0548**	0.0562**	0.0653***	0.0593***
	(0.0265)	(0.0244)	(0.0235)	(0.0203)
Log Price EU27		0.325**		
		(0.159)		
Observations	9388	9388	9388	9388
Trend	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes
EU Price Control	No	Yes	No	No
Country-specific Price Controls	No	No	Yes	No

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table replicates the results from equation 7 and Table 1 when additionally controlling for EU food consumer prices (aggregate or country specific) or defining the dependent variable as UK prices relative to EU prices. 'Additional Controls' are listed in the note to Table 1 in the paper. Robust standard errors are clustered at the product-pre/post Dec 2019 level. Key: *** significant at 1%; ** 5%; * 10%.

Table A.7: The impact of Brexit on consumer prices: level share exposure

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
EU Share × Post Brexit	0.158**	0.148***	0.155**	0.243***
	(0.0647)	(0.0466)	(0.0677)	(0.0737)
EU Share × Post Election	0.0695	0.0603	0.0649	0.133*
	(0.0590)	(0.0388)	(0.0618)	(0.0684)
Observations	9388	9388	9388	8418
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of equation A.2. 'Additional Controls' are listed in the note to Table 1 in the paper. Robust standard errors are clustered at the product-pre/post Dec 2019 level. Key: *** significant at 1%; ** 5%; * 10%.

Table A.8: The impact of Brexit on imports

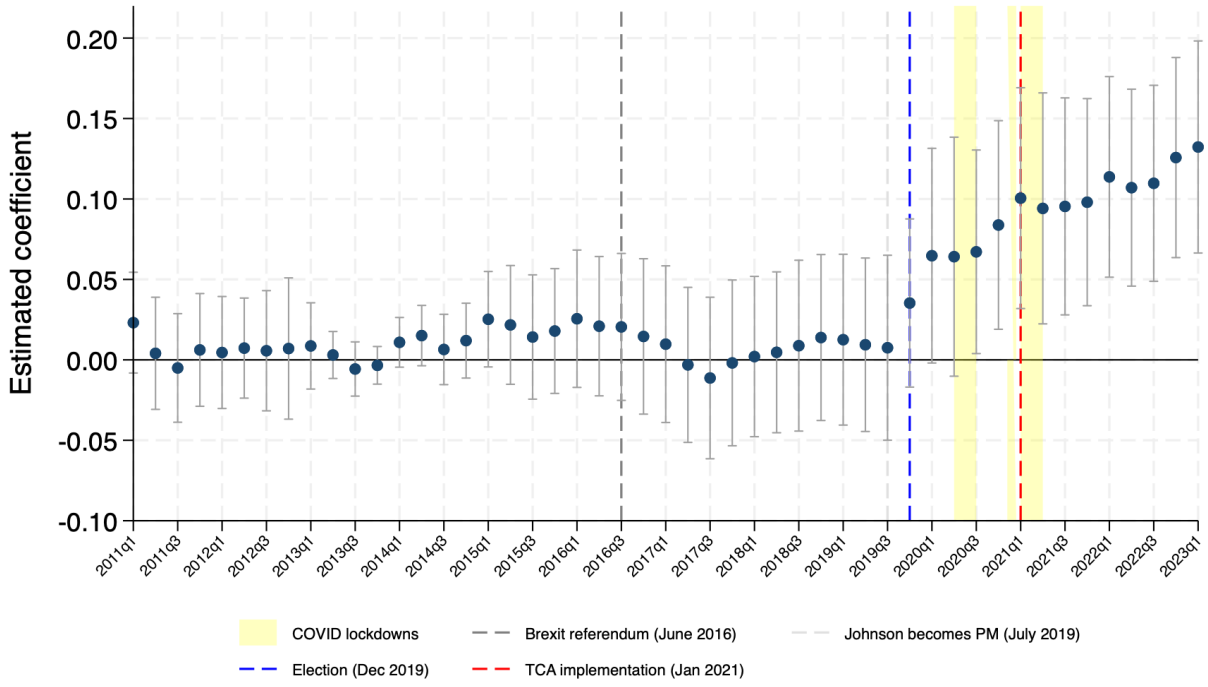
	(1) Log Imports	(2) Log Imports	(3) Log Imports	(4) Log Imports
Log EU Share × Post Brexit	-0.0914	-0.0949	-0.0934	-0.121
	(0.0946)	(0.0676)	(0.0979)	(0.122)
Log EU Share × Post Election	-0.0459	-0.0494	-0.0511	-0.0751
	(0.0819)	(0.0519)	(0.0849)	(0.109)
Observations	9319	9319	9319	8363
Trend	Yes	No	Yes	Yes
Additional controls	No	No	No	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	No	No
Product-Month FE	No	No	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of the baseline equation (7) with the log of import quantity as the dependent variable. 'Additional Controls' are listed in the note to Table 1 in the paper. Robust standard errors are clustered at the product-pre/post Dec 2019 level. Key: *** significant at 1%; ** 5%; * 10%.

Figure A.1: Event study with log EU share exposure and controls



Notes: This figure presents the estimates of β^k from equation A.1 and 95% confidence intervals based on standard errors clustered at the product level. Estimates are normalised against January 2011 and January 2014. The vertical lines indicate the timing of the referendum to leave the EU in June 2016 (dark grey, dashed), when Boris Johnson becomes Prime Minister in July 2019, (light grey, dashed), the UK general election in December 2019 (blue, solid), and implementation of the TCA in January 2021 (black, solid) and the highlighted yellow areas indicate Covid lockdowns. The controls include product-time-specific EU export price index and Brexit trade uncertainty, as well as interactions of stockpiling dummy and UK tariffs with the post dummies.Note that the controls exclude the exchange rate and uncertainty controls as the data is not available in 2011.

Table A.9: The impact of Brexit on consumer prices: World Bank NTB interactions with additional controls

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price	(5) Log Price	(6) Log Price	(7) Log Price	(8) Log Price
High NTB × Log EU Share × Post Brexit	0.134***	0.131***	0.137***	0.132***	0.135***	0.134***	0.135***	0.139***
	(0.0157)	(0.0165)	(0.0153)	(0.0173)	(0.0164)	(0.0153)	(0.0153)	(0.0176)
High NTB × Log EU Share × Post Election	0.0995***	0.0961***	0.104***	0.0976***	0.0980***	0.0992***	0.0998***	0.102***
	(0.0196)	(0.0189)	(0.0194)	(0.0195)	(0.0199)	(0.0185)	(0.0188)	(0.0193)
Low NTB × Log EU Share × Post Brexit	-0.0254	0.00331	-0.0250	0.00622	-0.0231	-0.0240	-0.0245	0.0423
	(0.0312)	(0.0299)	(0.0312)	(0.0442)	(0.0327)	(0.0309)	(0.0313)	(0.0443)
Low NTB × Log EU Share × Post Election	-0.0525**	-0.0268	-0.0588**	-0.0296	-0.0592**	-0.0497*	-0.0488*	-0.0133
	(0.0265)	(0.0254)	(0.0255)	(0.0342)	(0.0281)	(0.0260)	(0.0272)	(0.0348)
Low NTB × Post Brexit=1	-0.103***	-0.0821**	-0.111***	-0.0807**				
	(0.0352)	(0.0328)	(0.0346)	(0.0333)				
Low NTB × Post election=1	-0.0999***	-0.0798***	-0.109***	-0.0796***				
	(0.0311)	(0.0295)	(0.0311)	(0.0298)				
Brexit trade uncertainty		-9.109***						-9.793***
		(1.828)						(2.147)
EU export price			0.0206***					0.0191***
			(0.00459)					(0.00440)
Log exchange rate deviation				0.0534				0.0900
				(0.0639)				(0.0681)
Post Brexit=1 × Perishable (strict)=1					-0.00805			-0.00652
					(0.0338)			(0.0320)
Post election=1 × Perishable (strict)=1					0.0227			0.0214
					(0.0301)			(0.0294)
Post Brexit=1 × Perishable=1						0.0168		
						(0.0359)		
Post election=1 × Perishable=1						0.0296		
						(0.0325)		
Post Brexit=1 × UK posted MFN tariff							0.000781	0.0000631
							(0.00101)	(0.000954)
Post election=1 × UK posted MFN tariff							0.00142*	0.00114
							(0.000770)	(0.000763)
Observations	9388	8567	9211	8673	9388	9388	9388	8418
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	No	No	No	No	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of the difference-in-differences equation with the NTB interaction (8) using the World Bank NTB measure, adding controls individually, as well as displaying the estimated coefficients from Table 3, Panel A, Column (4). Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.10: The impact of Brexit on consumer prices: GTAP NTB interactions with additional controls

	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price	(5) Log Price	(6) Log Price	(7) Log Price	(8) Log Price
High NTB × Log EU Share × Post Brexit	0.136***	0.137***	0.141***	0.141***	0.136***	0.137***	0.139***	0.148***
	(0.0147)	(0.0156)	(0.0141)	(0.0158)	(0.0147)	(0.0139)	(0.0134)	(0.0135)
High NTB × Log EU Share × Post Election	0.102***	0.102***	0.108***	0.106***	0.102***	0.102***	0.107***	0.117***
	(0.0202)	(0.0199)	(0.0194)	(0.0198)	(0.0192)	(0.0195)	(0.0163)	(0.0152)
Low NTB × Log EU Share × Post Brexit	0.0342	0.0513*	0.0306	0.0658**	0.0391	0.0330	0.0364	0.0772**
	(0.0298)	(0.0283)	(0.0284)	(0.0294)	(0.0346)	(0.0303)	(0.0299)	(0.0315)
Low NTB × Log EU Share × Post Election	-0.000110	0.0170	-0.00528	0.0239	-0.0103	-0.00142	0.00182	0.0196
	(0.0267)	(0.0251)	(0.0273)	(0.0258)	(0.0310)	(0.0271)	(0.0268)	(0.0299)
Low NTB × Post Brexit=1	-0.0267	-0.0275	-0.0468	-0.0238				
	(0.0423)	(0.0411)	(0.0419)	(0.0409)				
Low NTB × Post election=1	-0.0123	-0.0135	-0.0284	-0.0123				
	(0.0382)	(0.0377)	(0.0390)	(0.0377)				
Brexit trade uncertainty		-9.903***						-10.67***
		(2.161)						(2.249)
EU export price			0.0225***					0.0200***
			(0.00450)					(0.00440)
Log exchange rate deviation				0.119**				0.133**
				(0.0504)				(0.0527)
Post Brexit=1 × Perishable (strict)=1					-0.0108			0.00152
					(0.0376)			(0.0344)
Post election=1 × Perishable (strict)=1					0.0222			0.0290
					(0.0340)			(0.0326)
Post Brexit=1 × Perishable=1						0.0159		
						(0.0363)		
Post election=1 × Perishable=1						0.0178		
						(0.0309)		
Post Brexit=1 × UK posted MFN tariff							0.00139	0.000520
							(0.00103)	(0.000953)
Post election=1 × UK posted MFN tariff							0.00225**	0.00173*
							(0.000943)	(0.000903)
Observations	9388	8567	9211	8673	9388	9388	9388	8418
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	No	No	No	No	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the estimates of the difference-in-differences equation with the NTB interaction (8) using the GTAP NTB measure, adding controls individually, as well as displaying the estimated coefficients from Table 3, Panel B, Column (4). Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.11: The impact of Brexit on consumer prices: SPS NTB interactions with additional controls

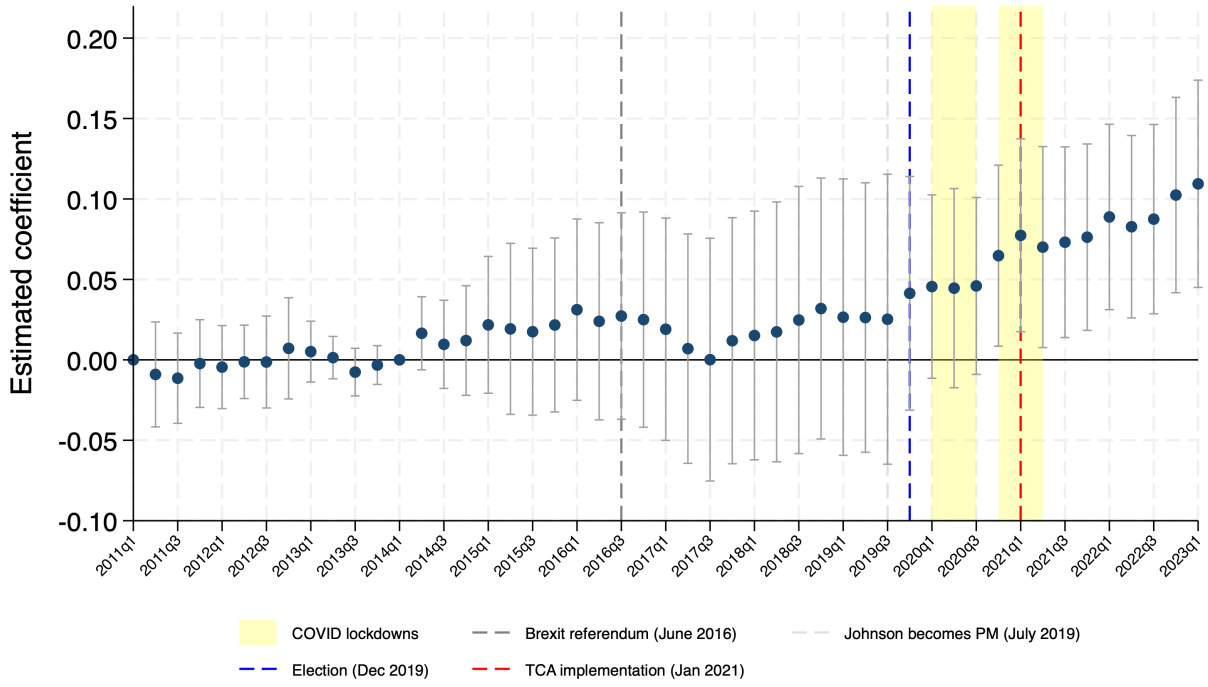
	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price	(5) Log Price	(6) Log Price	(7) Log Price	(8) Log Price
High SPS × Log EU Share × Post Brexit	0.110***	0.112***	0.111***	0.112***	0.120***	0.109***	0.110***	0.127***
	(0.0233)	(0.0214)	(0.0233)	(0.0233)	(0.0240)	(0.0237)	(0.0228)	(0.0216)
High SPS × Log EU Share × Post Election	0.0891***	0.0914***	0.0925***	0.0911***	0.0936***	0.0881***	0.0882***	0.102***
	(0.0249)	(0.0222)	(0.0247)	(0.0242)	(0.0258)	(0.0249)	(0.0244)	(0.0223)
Low SPS × Log EU Share × Post Brexit	0.0460	0.0613*	0.0518	0.106***	0.0447	0.0473	0.0507	0.119***
	(0.0375)	(0.0349)	(0.0332)	(0.0354)	(0.0344)	(0.0379)	(0.0390)	(0.0308)
Low SPS × Log EU Share × Post Election	-0.00734	0.00641	-0.00839	0.0302	-0.00565	-0.00567	0.00169	0.0433
	(0.0283)	(0.0266)	(0.0294)	(0.0285)	(0.0277)	(0.0281)	(0.0303)	(0.0292)
Low SPS × Post Brexit=1	-0.0207	-0.00508	-0.0261	-0.00514				
	(0.0335)	(0.0313)	(0.0328)	(0.0304)				
Low SPS × Post election=1	-0.0552*	-0.0399	-0.0643**	-0.0428				
	(0.0295)	(0.0282)	(0.0293)	(0.0273)				
Brexit trade uncertainty		-12.08***						-11.56***
		(2.910)						(2.405)
EU export price			0.0214***					0.0190***
			(0.00474)					(0.00445)
Log exchange rate deviation				0.156**				0.158***
				(0.0635)				(0.0597)
Post Brexit=1 × Perishable (strict)=1					-0.0396			-0.0268
					(0.0356)			(0.0326)
Post election=1 × Perishable (strict)=1					-0.0152			-0.00914
					(0.0313)			(0.0296)
Post Brexit=1 × Perishable=1						0.00723		
						(0.0386)		
Post election=1 × Perishable=1						0.0106		
						(0.0330)		
Post Brexit=1 × UK posted MFN tariff							0.00110	0.000632
							(0.00102)	(0.000960)
Post election=1 × UK posted MFN tariff							0.00156**	0.00138*
							(0.000742)	(0.000751)
Observations	9388	8567	9211	8673	9388	9388	9388	8418
Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	No	No	No	No	No	No	No	No
Product-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

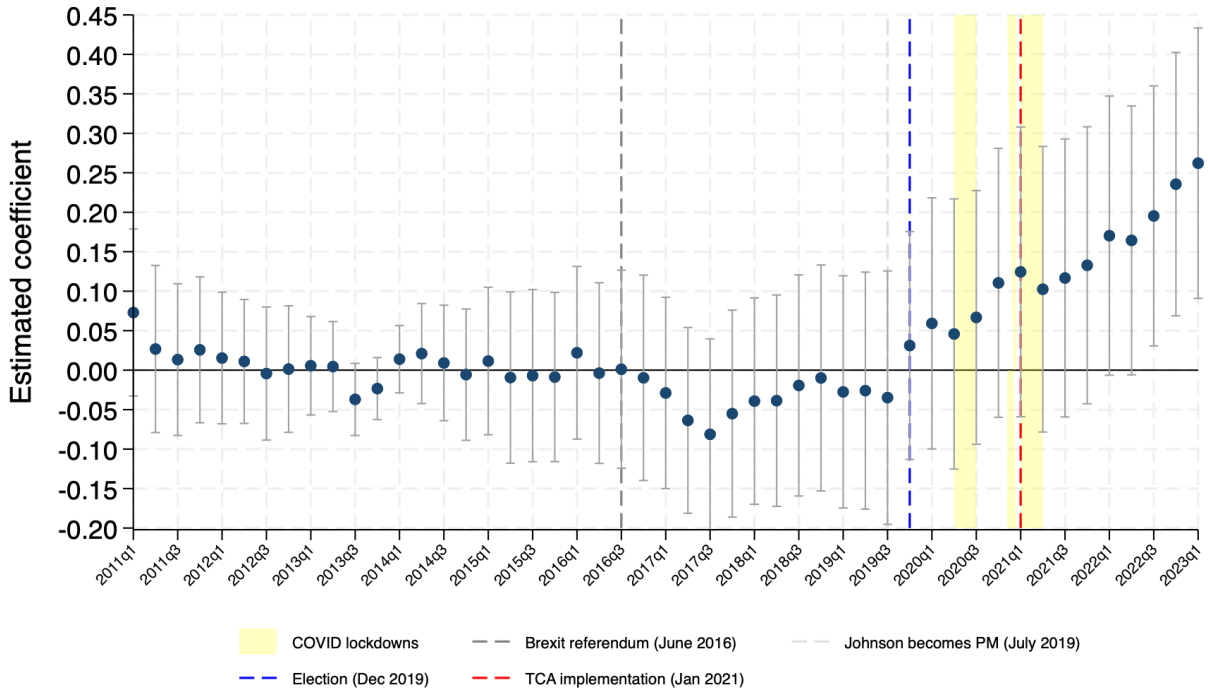
Notes: This table presents the estimates of the difference-in-differences equation with the NTB interaction (8) using the SPS count measure, adding controls individually, as well as displaying the estimated coefficients from Table 3, Panel C, Column (4). Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure A.2: The impact of Brexit on consumer prices: event study estimates without time trend



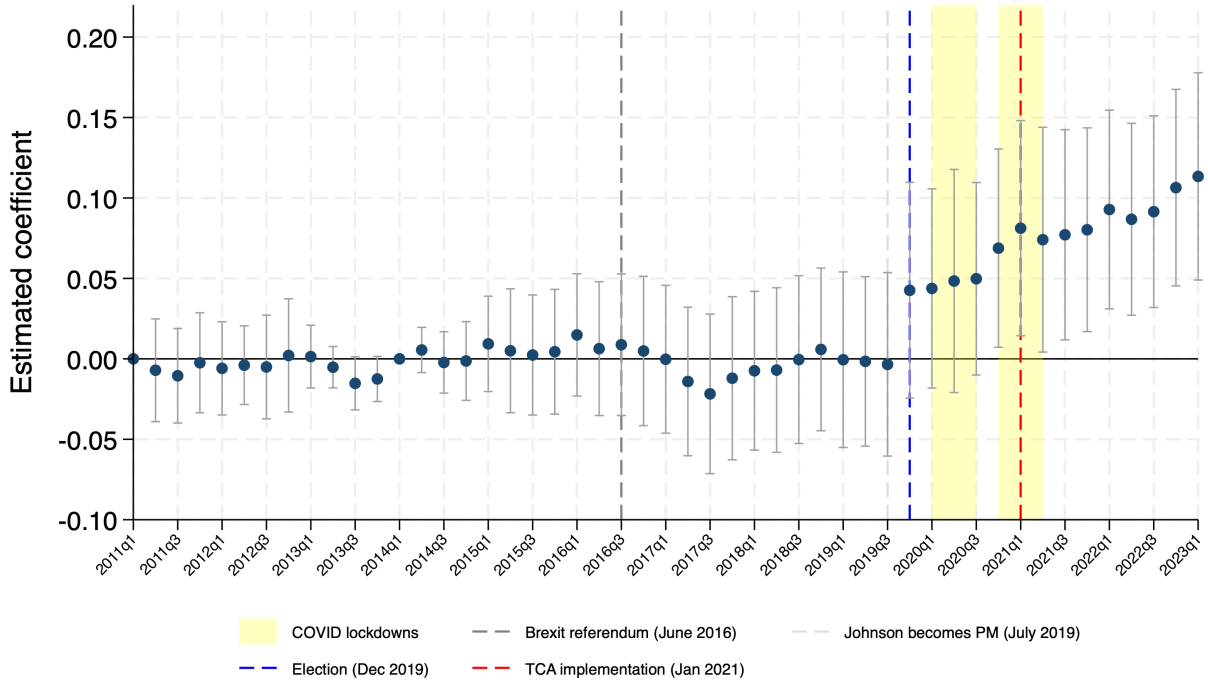
Notes: This figure presents the estimates of $\hat{\beta}^k$ from equation 6, excluding the time trend, and 95% confidence intervals based on standard errors clustered at the product-pre/post Dec 2019 level. Estimates are normalised against January 2011 and January 2014. The vertical lines indicate the timing of the referendum to leave the EU in June 2016 (dark grey, dashed), when Boris Johnson becomes Prime Minister in July 2019, (light grey, dashed), the UK general election in December 2019 (blue, solid), and implementation of the TCA in January 2021 (red, dashed) and the highlighted yellow areas indicate Covid lockdowns.

Figure A.3: Event study with level EU share exposure and controls



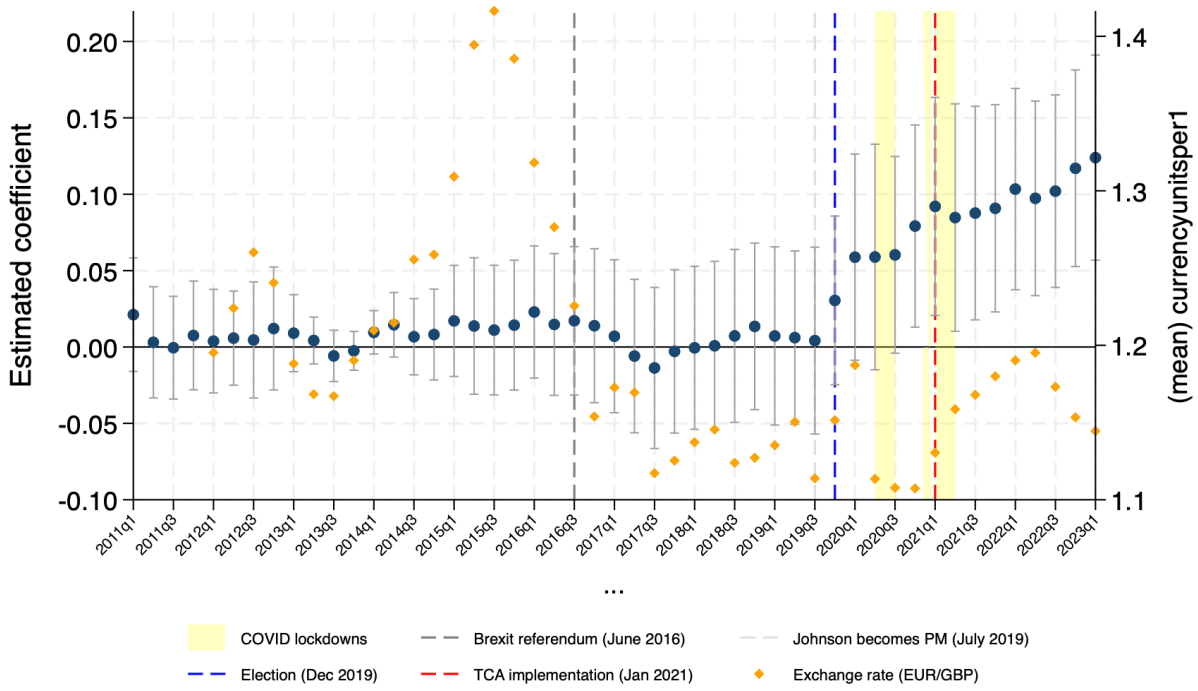
Notes: This figure presents the estimates of β^k from equation A.1 and 95% confidence intervals based on standard errors clustered at the product-pre/post Dec 2019 level. Estimates are normalised against January 2011 and 2014. The vertical lines indicate the timing of the referendum to leave the EU in June 2016 (dark grey, dashed), when Boris Johnson becomes Prime Minister in July 2019, (light grey, dashed), the UK general election in December 2019 (blue, solid), and implementation of the TCA in January 2021 (black, solid) and the highlighted yellow areas indicate Covid lockdowns. The controls include product-time-specific EU export price index and Brexit trade uncertainty, as well as interactions of stockpiling dummy and UK tariffs with the post dummies.Note that the controls exclude the exchange rate and uncertainty controls as the data is not available in 2011.

Figure A.4: The impact of Brexit on consumer prices: event study estimates from quarterly data



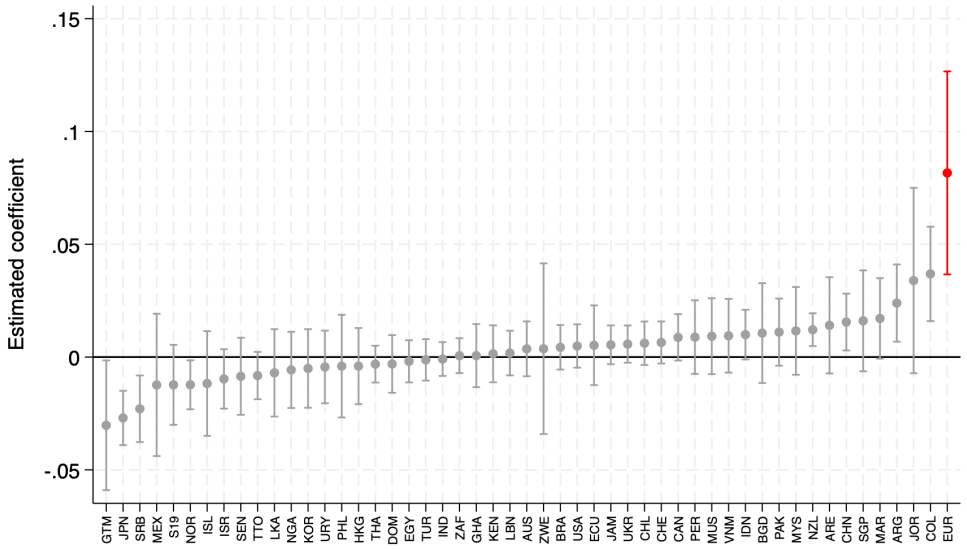
Notes: This figure presents the estimates of $\hat{\beta^k}$ from equation 6, first averaging log prices to the quarterly level, and 95% confidence intervals based on standard errors clustered at the product-pre/post Dec 2019 level. Estimates are normalised against January 2011 and January 2014. The vertical lines indicate the timing of the referendum to leave the EU in June 2016 (dark grey, dashed), when Boris Johnson becomes Prime Minister in July 2019, (light grey, dashed), the UK general election in December 2019 (blue, solid), and implementation of the TCA in January 2021 (red, dashed) and the highlighted yellow areas indicate Covid lockdowns.

Figure A.5: Event study with GBP-Euro exchange rate



Notes: This figure presents the estimates of $\hat{\beta^k}$ from equation A.1 and 95% confidence intervals based on standard errors clustered at the product-pre/post Dec 2019 level. Estimates are normalised against January 2011 and 2014. The vertical lines indicate the timing of the referendum to leave the EU in June 2016 (dark grey, dashed), when Boris Johnson becomes Prime Minister in July 2019, (light grey, dashed), the UK general election in December 2019 (blue, solid), and implementation of the TCA in January 2021 (red, dashed) and the highlighted yellow areas indicate Covid lockdowns. The diamond points corresponding to the right-sided y axis show the exchange rate between the Euro and Pound.

Figure A.6: Falsification test using non-EU import shares: Post-Election coefficients



Notes: The figure plots coefficient estimates and 95% confidence intervals from re-estimating the baseline price specification (equation 7) while replacing the EU import share with the import share from a single non-EU origin country (grey). In red we report the estimates from the baseline specification using the EU import share. In all cases, the sample, controls, fixed effects, and event-time structure are identical to the baseline; standard errors are clustered at the product-pre/post Dec 2019 level. Country codes denote the origin country used to construct the placebo import share.

$$
\begin{aligned}
\log(P_{it}) = \quad & \beta^{E} \times Post_{t}^{E} \times \frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}} \\
& + \beta^{B} \times Post_{t}^{B} \times \frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}} \\
& + \delta_h t \mathbb{1}\{t < \text{Dec 2019}\} + \gamma X_{it} \\
& + \alpha_i + \tau_t + [\alpha_i \times \gamma_m] + \varepsilon_{it}
\end{aligned}
\tag{A.2}
$$

B Additional details on model and welfare calculations

In this section, we lay out in more detail the conceptual framework underlying firm pricing decisions (outlined in section 2.2) and embed it in a partial equilibrium model that underlies the welfare calculations in section 4.3. The model formalizes a mechanism that delivers (i) price increases before the actual implementation of non-tariff barriers (NTBs), and (ii) heterogeneous (potentially incomplete) pass-through of cost shocks into consumer prices. The anticipatory pricing channel builds on compliance and logistical capability being most cost-effectively built over time and drawing on inputs shared with production and distribution, therefore investing into building these capabilities today raises current marginal cost and therefore current prices.

Time is discrete, $t = 0, 1, 2, \ldots$. A higher-border-friction regime is implemented at date T (e.g. January 2021). At an earlier date $t_0 < T$ (e.g. December 2019), firms receive "news" that updates beliefs about the severity of the post-T regime.

Firms Consider product i supplied to the UK. A representative firm chooses in each period output $q_{it} \geq 0$ and compliance capability investment $a_{it} \geq 0$ to adhere to non-tariff barriers. Output and capability-building draw on common operational inputs (managerial attention, IT integration, compliance staff, logistics coordination). We model this as a convex operating

cost in total operational intensity:

$$C_i(q_{it}, a_{it}) = w_i(q_{it} + a_{it}) + \frac{\chi_i}{2}(q_{it} + a_{it})^2 + \frac{\psi_i}{2}a_{it}^2, \qquad w_i > 0,\ \chi_i > 0,\ \psi_i > 0. \tag{A.3}$$

A key implication is $\partial^2 C_i/(\partial q\, \partial a) = \chi_i > 0$: investment raises the marginal cost of supplying output today even if $\mathbb{1}\{t \geq T\} = 0$.

Investment into capabilities accumulates into a capability stock CP_{it}:

$$CP_{i,t+1} = (1 - \delta)CP_{it} + a_{it}, \qquad \delta \in (0, 1). \tag{A.4}$$

Once NTBs are implemented, supplying one unit entails an iceberg compliance cost that depends on the accumulated capability:

$$\text{NTB unit cost:} \qquad \tau_{it}(CP_{it}) \cdot \mathbb{1}\{t \geq T\}, \tag{A.5}$$

where τ_i indexes the severity of the post-T regime for product i. We assume $\partial\tau_i/\partial CP < 0$ and $\partial^2\tau_i/\partial CP^2 \geq 0$: capability reduces per-unit NTB costs with diminishing returns.

A news shock at $t_0 < T$ increases beliefs about the future path of τ_i denoted θ_i (or equivalently the probability mass on a stricter regime), raising the expected marginal value of CP_{it} in post-T periods.

Let the inverse demand for product i in period t be $p_{it} = P_{it}(q_{it})$, with $P'_{it}(q) < 0$. Define the elasticity (ε_{it}) and the associated demand curvature measure (κ_{it}):

$$\varepsilon_{it}(q) \equiv -\frac{P_{it}(q)}{q\, P'_{it}(q)} \qquad\qquad \kappa_{it}(q) \equiv -\frac{q\, P''_{it}(q)}{P'_{it}(q)}. \tag{A.6}$$

Firm per-period profit is given by:

$$\pi_{it} = p_{it}q_{it} - C_i(q_{it}, a_{it}) - \tau_i(CP_{it}; \theta_i)\, \mathbb{1}\{t \geq T\}\, q_{it}. \tag{A.7}$$

The firm chooses $\{q_{it}, a_{it}\}$ to maximize discounted expected profits subject to the capability accumulation law of motion (A.4). Let

$$MC_{it} \equiv \frac{\partial C_i(q_{it}, a_{it})}{\partial q_{it}} + \tau_i(CP_{it}; \theta_i)\mathbb{1}\{t \geq T\} = w_i + \chi_i(q_{it} + a_{it}) + \tau_i(CP_{it}; \theta_i)\mathbb{1}\{t \geq T\}. \tag{A.8}$$

The static first-order condition for q_{it} is $MR_{it}(q_{it}) = MC_{it}$, where $MR_{it}(q) \equiv P_{it}(q) + qP'_{it}(q)$. Equivalently,

$$p_{it}\left(1 - \frac{1}{\varepsilon_{it}(q_{it})}\right) = MC_{it} \qquad \Rightarrow \qquad p_{it} = \mu_{it}(q_{it})\, MC_{it}, \quad \mu_{it}(q) \equiv \frac{\varepsilon_{it}(q)}{\varepsilon_{it}(q) - 1}. \tag{A.9}$$

which yields standard markup pricing over marginal cost.

The investment choice a_{it} trades off current resource costs against the discounted value of capability in reducing future NTB unit costs. An interior Euler condition takes the form:

$$\frac{\partial C_i(q_{it}, a_{it})}{\partial a_{it}} = \beta\, \mathbb{E}_t[V_{K,i}(CP_{i,t+1})]\,, \qquad \frac{\partial C_i}{\partial a_{it}} = w_i + \chi_i(q_{it} + a_{it}) + \psi_i a_{it}, \tag{A.10}$$

where $V_{K,i}$ is the shadow value of capability. Since capability reduces post-T unit costs, the shadow value increases when beliefs about τ_i rise. Hence, a news shock at $t_0 < T$ raises the RHS of A.10 for $t \geq t_0$ and induces higher investment a_{it} before implementation.

Crucially, for $t < T$, A.8 implies $\partial MC_{it}/\partial a_{it} = \chi_i > 0$, so the investment response increases current marginal cost and therefore current prices even though the statutory wedge $\tau_i(\cdot)\mathbb{1}\{t \geq T\}$ is not yet active. This delivers anticipatory pricing in line with the empirical results for

the post election period.

Total supply to the UK market ($S_t^T(p)$) is given by the sum of domestic and import supply:

$$S_t^T(p) \equiv S_t^D(p) + M_t(p; a_{it}, CP_{it}, \theta_i), \tag{A.11}$$

where S_t^D denotes domestic supply and M_t denotes import supply. Since there is no statistically significant differential adjustment in imports relative to consumption (see Tables A.8 and 2) and the qualitative evidence from industry reports suggests a lack of adjustment of production capacity (see discussion in the main text), we treat domestic supply as perfectly inelastic around the horizons relevant for our welfare calculations ($S_t^D(p) \approx \bar{S}^D$).

Consumer We assume that UK consumers have quasi-linear preferences over "all other goods in the economy" and food:

$$U_n \;=\; C_n \;+\; \Gamma(V_{nt})\,, \tag{A.12}$$

where C_n is consumption of the non-food numeraire and V_{nt} is the expected utility from the food choice problem (the lower nest). This allows us to abstract from income effects as well as changes in non-food sectors and given the low income elasticity of food as a composite product is a reasonable approximation given the empirical estimates for the UK (Tiffin and Tiffin, 1999 and Dogbe and Revoredo-Giha, 2021).

The indirect utility function across food products $g \in \mathcal{G}$ (e.g., milk, cheese, yogurt) is given by

$$u_{ngt} \;=\; \delta_g \;-\; \alpha\, p_{gt} \;+\; \varepsilon_{ngt}, \qquad \alpha > 0, \tag{A.13}$$

where P_{gt} is the price of food item g and $p_{gt} = \ln(P_{gt})$, and the choice probabilities over food categories are

$$s_{gt} = \Pr(g \mid t) = \frac{\exp(\delta_g - \alpha p_{gt})}{\sum_{h \in \mathcal{G}} \exp(\delta_h - \alpha p_{ht})}, \tag{A.14}$$

The corresponding inclusive value entering the upper nest is

$$V_{nt} \;=\; \frac{1}{\alpha}\,\ln\!\left(\sum_{g\in\mathcal{G}}\exp(\delta_g-\alpha p_{gt})\right) \;+\; \text{constant}. \tag{A.15}$$

Welfare effects of Brexit The compensating variation (CV) for a change from environment 1 to 2 (e.g. pre- versus post-Brexit) is then given by:

$$\Delta CV = \frac{1}{\alpha}\left[\ln\Big(\sum_{g\in\mathcal{G}}\exp(\delta_{g2}-\alpha p_{g2})\Big)-\ln\Big(\sum_{g\in\mathcal{G}}\exp(\delta_{g1}-\alpha p_{g1})\Big)\right]. \tag{A.16}$$

Equation A.16 accounts for substitution across products within the food choice set and provides an estimate of the welfare costs from increasing food prices due to Brexit for consumers.

To empirically implement the above welfare calculation we identify the marginal utility of log prices, α, using variation in observed food expenditure shares and an instrumental variables strategy that exploits differential exposure to Brexit-induced trade frictions.

Under the multinomial logit structure in equation A.13, aggregate choice probabilities satisfy

$$s_{gt} = \frac{\exp(\delta_{gt})}{\sum_{h\in\mathcal{G}}\exp(\delta_{ht})}, \tag{A.17}$$

where $\delta_{gt} \equiv \delta_g - \alpha \ln p_{gt}$ denotes mean indirect utility. Given observed aggregate shares s_{gt}, mean utilities are therefore identified up to an additive constant. Normalising relative to an arbitrary reference product g_0, we recover period-specific mean utilities via the standard logit inversion:

$$\delta_{gt} - \delta_{g_0 t} = \ln s_{gt} - \ln s_{g_0 t}. \tag{A.18}$$

We implement this inversion separately for each period t, yielding a panel of mean utilities δ_{gt} that capture both time-invariant product quality and time-varying price effects.

Substituting $\delta_{gt} = \delta_g - \alpha \ln p_{gt} + \xi_{gt}$ into equation (A.18) yields the estimating equation

$$\delta_{gt} = \delta_g - \alpha p_{gt} + \xi_{gt}, \tag{A.19}$$

where δ_g are product fixed effects and ξ_{gt} captures unobserved demand shocks. Since prices may be endogenous to demand conditions, we instrument $\ln p_{gt}$ using differential exposure to Brexit, as per our main estimating equation.

As such, the first-stage relationship is given by

$$p_{gt} = \beta^B \, \mathbb{1}\{t \in \text{Post}\} \times \ln\left(\frac{M^{EU}_{g,2015}}{M^{Total}_{g,2015}}\right) + \alpha_g + \tau_t + \delta_h t + \varepsilon_{gt}, \tag{A.20}$$

We use only pre-election and post-Brexit periods for simplicity. α in (A.19) is then estimated by instrumental variables using (A.20) as the source of exogenous price variation in the standard difference-in-difference framework:

$$\delta_{gt} = -\alpha \, ln(P_{gt}) + \alpha_g + \tau_t + \delta_h t + \xi_{gt}, \tag{A.21}$$

The results from this exercise are given in table A.12 below.

As the above approach gives an estimate on $\hat{\alpha}$ we can in turn calculate the Marshallian demand elasticity at the food-product level according to:

$$\varepsilon_{gg} = -\alpha(1 - s_{gt}) \tag{A.22}$$

which gives a median demand elasticity of -1.74 across food products.

Since alternatives are defined at the food-product level, this elasticity captures the respon-

Table A.12: First Stage and IV Demand Estimates

	Log Price	δ_{it}
	(1)	(2)
Log EU Share × Post Brexit	0.0931***	
	(0.0235)	
Log Price		-1.7546***
		(0.4734)
Observations	8,369	8,369
Trend	Yes	Yes
Year-Month FE	Yes	Yes
Product-Month FE	Yes	Yes

Notes: This table presents the estimates of equation A.20 in column (1) and from A.21 in column (2). Standard errors are clustered at the product-pre/post Dec 2019 level and statistical significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

siveness of aggregate consumption of product g (e.g. apples) to changes in its average price, allowing for substitution across other food categories.

To quantify the welfare effects of Brexit, we construct counterfactual post-Brexit prices using the estimated first-stage coefficient $\hat{\beta}^B$. Interpreting $\hat{\beta}^B$ as an elasticity of prices with respect to EU exposure, we follow a first-order approximation to map this elasticity into a level price change. For each product g, the policy-induced change in log prices is given by

$$\Delta \widehat{p}_g^{\text{policy}} = \frac{\hat{\beta}^B}{\overline{E}} \frac{M_{g,2015}^{EU}}{M_{g,2015}^{Total}}, \tag{A.23}$$

such that

$$\overline{E} = \frac{1}{G} \sum_{g=1}^{G} \frac{M_{g,2015}^{EU}}{M_{g,2015}^{Total}}. \tag{A.24}$$

where exposure is measured using pre-Brexit import shares, and the division by $\bar{E}$ rescales the coefficient so it has a semi-elasticity interpretation.

Holding preferences fixed at their pre-Brexit values, counterfactual post-Brexit mean utilities

are then obtained as

$$\delta_g^{\text{cf}} = \bar{\delta}_g^{\text{pre}} - \hat{\alpha}\,\Delta\widehat{p}_g^{\text{policy}}, \tag{A.25}$$

where $\bar{\delta}_g^{\text{pre}}$ denotes the average pre-Brexit mean utility for product g.

Finally, we compute the compensating variation associated by plugging in the relevant coefficients into equation (A.16):

$$\Delta CV = \frac{1}{\hat{\alpha}} \left[\ln\Big(\sum_{g \in \mathcal{G}} \exp(\delta_g^{\text{cf}}) \Big) - \ln\Big(\sum_{g \in \mathcal{G}} \exp(\bar{\delta}_g^{\text{pre}}) \Big) \right]. \tag{A.26}$$

This expression accounts for substitution across food products within the basket and yields a money-metric measure of the welfare loss faced by consumers due to Brexit-induced increases in food prices.

Under the assumption that domestic supply is perfectly inelastic, the change in domestic producer surplus is given by the change in prices (ΔP) multiplied by the initial quantity produced domestically ($S_{1,2}^D = 1065$ items).

The deadweight loss can then be calculated as the difference between the changes in consumer and producer surplus. Note that this loss is larger than for an equivalent rise in tariffs. Under tariffs part of the difference between consumer loss and producer surplus would be recouped as government revenue. Under rising NTBs it is lost to the compliance cost and the cost of building the necessary capabilities for compliance.

C Additional details on data characteristics and matching

C.1 Expenditure weights

The UK CPI expenditure weights we use are provided by the Office for National Statistics (ONS). They are produced to reflect the expenditure patterns in the UK. Information on spending patterns come from the Household Final Consumption Expenditure (HHFCE) – one component of the UK National Accounts. The HHFCE is compiled both quarterly and annually.[1] In turn the HHFCE estimates are based on the ONS's Retail Sales Inquiry and Living Costs and Food Survey (LCF). The relevant weights for our survey—those for food and non-alcoholic beverages—are from the Living Costs and Food Survey (LCF). The LCF is a survey of consumers conducted by the ONS. Around 20,000 households are selected at random, using the Royal Mail's Postcode Address file.[2] Those that agree take part complete two elements (1) a face-to-face interview and (2) an expenditure diary. Their responses are anonymised. After accounting for non-responses and refusals to take part, around 4,000 households have been surveyed in recent years. Major updates to the expenditure weights are made yearly, with minor changes made throughout the year.

C.2 Products

[1] https://www.ons.gov.uk/economy/nationalaccounts/satelliteaccounts/methodologies/consumertrendsqmi
[2] ONS (2025), "Living Costs and Food Survey technical report: financial year ending March 2024".

Table A.13: Details on product classifications

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210415	H-KILLED BEEF BRAISING STEAK	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210414	FROZEN BEEFBURGERS PACK OF 4	20230	Meat; of bovine animals, boneless cuts, frozen	0.874	11.86	15.75	23
210805	BACON-STREAKY-PER KG	20312	Meat; of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled	1.000	4.98	19.75	16
210606	FRZEN IMP LAMB: LEG (PER KG)	20442	Meat; of sheep (including lamb), cuts with bone in (excluding carcasses and half-carcasses), frozen	0.058	11.86	13.03	16
211027	H K LIVER PER KG STATE TYPE	20890	Meat and edible meat offal; n.e.s. in chapter 2, fresh, chilled or frozen	0.719	4.98	7.80	81
211813	PROBIOTIC-STYLE YOGHURT DRINK	40310	Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa	0.987	7.25	26.70	35
211506	CHEESE SPREAD, 125g-200g TUB	40630	Dairy produce; cheese, processed (not grated or powdered)	0.998	7.25	27.96	24
211505	CHEESE CHESHIRE-PER KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
212107	HONEY JAR/BOTTLE 340G	40900	Honey; natural	0.152	0.39	25.88	24
630519	POTTED SHRUB	60220	Plants, live; edible fruit or nut trees, shrubs and bushes, grafted or not	0.998	0.15	5.70	5
212307	POTATOES-OLD RED-PER KG	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212501	FRESH VEG-TOMATOES-PER LB	70200	Vegetables; tomatoes, fresh or chilled	0.893	4.25	11.86	21
212519	FRESH VEG-ONIONS-PER KG	70310	Vegetables, alliaceous; onions and shallots, fresh or chilled	0.888	4.25	5.52	26
212530	FRESH VEG-BROCCOLI-PER KG	70410	Vegetables, brassica; cauliflowers and headed broccoli, fresh or chilled	0.976	4.25	4.12	21
212511	FRESH VEG-LETTUCE-ICEBERG-EACH	70511	Vegetables; cabbage (head) lettuce (lactuca sativa), fresh or chilled	1.000	4.25	3.78	21
212506	FRESH VEG-CARROTS-PER LB	70610	Vegetables, root; carrots and turnips, fresh or chilled	0.830	4.25	1.81	21
212510	FRESH VEG-CUCUMBER-WHOLE	70700	Vegetables; cucumbers and gherkins, fresh or chilled	0.986	4.25	1.04	21
212520	FRESH VEG-MUSHROOMS-PER KG	70951	Vegetables; mushrooms, fresh or chilled	1.000	4.25	12.26	39

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CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
212522	FRESH VEG-GREEN PEPPER-PER KG	70960	Vegetables; fruits of the genus capsicum or of the genus pimenta	0.943	4.25	12.26	21
212609	FROZEN GARDEN PEAS 800G-1KG	71021	Vegetables, leguminous; peas (pisum sativum), shelled or unshelled, uncooked or cooked by steaming or boiling in water, frozen	0.995	7.73	70.54	18
220311	DRY ROASTED PEANUTS IN-DIVIDUAL	71390	Vegetables, leguminous; n.e.s. in heading no. 0713, shelled, whether or not skinned or split, dried	0.415	4.25	8.84	46
212534	SWEET POTATO PER KG	71420	Vegetable roots and tubers; sweet potatoes, with high starch or inulin content, fresh, chilled, frozen or dried, whether or not sliced or in the form of pellets	0.228	4.25	20.36	23
212728	PINEAPPLE EACH	80430	Fruit, edible; pineapples, fresh or dried	0.112	4.25	16.01	25
212710	AVOCADO PEAR-EACH	80440	Fruit, edible; avocados, fresh or dried	0.317	4.25	16.01	25
212725	SMALL TYPE ORANGES PER PACK/KG	80510	Fruit, edible; oranges, fresh or dried	0.470	4.25	3.11	25
212715	GRAPEFRUIT-EACH	80540	Fruit, edible; grapefruit, fresh or dried	0.235	4.25	3.11	25
212722	GRAPES-PER KG	80610	Fruit, edible; grapes, fresh	0.347	4.25	8.19	25
212716	APPLES-COOKING-PER KG	80810	Fruit, edible; apples, fresh	0.610	4.25	14.34	25
212714	PEACHES-EACH	80930	Fruit, edible; peaches including nectarines, fresh	0.920	4.25	3.09	25
212707	PLUMS-PER LB	80940	Fruit, edible; plums and sloes, fresh	0.616	4.25	3.09	25
212720	STRAWBERRIES PER KG OR PUNNET	81010	Fruit, edible; strawberries, fresh	0.897	4.25	5.55	21
212734	RASPBERRIES PUNNET OR PER KG	81020	Fruit, edible; raspberries, blackberries, mulberries and loganberries, fresh	0.792	4.25	5.55	21
212729	BLUEBERRIES PUNNET PER KG	81040	Fruit, edible; cranberries, bilberries and other fruits of the genus vaccinium, fresh	0.436	4.25	5.55	25
212808	DRIED FRUIT - EG APRICOTS	81310	Fruit, edible; apricots, dried	0.107	4.25	3.54	22
210218	POPCORN, BAG, 10-30G	100510	Cereals; maize (corn), seed	0.954	0.00	33.02	5
210212	BASMATI RICE 500G-1KG	100630	Cereals; rice, semi-milled or wholly milled, whether or not polished or glazed	0.608	24.53	55.00	29
210201	FLOUR-SELF-RAISING-1.5KG	110610	Flour, meal and powder; of the dried leguminous vegetables of heading no. 0713	0.013	7.73	85.00	29
211401	MARGARINE SOFT 500 GRMS	151710	Margarine; excluding liquid margarine	0.997	24.53	5.57	43
211015	COOKED HAM PREPACKED/SLICED	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211029	COOKED MEAT TURKEY/CHICK SLICE	160231	Meat preparations; of turkeys, prepared or preserved meat or meat offal (excluding livers and homogenised preparations)	0.606	4.98	15.95	21

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CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210913	ROTISSERIE CHICKEN [WHOLE]	160239	Meat preparations; of poultry (excluding turkeys), prepared or preserved meat or meat offal (excluding livers and homogenised preparations)	0.469	4.98	15.95	42
211009	COOKED MEAT-HAM NOT SHOULDER	160241	Meat preparations; of swine, hams and cuts thereof, prepared or preserved (excluding homogenised preparations)	1.000	4.98	15.95	21
211023	COOKED HAM PREPACKED SLICED	160242	Meat preparations; of swine, shoulders and cuts thereof, prepared or preserved (excluding homogenised preparations)	1.000	4.98	15.95	21
211007	CANNED MEAT-STEWED STEAK	160250	Meat preparations; of bovine animals, meat or meat offal, prepared or preserved (excluding livers and homogenised preparations)	0.687	4.98	15.95	21
220323	KEBAB- TAKEAWAY	160290	Meat preparations; of meat, meat offal or the blood of any animal, n.e.s. in heading no. 1602	0.985	4.98	15.95	32
211207	CANNED FISH, TUNA, 130G-200G	160414	Fish preparations; tunas, skipjack and Atlantic bonito (sarda spp.), prepared or preserved, whole or in pieces (but not minced)	0.129	7.73	17.00	17
212937	CHILLED READY MEAL-FISH/VEG	160419	Fish preparations; fish prepared or preserved, whole or in pieces (but not minced), n.e.s. in heading no. 1604	0.967	7.73	17.00	49
211210	FROZEN FISH FINGERS 8-12 PK	160420	Fish preparations; fish minced or in forms n.e.s. in heading no. 1604, prepared or preserved	0.513	7.73	17.00	20
212217	CHEWING/BUBBLE GUM-SINGLE PK	170410	Sugar confectionery; chewing gum, whether or not sugar-coated, not containing cocoa	0.527	7.73	3.49	14
212214	FRUIT PASTILLES 2	170490	Sugar confectionery; (excluding chewing gum, including white chocolate), not containing cocoa	0.764	7.73	3.49	32
213005	HOT CHOCOLATE DRINK INSTANT	180610	Cocoa; powder, containing added sugar or other sweetening matter	0.925	7.73	8.28	14
212218	CARTON/BOX OF CHOCS 325-500GM	180631	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, filled, weighing 2kg or less	0.987	7.73	8.28	14
212926	BABY FOOD	190110	Food preparations; of flour, meal, starch, malt extract or milk products, for infant use, put up for retail sale	0.996	7.73	1.08	25
210204	DRY SPAGHETTI OR PASTA 500G	190219	Food preparations; pasta, uncooked (excluding that containing eggs), not stuffed or otherwise prepared	0.965	7.73	18.31	15
210219	BREAKFAST CEREAL GLUTEN FREE	190490	Food preparations; cereal or cereal products (excluding maize), in grain form, pre-cooked or otherwise prepared	0.836	7.73	37.51	47

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CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210302	PLAIN BISCUITS-200-300G	190510	Food preparations; crispbread, whether or not containing cocoa	0.977	7.73	17.51	15
210114	CHILLED GARLIC BREAD	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
212601	CANNED TOMATOES 390-400G	200210	Vegetable preparations; tomatoes, whole or in pieces, prepared or preserved otherwise than by vinegar or acetic acid	0.994	7.73	6.38	15
212405	FROZEN CHIPS 900G-1KG	200410	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen	0.999	7.73	1.27	18
212409	P'PARED MASHED POTATO 400-650G	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
212611	BAKED BEANS-415-420G TIN 4 PK	200551	Vegetable preparations; beans, shelled, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.984	7.73	270.36	18
210211	CORN SNACK SINGLE PACKET	200580	Vegetable preparations; sweetcorn (zea mays var. saccharata), prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.758	7.73	270.36	18
211409	PEANUT BUTTER, JAR, 225-350G	200710	Jams, fruit jellies, marmalades, fruit or nut puree and fruit or nut pastes; homogenised, cooked preparations, whether or not containing added sugar or other sweetening matter	0.917	7.73	30.79	15
212019	PURE FRUIT SMOOTHIE 750ML-1LTR	200990	Juices; mixtures, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter	0.986	7.73	42.13	15
212917	TOMATO KETCHUP	210320	Sauces; tomato ketchup and other tomato sauces	0.972	7.73	21.03	15
212916	SALAD CREAM-10 OZ/ 285G BOTTLE	210390	Sauces and preparations therefor; mixed condiments and mixed seasonings	0.780	7.73	21.03	18
212911	PACKET SOUP-1.5 PINT / 850CL S	210410	Soups and broths and preparations therefor	0.904	7.73	6.45	31
212933	ICE CREAM 500ML-1L	210500	Ice cream and other edible ice; whether or not containing cocoa	0.990	7.25	12.68	25
212940	PROTEIN POWDER 900G-2KG	210610	Protein; concentrates and textured protein substances	0.714	7.73	2.57	25

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CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
212922	CHILLED RDY-COOKD MEAL-SERVE 1	210690	Food preparations; n.e.s. in item no. 2106.10	0.850	7.73	2.57	56
210413	HOME KILLED BEEF-TOPSIDE KG	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210406	HOME KLD BEEF-RUMP/POPES STEAK	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210403	HOME KILLED BEEF-LEAN MINCE KG	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210416	BEEF ROASTING JOINT PER KG	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210407	HOME KILLED BEEF-STEWING STEAK	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210405	HOME KLLD BEEF-BRISKET NO BONE	20130	Meat; of bovine animals, boneless cuts, fresh or chilled	0.883	11.86	182.33	16
210807	BACON - BACK - HOME PRODUCED	20312	Meat; of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled	1.000	4.98	19.75	16
210802	BACON-GAMMON-PER KG	20312	Meat; of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled	1.000	4.98	19.75	16
210808	BACON-BACK-PER KG	20312	Meat; of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled	1.000	4.98	19.75	16
210806	BACON - BACK - DANISH	20312	Meat; of swine, hams, shoulders and cuts thereof, with bone in, fresh or chilled	1.000	4.98	19.75	16
211807	YOGHURT/FROMAGE 4-6PK, 45-125G	40310	Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa	0.987	7.25	26.70	35
211806	YOGHURT/FROMAGE FRAIS-SMALL	40310	Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa	0.987	7.25	26.70	35
211802	YOGHURT-FRUIT-SMALL INDIVIDUAL	40310	Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa	0.987	7.25	26.70	35
211814	YOGHURT-SMALL INDIVIDUAL	40310	Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa	0.987	7.25	26.70	35
211805	FROMAGE FRAIS-FLAVOURED-6 PACK	40310	Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa	0.987	7.25	26.70	35

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CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
211508	PROCESSED CHEESE SLICES (10)	40630	Dairy produce; cheese, processed (not grated or powdered)	0.998	7.25	27.96	24
211509	HARD REGIONAL CHEESE PER KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
211507	EDAM PER KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
211504	BRIE PER KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
211501	CHEDDAR-HOME PRODUCED PER KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
211511	SOFT CONTINENTAL CHEESE - KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
211502	CHEDDAR-IMPORTED-PER KG	40690	Dairy produce; cheese (not grated, powdered or processed), n.e.s. in heading no. 0406	0.953	7.25	27.96	24
212309	POTATOES-NEW-LOOSE-PER KG	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212308	POTATOES-OLD-LOOSE-WHITE-PERKG	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212305	POTATOES-NEW-LOOSE-PER LB	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212311	POTATOES- BAKING PR KG	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212310	POTATOES- OLD WHITE PER KG	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212301	POTATOES-OLD-LOOSE-WHITE-PER L	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212302	POTATOES-OLD-PREPK-WHITE-PERKG	70190	Vegetables; potatoes (other than seed), fresh or chilled	0.713	4.25	3.59	22
212515	FRESH VEG-TOMATOES-PER KG	70200	Vegetables; tomatoes, fresh or chilled	0.893	4.25	11.86	21
212507	FRESH VEG-ONIONS-PER LB	70310	Vegetables, alliaceous; onions and shallots, fresh or chilled	0.888	4.25	5.52	26
212504	FRESH VEG-CAULIFLOWER-EACH	70410	Vegetables, brassica; cauliflowers and headed broccoli, fresh or chilled	0.976	4.25	4.12	21
212523	BROCCOLI, PER KG	70410	Vegetables, brassica; cauliflowers and headed broccoli, fresh or chilled	0.976	4.25	4.12	21
212503	FRESH VEG-CABBAGE - WHOLE-PER L	70511	Vegetables; cabbage (head) lettuce (lactuca sativa), fresh or chilled	1.000	4.25	3.78	21

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CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
212516	FRESH VEG-CABBAGE-WHOLE-PER KG	70511	Vegetables; cabbage (head) lettuce (lactuca sativa), fresh or chilled	1.000	4.25	3.78	21
212528	FRESH VEG- LETTUCE-ROUND	70511	Vegetables; cabbage (head) lettuce (lactuca sativa), fresh or chilled	1.000	4.25	3.78	21
212518	FRESH VEG-CARROTS-PER KG	70610	Vegetables, root; carrots and turnips, fresh or chilled	0.830	4.25	1.81	21
212526	FRESH VEG-ORGANIC CAR-ROTS KG	70610	Vegetables, root; carrots and turnips, fresh or chilled	0.830	4.25	1.81	21
212508	FRESH VEG-MUSHROOMS-PER 0.25LB	70951	Vegetables; mushrooms, fresh or chilled	1.000	4.25	12.26	39
212514	FRESH VEG-GREEN PEPPER-SPECIFY	70960	Vegetables; fruits of the genus capsicum or of the genus pimenta	0.943	4.25	12.26	21
212532	FRESH VEG-PEPPERS -LOOSE OR KG	70960	Vegetables; fruits of the genus capsicum or of the genus pimenta	0.943	4.25	12.26	21
212806	PACKET OF PEANUTS 90-200G	71390	Vegetables, leguminous; n.e.s. in heading no. 0713, shelled, whether or not skinned or split, dried	0.415	4.25	8.84	46
212535	SWEET POTATO PER KG OR EACH	71420	Vegetable roots and tubers; sweet potatoes, with high starch or inulin content, fresh, chilled, frozen or dried, whether or not sliced or in the form of pellets	0.228	4.25	20.36	23
212709	ORANGES-CLASS 1-EACH	80510	Fruit, edible; oranges, fresh or dried	0.470	4.25	3.11	25
212708	GRAPES-PER LB	80610	Fruit, edible; grapes, fresh	0.347	4.25	8.19	25
212723	ORGANIC DESSERT APPLES KG	80810	Fruit, edible; apples, fresh	0.610	4.25	14.34	25
212701	APPLES -COOKING-PER LB	80810	Fruit, edible; apples, fresh	0.610	4.25	14.34	25
212717	APPLES-DESSERT-PER KG	80810	Fruit, edible; apples, fresh	0.610	4.25	14.34	25
212724	BAG OF ORGANIC DESSERT APPLES	80810	Fruit, edible; apples, fresh	0.610	4.25	14.34	25
212702	APPLES -DESSERT-PER LB	80810	Fruit, edible; apples, fresh	0.610	4.25	14.34	25
212727	PEACH/NECTARINE EACH	80930	Fruit, edible; peaches including nectarines, fresh	0.920	4.25	3.09	25
212711	NECTARINES-EACH	80930	Fruit, edible; peaches including nectarines, fresh	0.920	4.25	3.09	25
212721	PLUMS-PER KG	80940	Fruit, edible; plums and sloes, fresh	0.616	4.25	3.09	25
212726	PLUMS PER KG/PACK	80940	Fruit, edible; plums and sloes, fresh	0.616	4.25	3.09	25
212706	STRAWBERRIES-PER 1/2LB	81010	Fruit, edible; strawberries, fresh	0.897	4.25	5.55	21
212733	BLUEBERRIES PUNNET OR PER KG	81040	Fruit, edible; cranberries, bilberries and other fruits of the genus vaccinium, fresh	0.436	4.25	5.55	25
210217	RICE MICRO POUCH/TRAY 220-280G	100630	Cereals; rice, semi-milled or wholly milled, whether or not polished or glazed	0.608	24.53	55.00	29
210202	RICE-LONG GRAIN-WHITE-500G	100630	Cereals; rice, semi-milled or wholly milled, whether or not polished or glazed	0.608	24.53	55.00	29

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
211407	MARGARINE/LOW FAT SPREAD-500G	151710	Margarine; excluding liquid margarine	0.997	24.53	5.57	43
211014	SAUSAGES-PORK-PER KG	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211013	SALAMI-SLICED	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211031	COOKED HAM LOOSE PER 100G	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211017	SALAMI SLICED 70-113G	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211001	SAUSAGES-PORK-PER LB/454G.	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211016	COOKED HAM LOOSE SPECIFY TYPE	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211008	GARLIC SAUSAGE-SLICED-100-113G	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211024	CONTINENTAL SLICED DELI MEAT	160100	Meat preparations; sausages and similar products, of meat, meat offal or blood, and food preparations based on these products	0.994	4.98	2.73	32
211018	COOKED MEAT - SLICED TURKEY	160231	Meat preparations; of turkeys, prepared or preserved meat or meat offal (excluding livers and homogenised preparations)	0.606	4.98	15.95	21
210908	COOKED MEAT-TURKEY-SLICED	160231	Meat preparations; of turkeys, prepared or preserved meat or meat offal (excluding livers and homogenised preparations)	0.606	4.98	15.95	21
211005	COOKED MEAT-LUNCHEON MEAT	160241	Meat preparations; of swine, hams and cuts thereof, prepared or preserved (excluding homogenised preparations)	1.000	4.98	15.95	21
211010	PORK PIE INDIVIDL APP 3IN/8CM	160241	Meat preparations; of swine, hams and cuts thereof, prepared or preserved (excluding homogenised preparations)	1.000	4.98	15.95	21

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
211004	CANNED MEAT-CORNED BEEF	160250	Meat preparations; of bovine animals, meat or meat offal, prepared or preserved (excluding livers and homogenised preparations)	0.687	4.98	15.95	21
212936	CHILLED READY MEAL-MEAT-SERVS1	160290	Meat preparations; of meat, meat offal or the blood of any animal, n.e.s. in heading no. 1602	0.985	4.98	15.95	32
211203	FROZEN FISH FINGERS (10 PACK)	160420	Fish preparations; fish minced or in forms n.e.s. in heading no. 1604, prepared or preserved	0.513	7.73	17.00	20
212215	BAG OF SWEETS 150 - 250G	170490	Sugar confectionery; (excluding chewing gum, including white chocolate), not containing cocoa	0.764	7.73	3.49	32
212224	SWEETS, NOT CHOC, 150-250G BAG	170490	Sugar confectionery; (excluding chewing gum, including white chocolate), not containing cocoa	0.764	7.73	3.49	32
212203	THROAT LOZENGES	170490	Sugar confectionery; (excluding chewing gum, including white chocolate), not containing cocoa	0.764	7.73	3.49	32
212202	MINTS	170490	Sugar confectionery; (excluding chewing gum, including white chocolate), not containing cocoa	0.764	7.73	3.49	32
212223	BRAND CHOC SWEETS 100-185G BAG	180631	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, filled, weighing 2kg or less	0.987	7.73	8.28	14
212225	CHOCOLATE LARGE BAR 100-200G	180631	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, filled, weighing 2kg or less	0.987	7.73	8.28	14
210322	CHOCOLATE 11	180631	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, filled, weighing 2kg or less	0.987	7.73	8.28	14
212927	BABY FOOD-CAN/JAR	190110	Food preparations; of flour, meal, starch, malt extract or milk products, for infant use, put up for retail sale	0.996	7.73	1.08	25
211816	POWDERED BABY FORMULA 400-900G	190110	Food preparations; of flour, meal, starch, malt extract or milk products, for infant use, put up for retail sale	0.996	7.73	1.08	25
211810	POWDERED BABY FORMULA	190110	Food preparations; of flour, meal, starch, malt extract or milk products, for infant use, put up for retail sale	0.996	7.73	1.08	25
210106	SIX BREAD ROLLS-WHITE/BROWN	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210107	BROWN LOAF,400G,SLICED-GRAN	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210319	DOUGHNUT-EACH	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210105	LARGE WHOLEMEAL LOAF-UNSLICED	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210108	PITTA BREAD	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210316	ICED BUN-EACH	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
212939	CHILLED PIZZA EACH 300-600G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210324	CRUMPETS PACK 6-9 SPEC NUMBER	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210110	LARGE WHOLEMEAL LOAF (SLICED)	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210102	LARGE LOAF-WHITE-UNSLICED-800G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
212941	QUICHE 340G-450G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210109	FRENCH STICK/BAGUETTE	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210112	BROWN SLICED LOAF BRANDED 400G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
212924	FROZEN PIZZA-MED SIZE-300-450G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210312	WHOLE CHOC CAKE-NOT FROZEN	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210320	WHOLE SPONGE CAKE NOT FROZEN	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210113	WHOLEMEAL SLICED LOAF BRANDED	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
220124	MUFFIN/INDIVIDUAL CAKE	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210101	LARGE LOAF-WHITE-SLICED-800G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210318	FROZN CAKE/GATEAU NO ICE-CREAM	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210306	FRUIT SCONES	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210317	FRUIT PIES 4-6 PACK	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
210111	WHITE SLICED LOAF BRANDED 750G	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
210321	PACK OF 5-6 INDIVIDUAL CAKES	190590	Food preparations; bakers' wares n.e.s. in heading no. 1605, whether or not containing cocoa; communion wafers, empty cachets suitable for pharmaceutical use, sealing wafers, rice papers and similar products	0.922	7.73	17.51	18
212406	POTATO FLAVOUR SNACK IN TUBE	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
212407	POTATO CRISPS/CHIPS 150-200G	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
212408	PREMIUM POTATO CRISPS/CHIPS	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
212402	POTATO CRISPS-25G/40G	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
212404	POTATO CRISPS-MULTI-PACK	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
220310	POTATO CRISPS-INDIVIDUAL PACK	200520	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.982	7.73	270.36	18
212603	BAKED BEANS, 400-420G TIN	200551	Vegetable preparations; beans, shelled, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.984	7.73	270.36	18
212608	CANNED SWEETCORN 198-340G	200580	Vegetable preparations; sweetcorn (zea mays var. saccharata), prepared or preserved otherwise than by vinegar or acetic acid, not frozen	0.758	7.73	270.36	18
212930	MAYONNAISE 400G-500G	210390	Sauces and preparations therefor; mixed condiments and mixed seasonings	0.780	7.73	21.03	18
212923	COOK-IN SAUCE-JAR/CAN 350-520G	210390	Sauces and preparations therefor; mixed condiments and mixed seasonings	0.780	7.73	21.03	18

Continued on next page

Continued from previous page

CPI code	CPI description	HS code	HS description	EU import share	NTB AVE GTAP	NTB AVE World Bank	SPS measures
212910	CANNED SOUP-390-425G	210410	Soups and broths and preparations therefor	0.904	7.73	6.45	31
212938	CHOCOLATE COVERED ICE CREAM	210500	Ice cream and other edible ice; whether or not containing cocoa	0.990	7.25	12.68	25
212913	VANILLA ICE CREAM-2 LITRES	210500	Ice cream and other edible ice; whether or not containing cocoa	0.990	7.25	12.68	25
212914	CHOC COVERED ICE CREAM BAR	210500	Ice cream and other edible ice; whether or not containing cocoa	0.990	7.25	12.68	25
212918	FRZN READY-COOKD MEAL SERVES 1	210690	Food preparations; n.e.s. in item no. 2106.10	0.850	7.73	2.57	56
212901	CUSTARD POWDER-300G DRUM	210690	Food preparations; n.e.s. in item no. 2106.10	0.850	7.73	2.57	56