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Federico Di Pace
University of Rennes, Ensai

Giacomo Mangiante
Banca d'Italia

Riccardo Masolo
Università Cattolica del Sacro Cuore

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Dipartimento di Economia e Finanza
Università Cattolica del Sacro Cuore
Largo Gemelli 1 - 20123 Milano – Italy
tel: +39.02.7234.2976
e-mail: dip.economiaefinanza@unicatt.it

BREXIT AND THE COST OF LIVING: A TALE OF TWO PHASES*

Federico Di Pace[a], Giacomo Mangiante[b], and Riccardo M. Masolo[c]

[a]CREST-Ensai
[b]Banca d'Italia
[c]Università Cattolica del Sacro Cuore

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Abstract

We employ Synthetic Control Method techniques to estimate the causal effect of Brexit on the consumer price index (CPI) in the United Kingdom. We construct a counterfactual CPI index from a weighted pool of comparable economies and find that the price level of the United Kingdom rose approximately 7 percentage points more than its synthetic counterpart, between 2016Q2 and 2024Q4. This accounts for over a quarter of total inflation during the period. We attribute about 2 percentage points of this increase to the depreciation of the British pound after the Referendum and the remaining 5 percentage points to the change in trading relationships that ensued the 2021 Trade and Cooperation Agreement.

JEL Classification: C32, E31, F13, G10.
Keywords: Brexit, Exchange Rate, Trade Barriers and Consumer Prices.

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Federico Di Pace, Univ Rennes, Ensai, CNRS, CREST-UMR 9194, F-35000 Rennes, France. Email: federico.di-pace@ensai.fr.
Giacomo Mangiante, Bank of Italy, Rome, Italy. Email: giacomo.mangiante@bancaditalia.it.
Riccardo M. Masolo, Università Cattolica del Sacro Cuore, Milan, Italy. Email: riccardomaria.masolo@unicatt.it.

1 Introduction

Trade policy is at the forefront of the economic debate in recent times. This paper quantifies the effects of trade fragmentation by exploiting a quasi-natural experiment: Brexit. On 23 June 2016, the United Kingdom (UK) voted to leave the European Union (EU), marking a rare, modern instance of economic de-integration for an advanced economy with extensive trade linkages. A notable shift in consumer price expectations was evident immediately after the vote. Importantly, though, the specifics of the withdrawal remained uncertain for some time.

We study the dynamics of the UK Consumer Price Index (CPI) through the end of 2024, a period that covers both the effects of the referendum and the ensuing uncertainty, as well as the effects of actual change in trading conditions. Born et al. (2019) document a decline in real activity following the referendum. This could lead us to expect a reduction in inflationary pressures. However, inflation accelerated. Our estimates suggest that Brexit raised prices by about 7% by the end of 2024, increasing average annual inflation by roughly 0.8 percentage points and accounting for over one-quarter of the total price increase since 2016.

By contrasting UK CPI with a synthetic counterfactual, we identify two distinct phases of price acceleration. The first began immediately after the referendum and was largely driven by the sharp depreciation of sterling in the summer of 2016. Firms gradually passed this depreciation through to consumers, resulting in cumulative price growth 2.5–2.9 percentage points above the counterfactual by mid-2019. We attribute this phase to Brexit-related expectations and news. A second, more pronounced phase followed the implementation of the Trade and Cooperation Agreement (TCA) on 1 January 2021, reflecting the materialization of trade barriers. This adjustment appears complete by early 2023, with the CPI index rising about 6 percentage points more than the counterfactual—an average inflation increase of roughly 3 percentage points. Since 2023, inflation has fallen back in line with the synthetic benchmark, suggesting that the Brexit-induced price adjustment has largely run its course.

Our identification relies on two key assumptions: (i) the referendum outcome was largely unanticipated, and (ii) Brexit expectations began to influence decisions well before the TCA was finalized. We identify the effects of Brexit by exploiting the one-off news (the referendum outcome) that set the process in motion.

To construct the counterfactual, we employ the Synthetic Control Method (SCM; Abadie and Gardeazabal 2003), combining price indices from other economies to best match UK CPI before the referendum. The divergence between actual and synthetic CPI measures the causal effect of Brexit on UK prices.

Notably, evidence from high-frequency financial market responses reinforces our findings. Asset prices allow us to recover inflation expectations at daily frequency, offering a sharp measure of the surprise component of Brexit news. This enables us to verify whether the inflation developments observed in the data are consistent with what market participants anticipated at the time of key announcements.

We draw on the shock series constructed by Geiger and Güntner (2024), which captures unexpected Brexit-related events, and estimate the corresponding response of inflation-linked

swap rates. Financial markets interpreted Brexit surprises as raising expected inflation at short and medium horizons, while long-run inflation expectations remained firmly anchored. This pattern suggests that markets continuously updated their views as the Brexit process unfolded, yet maintained confidence in the credibility of the inflation-targeting regime to deliver stable long-run inflation.[1]

Our analysis extends Born et al. (2019), who assess output effects but stop before the formal EU exit. We offer the first comprehensive, long-run quantification of Brexit's impact on consumer prices. We make two main contributions. First, we isolate two distinct phases of Brexit-related inflation acceleration. Second, we relate these dynamics to the contemporaneous movements in inflation expectations and exchange rates that anticipated the unfolding of Brexit. We estimate an exchange rate pass-through of about 30%, implying that a 10% sterling depreciation raised prices by roughly 3%, consistent with Breinlich et al. (2022). This process took about three years to complete. By contrast, the 2021–2023 acceleration aligns more closely with the 6% price impact of Non-Tariff Barriers (NTBs) estimated by Bakker et al. (2022). From Brexit, we draw three lessons relevant to current policy debates. First, announcements matter—markets and firms respond to expectations even before details are finalized. Second, trade fragmentation can raise aggregate inflation significantly, by up to one percentage point annually. Third, inflation targeting remains effective: while the price level shifts permanently, inflation itself reverts to normal once the adjustment is complete.

Related Literature. Our analysis speaks to the literature exploring the role of trade policy and the effects of economic fragmentation, Brexit representing an instance of a "deglobalization shock" (Gourinchas and Hale 2017).

A number of papers have studied the impact of Brexit news on economic activity. Born et al. (2019) and Vlieghe (2019) focus on the period immediately after the referendum with a focus on GDP. Fetzer and Wang (2020) find that the Brexit vote gave rise to significant and uneven economic losses across UK regions, with short-term job gains masking deeper productivity challenges and potential future labor market disruptions.[2] We complement these findings with a focus on prices and by extending the analysis to the post-TCA period, which, we show, has had a larger impact on UK consumer prices than the period that intervened between the referendum and the TCA, and we relate our findings to asset price movements.

Others have analyzed the impact of Brexit on consumer and import prices using disaggregated data. Breinlich et al. (2022) find that the depreciation of sterling raised UK consumer prices by 2.9%, costing households some £870 annually. Graziano, Handley, and Limão (2024) document that higher trade policy uncertainty from Brexit increased UK import prices, reduced product variety, and lowered real incomes. By focusing on aggregate CPI, we can calculate the overall impact of Brexit on the prices of both goods and services. Costa, Dhin-

[1] These results are consistent with the evidence in Broadbent (2017b) and Broadbent (2017a), who document that, within a month of the referendum, inflation expectations rose by around 0.25 percentage points while sterling depreciated by roughly 10.5%.

[2] Using SCM, Campos, Coricelli, and Moretti (2019) and Grassi (2024) show that EU accession significantly increased economic growth for new members, largely driven by productivity improvements and economic convergence.

gra, and Machin (2024) show that industries facing larger currency depreciations experienced rising import costs, which drove down real wages and contributed to a 3–3.6% decline in aggregate real wage growth over three years. Corsetti, Crowley, and Han (2022) find that exchange rate pass-through was complete for transactions invoiced in the producer's currency but initially low for those invoiced in other currencies—a gap that narrowed within six quarters. Our findings relate to Geiger and Güntner (2024), who find a small, temporary GDP contraction and modest price increases. We show that financial markets immediately priced in these inflationary effects. Our paper reconciles the entire price dynamics following Brexit with previous studies.

Our results also speak to those from other papers that quantify the effects of Brexit on trade (Dhingra et al. 2017; Sampson 2017; de Lucio et al. 2024), foreign direct investment (McGrattan and Waddle 2020), financial market volatility and stock returns (Davies and Studnicka 2018), and uncertainty (Steinberg 2017; Bloom et al. 2018; Faccini and Palombo 2020; Hassan et al. 2020). Broadbent et al. (2024) build a structural model to study the dynamic adjustments of the UK economy post-referendum.

The remainder of the paper is organized as follows. Section 2 shows the financial market responses to Brexit shocks, while Section 3 outlines the methodology. Section 4 presents the main results, and Section 5 concludes.

2 Motivation

Our analysis hinges on the outcome of the Brexit referendum, representing a genuine shock. Our synthetic control analysis rests on the assumption that the referendum outcome was unanticipated. In particular, we require that pricing decisions started to account for the effect of Brexit after the referendum but not before. Financial market participants are as informed and responsive as any other agent in the economy. If Brexit announcements were a surprise to them, we can safely assume that they represented a surprise for economic agents at large.

One of the asset prices that reacted most sharply to the Brexit referendum is sterling (see Panel (b) of Figure 3 in the Appendix). The exchange rate typically moves in anticipation of expected changes in a country's future trading relationships. In the UK case, the pound began depreciating before the referendum, in the second quarter of 2015. This timing coincides with the introduction of the European Union Referendum Bill in the House of Commons on 28 May 2015 and its approval in December of the same year. It is difficult, however, to determine whether this early depreciation reflected markets pricing in a possible Leave vote or simply heightened uncertainty.

For our purposes, the key fact is that the pound depreciated by 10.5% immediately after the referendum—its largest one-day loss since the adoption of floating exchange rates (Dhingra et al. 2017). This decline proved highly persistent, which helps us isolate the degree of exchange-rate pass-through to prices.[3]

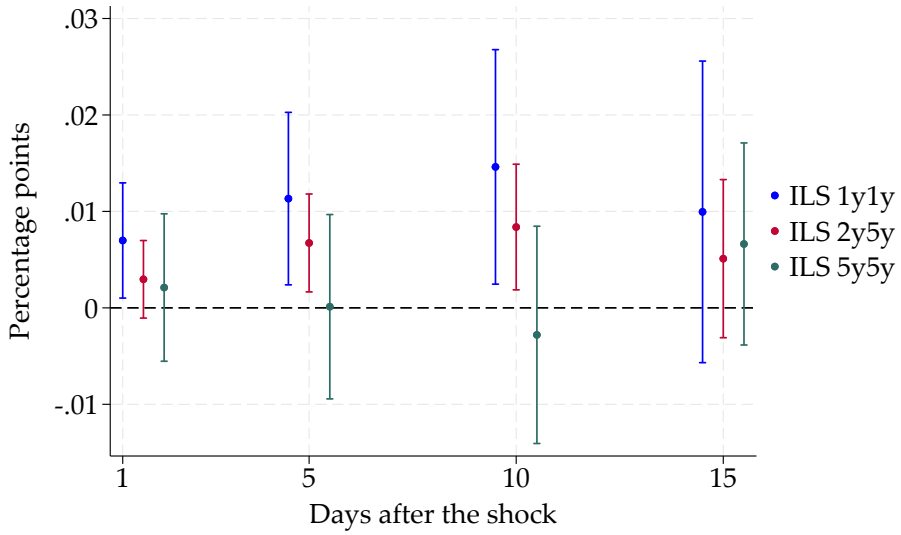
Market-based inflation expectations, as computed by the Bank of England, increased across

[3]By contrast, the nominal exchange-rate measure based on the narrow basket plateaued after the Brexit vote and shows no further revaluations around the introduction of the TCA.

different time horizons after the Brexit vote.[4] Financial markets almost immediately priced in a 0.4 percentage point rise in inflation, which represents about half the increase we estimate for the pre-TCA phase of our analysis. Importantly, markets anticipated a significant increase in inflation expectations for about four years. This aligns well with our estimates, which show that inflation in the UK was higher than our estimated counterfactual for about three years after the referendum, before leveling off when the TCA took effect in 2021.

Moreover, we use the reaction of medium and long-term inflation expectations to assess whether markets anticipated prices to rise or fall—that is, whether they expected the aggregate-demand or aggregate-supply effects of Brexit to dominate on average during the period comprising the referendum and TCA. The response of inflation expectations to Brexit-related announcements also provides information about whether markets anticipated price effects even before the TCA was implemented, and over what horizon they expected any Brexit-induced inflation pressures to dissipate.

Figure 1: Market reaction to Brexit shocks



Notes: The figure shows the response of the U.K. inflation-linked swap rate to a Brexit surprise across different horizons. Dots represent point estimates, while vertical bars denote 95 percent confidence intervals. The horizontal axis is measured in days.

We test the market responsiveness to Brexit news by estimating the following local projection at daily frequency à la Jordà (2005):

$$y_{t+h} = \alpha_h + \beta_h \text{Brexit surprise}_t + \theta_h^p X_t + \epsilon_{t+h}, \tag{1}$$

for $h \in \{1, 5, 10, 15\}$. The dependent variable y is the inflation-linked swap (ILS) rate at different maturities. The set of controls X_t includes one lag of the dependent variable, the contemporaneous and lagged value of the one-year yield, day-of-the-week fixed effects, month fixed effects, and a Covid dummy equal to 1 from 2020M2 to the implementation of the TCA.

[4]For the calculation of market-based expectations, see https://www.bankofengland.co.uk/statistics/yield-curves.

As a measure of Brexit surprises, we rely on the series constructed by Geiger and Guntner (2024), who draw on an official list of political events compiled by the House of Commons Library and combine it with daily asset-price data and economic-policy-uncertainty indicators to construct an instrument capturing unexpected Brexit-related news. The sample period runs from 2005M1 to 2020M12, although restricting the estimation to the period starting in 2013M1, when non-zero surprises start to be recorded, has no effect on the results.

Figure 1 reports the estimated coefficients at horizons 1, 5, 10, and 15 days, using as dependent variables the various ILS maturities. We can thus consider them the high-frequency inflation expectation responses to Brexit announcements. Brexit shocks generate a positive and persistent response of market inflation expectations, confirming that market participants were often surprised by Brexit-related announcements, and suggesting that Brexit was perceived as inflationary. Markets expected Brexit announcements to have a significant effect on prices starting already at the one-to-two year horizon, i.e., generally before the TCA came into effect. In contrast, long-term expectations, as measured by the five-year, five-year forward ILS, do not react, indicating that long-run inflation expectations remained well anchored throughout, as markets expected firms to pass through any effect of Brexit announcement within 5 years. This high-frequency asset-price-based evidence represents our motivation (and prior) to approach the time series of actual prices to check if these expectations were warranted.[5]

Taken together, the variation in asset prices provides evidence that the economic actors at large were taken by surprise by the vote's outcome. The response was swift, however. In hindsight, the financial market's response to Brexit events appears to have been very accurate.

The direct effect of a nominal exchange rate depreciation and the long-term impact of increased trade barriers on prices are well understood from an economic standpoint. According to theory, because pricing decisions are forward-looking, a rise in inflation expectations typically puts upward pressure on consumer prices. This increase may reflect an anticipated rise in input costs due to higher expected nominal wages and prices of imported intermediates. But it could also reflect expectations that final goods prices will rise. The depreciation of the exchange rate increases the prices of imported intermediates and final goods, thereby raising inflation over time. The extent of this effect depends on the degree of pass-through, which we can estimate from the data.

[5]We focus on the variation in inflation expectations because they are the closest asset price to the series we use for our synthetic control exercise. However, it is well known that other asset prices reacted significantly to Brexit announcements, most notably exchange rates. The yield on index-linked bonds was fairly stable in the run-up to the referendum but dropped substantially thereafter. If we average the first half of 2016 and compare it to the second, the drop is approximately 0.7%. This fall reflects an increase in inflation expectations, a possible contraction in underlying 'equilibrium' real rates, and variations in premia. Taken at face value, this variation surprisingly closely aligns with our measured average effect of Brexit on annual inflation between 2016 and 2024. Panel (c) of Figure 3 in the Appendix illustrates the extent to which markets were surprised on the morning of June 24, 2016.

3 Empirical Strategy

Methodology. To quantify the differential effect of Brexit on prices, we use the Synthetic Control Method (SCM), following Abadie and Gardeazabal (2003). The methodology consists of constructing a synthetic counterfactual - also referred to as a Doppelgänger or look-alike - that estimates how UK CPI would have evolved had Brexit never occurred. By comparing the actual UK CPI with its synthetic counterpart, we quantify the causal impact of Brexit on the consumer price level. The chosen methodology ensures that the observed inflationary effects are isolated from global economic shocks, such as the COVID-19 pandemic and rising energy prices due to the war in Ukraine.

We consider quarters $t = 1, ..., T_0, T_0 + 1, ..., T_1$, where period $t = 1$ corresponds to the first quarter of 1993 in our application. T_0 corresponds to the second quarter of 2016, which marks the quarter when the referendum takes place, the treatment date. T_1 is the last quarter in our datasets, 2024Q4.

For each period t, we observe the log-level CPI for J countries (our *donor pool*), $p_{j,t}$, where $j = 1, ..., J$ represents each country in the *donor pool*. We label UK CPI as $p_{0,t}$. Our sample of $J \times T_0$ observations is augmented with covariates, which include the sample averages of the shares of nominal consumption, investment, government spending, and imports to nominal Gross Domestic Product, as well as quarterly GDP growth per capita.

The counterfactual CPI for the UK, denoted as $\hat{p}_{0,t}$, is a linear combination of CPI indices (in logs) from donor countries:

$$\hat{p}_{0,t} = \sum_{j=1}^{J} \omega_j^* p_{j,t}, \quad \text{where} \quad \omega_j^* \geq 0, \quad \sum_{j=1}^{J} \omega_j^* = 1. \tag{2}$$

ω_j^* represents the optimally selected weight assigned to country j. They are pinned down by solving:

$$\min_{\underline{\omega}} \left(\underline{p}_0 - \mathbf{P}\underline{\omega} \right)' \mathbf{V} \left(\underline{p}_0 - \mathbf{P}\underline{\omega} \right), \tag{3}$$

where $\underline{\omega} = (\omega_1, ..., \omega_J)'$ is the vector of weights. The vector $\underline{p}_0 = (p_{0,1}, ..., p_{0,T_0}, \bar{x})'$ contains UK CPI observations prior to the treatment date and a vector of N_0 covariates, $\bar{x}$. The matrix $\mathbf{P} = [\underline{p}_1, ..., \underline{p}_J]$ is a $(T_0 + N_0) \times J$ matrix, where each column $\underline{p}_j = (p_{j,1}, ..., p_{j,T_0}, \bar{x}_j)'$ represents the CPI time series of a donor country up to the referendum date, augmented by the country covariates. The weighting matrix $\mathbf{V}$ is a $(T_0 + N_0) \times (T_0 + N_0)$ diagonal matrix that assigns relative importance to different pre-treatment periods, optimized following the methodology of Abadie and Gardeazabal (2003), Abadie, Diamond, and Hainmueller (2010), and Born et al. (2019).

Once the optimal weights ω_j^* are determined, the Doppelgänger for the UK CPI in the post-Brexit period is computed as:

$$\hat{p}_{0,t} = \sum_{j=1}^{J} \omega_j^* p_{j,t}, \quad \text{for} \quad T_0 < t \leq T_1. \tag{4}$$

The estimated Brexit effect on the UK CPI, $\mathfrak{p}_t$ can be then estimated as:

$$\mathfrak{p}_t = p_{0,t} - \hat{p}_{0,t}, \quad \text{for} \quad T_0 < t \leq T_1, \tag{5}$$

which we will denote as the standardized Doppelgänger gap, and we will express in percentage terms by multiplying it by 100.

Data. Key to the construction of the synthetic UK CPI is the selection of the donor pool; i.e., the group of countries whose price indices are weighted to create the no-Brexit counterfactual. The ideal donor country is the least affected by Brexit and yet a close match for the pre-Brexit UK economy. The choice of donors represents a balancing act between the risk of overfitting the data (if the number of countries is too large relative to the number of periods) and not producing a credible counterfactual - e.g., if there is not enough variation. These considerations and the availability of long-enough and consistently defined price indices lead us to include 23 OECD countries; i.e. advanced economies with low trade barriers, as well as data for China, India, and Singapore.[6] These three countries, in addition to being important non-OECD economies, help mitigate concerns that some OECD countries—particularly EU members—may have been affected by Brexit. However, if any donor countries were influenced by Brexit, this would likely bias our results downward by narrowing the gap between UK CPI and the synthetic counterfactual.

We use quarterly, seasonally adjusted consumer price indices from 1993Q1 to 2024Q4.[7] All series are normalized to the year 2010 and log-transformed. The starting point of our sample is determined by the availability of data for a sufficiently large number of countries.

Identification and the treatment date. The period under consideration is marked by significant economic uncertainty and shaped by major shocks such as the global financial crisis, the COVID-19 pandemic, and the Russian invasion of Ukraine. During these three decades, several countries in our dataset have experienced large shifts in consumer price inflation — going from a prolonged stretch of low and stable inflation to a sharp rise into double-digit levels. From the point of view of the UK, this time also includes key Brexit-related events: the lead-up to the 2016 referendum, the referendum itself, the negotiation of a new trade agreement with the European Union (June 2016–December 2020), the provisional implementation of Brexit through the Trade and Cooperation Agreement on January 1, 2021 and its formal implementation on May 1, 2021.

Central to our analysis is the *treatment date*. That corresponds to the quarter in which Brexit

[6]The full list of countries includes: Australia, Austria, Belgium, Canada, China, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, India, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, and the United States. We exclude other OECD countries such as Chile, Colombia, Costa Rica, the Czech Republic, Estonia, Hungary, Israel, Latvia, Lithuania, the Slovak Republic, Slovenia, and Turkey, either because of data limitations or because the growth rate of CPI is much higher than in the UK during the period of analysis. Including these countries does not alter the analysis, as these countries would take zero weight for the construction of the synthetic at the cost of the algorithm taking longer to converge. In addition, the inclusion of a higher number of countries may result in overfitting.

[7]Data are sourced from Refinitiv.

"happens". It means that we estimate our synthetic control up to that period and consider the rest of the sample as a treated period. Even though the UK officially left the EU in January 2021, our treatment date is June 23 2016 (2016Q2). The rationale is that treatment should be unexpected, and the referendum outcome was largely surprising, as discussed above. The same does not apply to the TCA, which was widely anticipated. Indeed, our analysis of asset prices shows clearly that markets priced in an inflationary effect of Brexit right after the referendum.

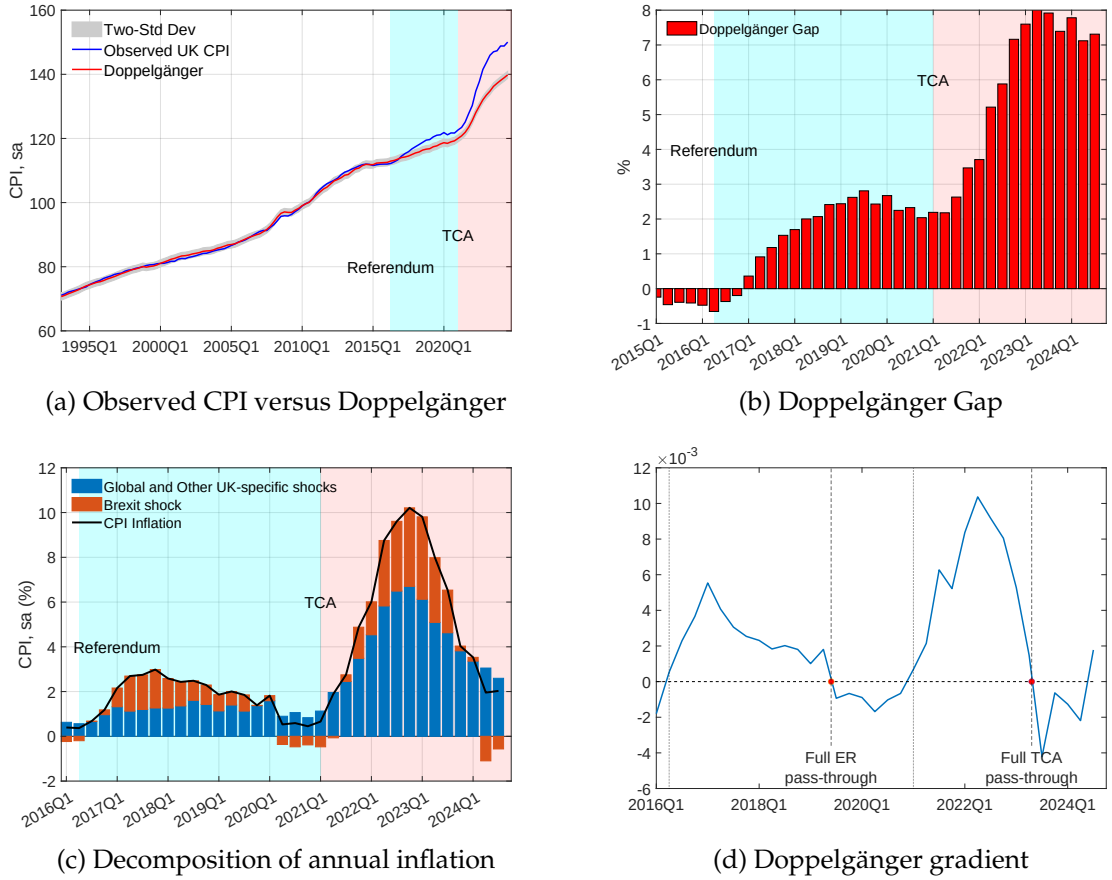
Our choice of the treatment date enables us to capture potential anticipatory effects. We deliberately refrain from taking a stance on whether the economic impact of Brexit was driven primarily by the referendum outcome (Brexit news) or by its formal introduction. Instead, our analysis allows us to assess both phases separately. In doing so, we find that both the news and implementation phases had significant, yet distinct, effects on consumer prices.

Panel (a) of Figure 4 in the Appendix reports the level of log CPI in the UK (in red) alongside those from the donor countries (in grey). The series are normalized using the average value in the year 2010, which explains why the series fan out before and after that date. The extent of homogeneity across countries can be assessed by observing how closely the lines align. Importantly, the UK series falls well within the range spanned by the donor pool both before and after the referendum. This visual inspection highlights that a suitably weighted average of the price indices for those countries has the potential to track the dynamics of CPI prior to treatment. If this is the case, we can be confident that the same weighted combination of prices serves as a reliable counterfactual for what the UK price index would have been had Brexit not occurred.

It is also important to note that for all countries, there is a clear price acceleration at the end of the sample. We can trace this back to the supply shortages (associated with the pandemic) and the recent surge in energy-driven inflation. Against this background, a simple visual inspection reveals that the UK CPI series grew faster than average post-referendum, due to domestic factors amplifying global price pressures.

Strong economic parallels between the UK and the countries in the donor pool are essential. Following the synthetic control literature, we include country covariates to capture similarities (or lack thereof) between the UK and donor pool countries beyond price levels. Omitting covariates could lead to overfitting the data before the treatment period, while placing excessive weight on them may weaken the pre-treatment fit. We consider the following covariates: the ratios of nominal consumption, investment, government spending, and imports (of goods and services) to nominal Gross Domestic Product, as well as quarterly GDP growth per capita in 2021 constant PPP terms. All data are annual, sourced from the World Bank's World Development Indicators, normalized to the year 2010, and averaged over the pre-treatment period.

Figure 2: Main Results



(a) Observed CPI versus Doppelgänger

(b) Doppelgänger Gap

(c) Decomposition of annual inflation

(d) Doppelgänger gradient

Notes: Panel (a) shows the log of the UK CPI index (blue) and the Doppelgänger counterfactual (red). Grey bands represent confidence intervals. Panel (b) depicts the gap between the observed CPI and its synthetic counterpart, quantifying the impact of Brexit on UK consumer prices. Panel (c) decomposes annual consumer price inflation into Brexit-related shocks (red) and global/other UK-specific shocks (blue). The period between the Referendum and EU withdrawal is indicated in shaded light blue, while the post-TCA period is shaded red. Panel (d) presents the gradient of the Doppelgänger gap. The gradient is zero when the observed and synthetic CPI move in parallel (marked by red dots). Vertical dotted lines indicate full pass-through and key dates.

4 Results

Panel (a) of Figure 2 shows graphically the main estimation result, comparing the UK CPI index (in logs) with the Doppelgänger counterfactual. The data is first normalized using the average value in the year 2010 prior to running the algorithm, and then it is restored to its original level. The optimally weighted average of CPI indices from the donor pool closely tracks the UK benchmark during the pre-referendum period, which serves as the estimation sample. The shaded area represents a two-standard-deviation band, which is calculated from the gap between observed and synthetic data before the treatment date. The observed CPI data lie within the bands during the period leading to the Brexit Referendum, which indicates that our approach effectively captures the aggregate price dynamics in the UK for over 23 years' worth of quarterly data and provides a reliable control group for assessing post-referendum effects.

Since the second half of 2016, we observe a wedge opening between the two series. The actual UK CPI lies above its synthetic no-Brexit benchmark. Panel (b) of Figure 2 zooms in this wedge, which is our estimate of $\mathfrak{p}_t$. We can easily detect periods when the wedge opens up and when it levels off. A gap begins to emerge in the second half of 2017 and grows until the end of 2019, after which it plateaus and partially reverses in 2020. We refer to this initial period as the anticipation—or news—phase, as no changes in trading arrangements had materialized at that time. The exchange rate serves as a natural measure of the anticipation effect. We attribute most of the observed price gap to the 10.5% depreciation of the pound following the referendum, with only minor subsequent revaluations of sterling.

Three years after sterling's initial depreciation, prices had increased by approximately 2.9% more than under our no-Brexit benchmark. This finding is broadly consistent with the study by Breinlich et al. (2022) and with an estimate suggesting that exchange rate variations fully pass through to prices at about 30% after three years (see more below). These dynamics also support the interpretation by Broadbent et al. (2024), who argue that the Brexit shock can be viewed as a negative productivity shock affecting the tradable sector once the UK exits the European Union, with the exchange rate depreciation reflecting that expectation.

The gap between the observed UK CPI and the Doppelgänger widens sharply again in 2021, when the TCA took effect following the UK's departure from the EU. We refer to this as the *implementation phase*, which had larger and more immediate effects. This period was marked by rising cost pressures—from energy prices, supply chain disruptions, and tight labor market conditions. However, there is no reason to believe these factors were unique to the UK. Indeed, our Doppelgänger price index also steepens, reflecting the global inflation surge. Nonetheless, inflation in the UK rose even more sharply following the TCA. This is inspite of a subsequent and strong nominal depreciation of sterling, which is likely to reflect a reaction to higher trade barriers. Note that, according to theory, a terms-of-trade deterioration driven by rise in import tariffs leads to a real exchange rate depreciation. In this sense, the nominal exchange rate in a free-floating exchange regime acts as a shock absorber.

The effects of the UK's departure from the EU can be better appreciated through the decomposition in Panel (c) of Figure 2. We construct this decomposition by computing the annual inflation rate post-treatment using both the observed CPI series and its synthetic counterpart. The difference between these inflation rates captures the impact of Brexit. However, non-Brexit shocks account for most of the rise in annual inflation between 2021 and 2024. Still, we identify a Brexit-related component contributing up to 3 percentage points to inflation, with the peak effect occurring in 2022 and early 2023.

Panels (b) and (c) also show that while the effects of Brexit on the price level may never fully reverse, the effects on inflation have. This is reassuring from a technical perspective because it suggests that our weighted average of donor-pool country prices serves as a good proxy for UK price dynamics not only before 2016 but also as late as 2024. Economically, this finding aligns with expectations in a pool of mostly inflation-targeting economies. Eventually, inflation reverts to the inflation target and the gap between realized UK prices and the synthetic counterfactual stabilizes. Importantly, our analysis indicates that these two distinct

waves differ primarily in magnitude and, to a lesser extent, in duration.

Panel (d) of Figure 2 clearly illustrates the time when the actual and synthetic price indices began to diverge and when they resumed growing at roughly the same pace. A zero gradient indicates that the observed CPI and its synthetic counterpart attain the same trend, implying that the depreciation of sterling has fully passed through to prices. In fact, the exchange rate pass-through was completed three years after the Brexit referendum, around mid-2019. The same is true for the second phase of price acceleration, which we estimate to be complete around 2023Q2.

Finally, we can isolate two underlying economic phenomena. UK CPI is highly correlated mostly with that of small open advanced economies, such as Belgium (8.92%), Cyprus (0.79%), Japan (22.18%), New Zealand (15.10%), Singapore (23.56%), Finland (15.07%), and Iceland (4.28%) and tightly related to India (10.10%), due to their close economic and financial ties. Importantly, for our purposes, EU member-states do not get the lion's share of the weight. This mitigates the risk that price indices in our donor pool may also have been affected by Brexit, which we will return to in the following section. Interestingly, the weight attached to the US and Germany (and indeed the remaining members of the donor pool) is essentially zero. Panel (b) of Figure 4 in the Appendix reports a summary of our estimated ω_j^*.

4.1 Robustness

Individual Countries. We evaluate the contribution of individual donor pool countries with non-zero weights to the Doppelgänger by iteratively re-estimating our baseline model omitting each of them in turn. Removing countries from the donor pool reduces the goodness of fit. We carry out this exercise to show that our key findings do not rest on the inclusion of any specific country. Panel (a) of Figure 5 in the Appendix presents the baseline Doppelgänger gap alongside the results from these restricted donor pools. While some variation exists, the results are robust to the exact composition of the donor pool. In fact, in each case, we can clearly identify two distinct phases of price acceleration. Notably, our baseline lies roughly in the middle of the pack. Even in the estimation with the smallest effect, CPI remains 5% higher toward the end of 2024.

Placebo tests. We consider the hypothetical scenario in which one of the countries in the estimation receiving positive weights is subjected to a placebo treatment at the time of the Brexit referendum. We estimate these hypothetical Doppelgängers by iteratively re-estimating the model for each of the countries with non-zero weights.

Following Born et al. (2019), we then consider two statistics for assessing how well the model fits the data before and after treatment – an event affecting the UK. The first is the Root Mean Squared Prediction Error (RMSPE). The second is the Maximum Absolute Prediction Error (MAPE). They are reported in panels (b) and (c) of Figure 5.[8] By comparing

[8]The relative RMSPE (ρ_1) is the ratio of the root mean squared prediction error after treatment to that before treatment. The RMSPE is an average measure of how much the model's predictions deviate from the actual

post-treatment to pre-treatment errors, these ratios indicate whether the model's predictive performance worsened after the treatment. A ratio significantly greater than 1 suggests that the treatment had an effect. Note that Belgium is the only country showing some signs of price acceleration after the Referendum. Since Belgium is part of the EU, it may have been indirectly affected. However, its overall importance is relatively small. If anything, the inclusion of Belgium increases the growth rate of the synthetic, making the gap a conservative estimate. Importantly, excluding Belgium, as we did in the previous exercise, does not alter the main conclusion.

We also conduct a series of time placebos, by letting the treatment date vary arbitrarily, between 2014Q1 and 2016Q2. This should capture any anticipatory effect in the run-up to the vote. We re-estimate the model by changing the treatment dates iteratively. Panel (d) illustrates that the resulting gaps (shown in the gray lines) are very much aligned with the baseline gap (shown in red).

Normalization. The choice of normalization date does not affect our main results. We normalize the data at different points in time—specifically, to the years 1996, 2003, and 2010—before running the algorithm. As shown in panel (d) of Figure 5, the Doppelgänger changes only slightly when using these alternative normalization dates. These dates were selected to cover the full sample period while excluding the initial and treatment periods. However, our results also remain robust even when accounting for the starting year of the sample and the treatment year in the normalization.

Removing co-variates. Excluding the covariates from the analysis does not change the main message. When we do so, the algorithm assigns higher weights to countries whose CPI index is more closely aligned with that of the UK, even if they do not match the UK along other dimensions. This is particularly true for Singapore, whose CPI serves as a very strong proxy for the UK in the absence of covariates (with a weight of 40%). The algorithm also assigns larger weights to countries such as China and India, which present quite substantial structural differences relative to the UK along other dimensions. If anything, excluding covariates produces a Doppelgänger that fits the observed UK CPI prior to treatment better. Indeed, the role of the covariates is to avoid overfitting by ensuring that weights are assigned to countries not exclusively based on their CPI index.

5 Conclusion

Brexit provides a valuable case study for assessing the economic impact of rising trade barriers. It serves as a quasi-natural experiment, as the referendum outcome was largely unanticipated by markets.

values. The relative MAPE (ρ_2) is the ratio of the maximum absolute prediction error after treatment to that before treatment. The MAPE focuses on the single largest deviation between the model's prediction and the observed data.

Our study estimates the causal effects of Brexit on UK prices without imposing a fully-specified model of the economy. By applying Synthetic Control Methods, we estimate that the UK's price level increased by approximately 7 percentage points more than its synthetic counterpart between 2016Q2 and 2024Q4. The Brexit effect accounted for over 25% of the total inflation variation over the period or, according to a different metric, a 0.8 percent higher average annual inflation.

Our estimation shows that the effects of Brexit accrued over two distinct phases. The first, immediately following the referendum, was primarily driven by the depreciation of the British pound, which in turn we can trace back to the expected effects of a foreseeable trading agreement. We estimate full-pass through from the exchange rate to aggregate prices to be around 30% over the course of three years. The second phase, starting from the implementation of the Trade and Cooperation Agreement (TCA), in 2021, captures the effects of additional trade frictions. This second phase has had both larger and faster effects.

Overall, our results suggest that the rise in trade barriers and currency depreciation following the Brexit referendum has had substantial and persistent effects on UK consumer prices. The impact of Brexit on inflation may be complete, but the cumulated impact on the level of prices is unlikely to reverse any time soon. Future research should explore the sectoral implications of these inflationary effects and assess the long-term impact on economic growth and household welfare.

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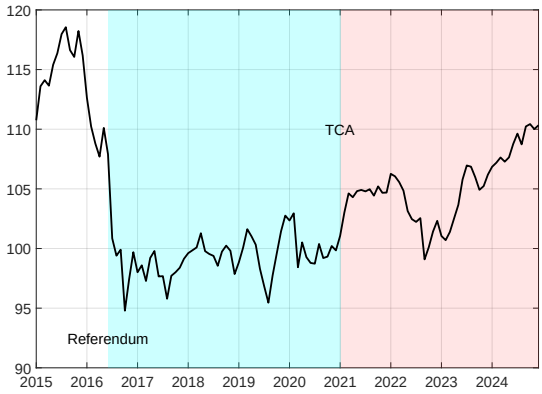
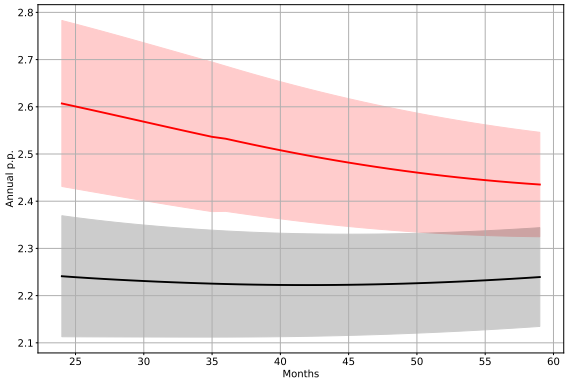
Appendix

Figure 3: Additional Financial Data



(a) Nominal Effective Exchange Rate

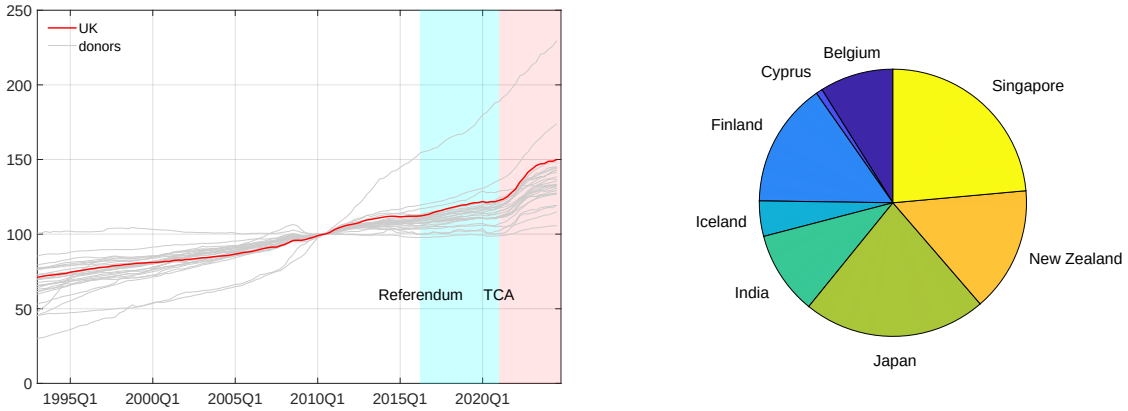


(b) Market-implied expectations

(c) Index-Linked Bond Yields

Notes: Panel (a) plots the time series for the nominal effective exchange rate from 2015. The data (broad basket) is sourced from the Bank of International Settlements, https://data.bis.org/topics/EER/. Panel (b) illustrates the reaction of market-based inflation expectations at different horizons (on the horizontal axis) to the outcome of the Referendum (Bank of England data and own calculations). The data is presented for the month leading up to the referendum (June 23, 2016) in black, and the month following it in red. The shaded areas represent 2 standard deviation bands, computed from the daily observations for the respective months. Panel (c) shows the daily time series of the yield on the 2% Index-linked Treasury Stock 2035 (United Kingdom Debt Management Office data). The grey shaded area denotes the post-referendum period, and the dashed red lines represent the pre- and post-referendum means.

Figure 4: Data and Weights

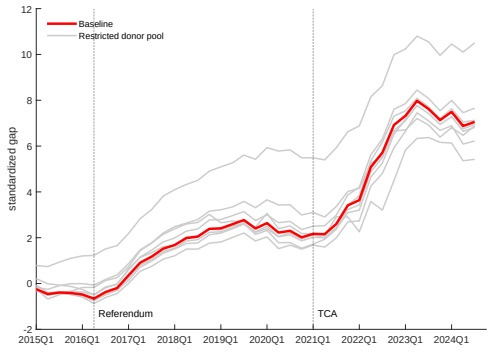


(a) Normalized Data

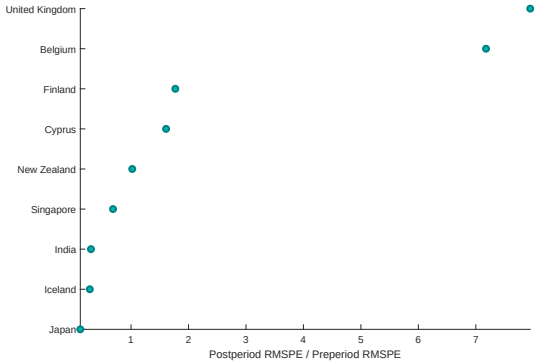
(b) Weights

Notes: Panel (a) displays the log CPI indices in the UK (red) and in the donor countries (gray). In the last two panels, the period between the Referendum and EU withdrawal is indicated by the light blue shading and the period Post-Trade Cooperation Agreement is denoted in red. Panel (b) displays a pie chart with the optimally computed weights that minimize the distance between actual and synthetic data before the Brexit Referendum.

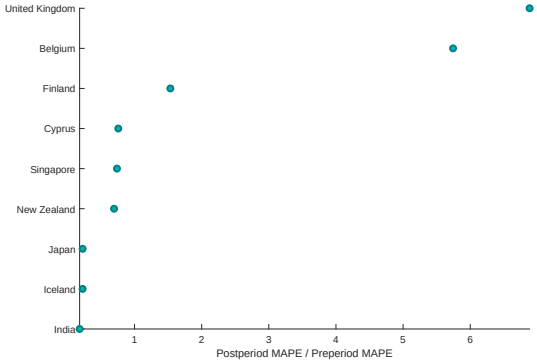
Figure 5: Robustness



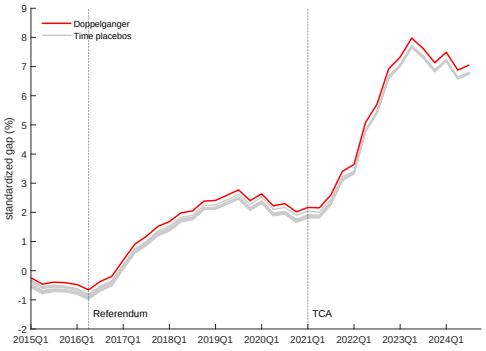
(a) Removing countries



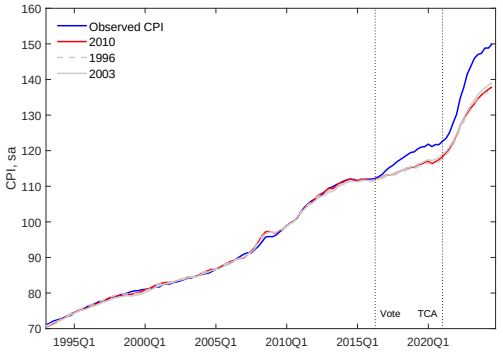
(b) Root Mean Squared Prediction Errors



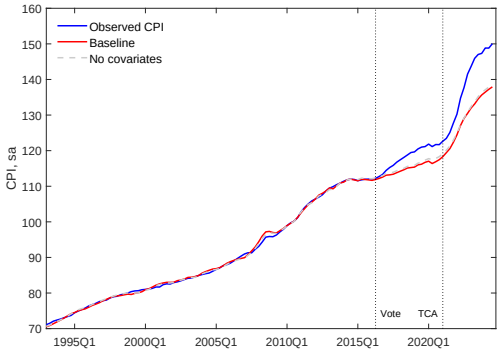
(c) Maximum Absolute Prediction Error



(d) Time placebos



(e) Alternative standardization



(f) No covariates

Notes: Panel (a) shows the standardized gap (red) versus alternative gaps excluding each positively weighted country (grey). Panels (b) and (c) display RMSPE and MAPE as dots. Panel (d) presents Doppelgänger gaps for time placebos (2014Q1–2016Q1, grey) against the baseline (red). Panel (e) compares the baseline synthetic (red) to alternatives using 1996 (dashed grey) and 2003 (solid grey) standardizations. Panel (f) contrasts the baseline (solid red) with a synthetic using only CPI indices (dashed grey). Actual data appears in blue. Vertical dotted lines mark the Referendum and EU withdrawal.

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