The Swift Decline of the British Pound:
Evidence from UK Trade-invoicing after the Brexit Vote*

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Abstract

Using administrative transactions data from the United Kingdom, we document a swift decline in sterling use among British exporters after the 2016 Brexit vote. Through a novel decomposition, we document most of this decline comes from two sources: (i) continuously-operating firms switching from sterling to dollars or local currencies and (ii) reductions in trade volumes and transactions for sterling-loyal firms. We quantify the role of firm and market heterogeneity in driving these changes and document that firms which served markets with more US competitors and used more dollar-invoiced imported inputs were more likely to switch to dollars after the Brexit vote. Altogether, our findings provide the first quantitative evidence on the channels that contribute to changes in aggregate invoicing shares amidst political upheaval.

JEL classification: F14, F31, F41

Keywords: Invoicing currency, trade transactions, sterling, Brexit.

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1 Introduction

Since the collapse of the Bretton Woods System of fixed exchange rates in 1972, an enormous body of research has documented the US dollar's dominance in world trade. A recent contribution from Boz et al. (2022) highlighted the US dollar's global dominance and the relative stability and persistence of global currency shares used for invoicing international trade over long periods. Recently, major shocks to the global trading system have raised the question of whether other currencies might rise in importance in the future. The rise of China as an economic power following its entry into the World Trade Organisation, the war in Ukraine and consequent economic sanctions against Russia, and Britain's departure from the European Union are potentially transformative political events with the power to change trade flows and the currencies in which these flows are invoiced.

In this paper, we examine a major political event, Britain's referendum vote in June 2016 to exit the European Union, and trace out the impact on the currencies used to invoice Britain's international trade. After the "Brexit vote," the sterling depreciated substantially, measures of Britain's economic policy uncertainty rose sharply, and the World Bank's measure of Britain's Government Effectiveness declined absolutely and relative to other countries.[1] Simultaneously, there was a swift decline in the share of Britain's extra-EU exports invoiced in sterling. In this study, we use administrative data on *daily* trade transactions to investigate the sterling's decline as an invoicing currency during a period of dramatic political, institutional, and policy uncertainty.

The United Kingdom presents a particularly interesting case. Unlike previous research that observed stable shares of invoicing currencies over time (Ito and Kawai 2016; Maggiori, Neiman and Schreger 2019; Boz et al. 2022; Berthou, Horny and Mésonnier 2022), we document a significant change in the invoicing practices of UK exporters following the 2016 Brexit vote. The sterling's share of UK exports to extra-EU destinations decreased from 57% in early 2016 to 41% by 2019. This change coincided with rapid increases in the shares of the US dollar and other currencies.

A primary concern in analyzing changes in aggregate trade shares by invoicing currencies is that they can be confounded by valuation effects of exchange rate movements. A depreciation of sterling mechanically reduces the value share of sterling-invoiced transactions while increasing the shares of all other currencies, even if there is no change in the underlying trade transactions of firms. With nearly a 15% depreciation of sterling after the Brexit vote, the mechanical valuation effects can be nontrivial.[2]

[1] See Online Appendix figure OA1-1.

[2] Consider the case of two currencies, the sterling and the US dollar, each accounting for 50% of export value. Suppose there is a sudden sterling depreciation of 15%; if there is no change in the firms' currency

We use transaction-level data from His Majesty's Revenue and Customs (HMRC), available for extra-EU transactions over 2010-2019, to minimize the mechanical valuation effects. HMRC maintains records of the entire universe of customs transactions, including data at the firm, product, origin or destination, and *date* level. By exploiting the date information from transaction level data, we construct "constant value share" measures by applying the exchange rate of the sterling to other currencies from the week of the referendum vote in June 2016 to firm-level trade data over 2010–2019. By explicitly controlling for mechanical changes in currency movements, our reported statistics are more likely to reflect the true behavioural changes in firms' currency usage.[3]

Our main findings are threefold. First, we document a swift decline in sterling's annual *constant value* invoicing share for extra-EU exports of 14.6 percentage points, from 59.0% in 2016 to 44.4% in 2019 (Figure 1 panel b). Interestingly, in light of the J-curve theory that predicts the positive export volume response to a depreciation occurs at a delay, we find a temporary rise in sterling's *weekly* constant value invoicing share in the first six months after the depreciation. This is followed by a steady decline in sterling's share in weekly invoicing data of about 30 percentage points between early 2017 and the end of 2019 (Figure 1 panel c). This decline in sterling usage was widespread across destinations but varied significantly by product type. The decline in sterling was concentrated in highly differentiated goods, such as automobiles and transportation equipment, while the sterling share of less differentiated manufactured goods, such as processed foods, remained relatively stable at around 50% during 2016-2019.

Second, we introduce a novel decomposition of the micro trade margins contributing to changes in invoicing currency shares. We decompose the aggregate change in trade value (measured at a constant exchange rate) between 2016 and 2019 into the conventional extensive margins: (1) net firm entry into exporting, (2) net addition of geographic destination markets by existing exporters, and (3) net addition of products by firms already trading in a destination market, as well as two novel intensive trade margins: (4) a contribution from continuing firms in continuously operating geographic product markets who switch the invoicing currency, and (5) a contribution from continuing firms in continuously operating geographic product markets who retain the original currency, but change the intensity of trade by adjusting volumes and/or frequencies of transactions.

choices, the new *value share* of sterling-invoiced trade decreases to 45.9% [= 0.85/(0.85+1)]. Our measures, using micro transactional level data, maintain the sterling's invoicing share at 50% if there is no change in firms' currency choices. See Online Appendix OA1.2 for more details.

[3]In the Online Appendix, we present an analysis of the data based on an alternative measure purged of mechanical exchange rate valuation effects: sterling's "invoicing transaction shares", based on counts of weekly firm-destination-product-currency transactions. Results are broadly consistent across measures.

Our principal finding is that the swift decline is dominated by contributions from the two intensive margins, "currency-switching" and changes in within-currency trade intensity. These account for 32% and 64% of the decline in sterling's share, respectively. The large contribution of the currency-switch margin indicates proactive management of invoicing currencies by firms in established trade relationships, while the significant change in the within-currency trade intensity margin highlights that, among continuing firms that had previously invoiced in sterling, those that continued to invoice in sterling engaged in fewer transactions and sold lower trade volumes compared to those firms that switched to alternative currencies. Comparing the decomposition from the "normal" period of 2013-2016 with that of the period of policy and institutional turmoil (2016-2019), we find stark differences in the quantitative importance of the identified micro margins (Figure 3). Notably, while the currency-switch margin was close to zero during 2013-2016, its contribution surged during 2016-2019, making it the second most important margin contributing to the decline in sterling usage.

Our final contribution is to quantify the role of firm and market heterogeneity in driving the intensive margin changes in sterling's share. Our estimates underscore the significant role of the currency used for imported inputs, the firm's market share and size, and the currency choices of the firm's foreign competitors on the currency switching decisions of continuing firms selling to continuously operating geographic product markets. UK exporters that (i) relied more on dollar-invoiced imported inputs or (ii) served markets with more US competitors were more likely to switch to US dollars after the Brexit vote.

Literature. The invoicing currency choice of firms plays a central role in the international transmission of shocks and has long been a focus of the international macro literature (Gopinath and Itskhoki 2022). Since prices tend to be sticky in the firm's invoicing currency, the currency composition of a country's international trade is a key predictor of aggregate exchange rate pass-through and associated expenditure-switching.[4] Early research endeavoured to develop a theoretical framework to document macro and micro determinants of invoicing currency choice (Corsetti and Pesenti 2002 Devereux, Engel and Storgaard 2004; Bacchetta and van Wincoop 2005; Engel 2006; Goldberg and Tille 2008; Gopinath, Itskhoki and Rigobon 2010). More recent research focused on empirically testing these determinants using transaction-level data for particular countries (Chung 2016; Goldberg and Tille 2016; Devereux, Dong and Tomlin 2017; Crowley, Han and Son 2021; Amiti, Itskhoki and Konings

[4]Thanks to the recent availability of invoicing data, there is increasing micro evidence on the tight linkage between the invoicing currency of firms and exchange rate pass-through, see Gopinath, Itskhoki and Rigobon (2010), Barbiero (2020), Bonadio, Fischer and Sauré (2020), Auer, Burstein and Lein (2021), Chen, Chung and Novy (2021) and Corsetti, Crowley and Han (2022).

2022; Berthou, Horny and Mésonnier 2022, Amador, Garcia, Mehl and Schmitz 2024), as well as cross-country data (Goldberg and Tille 2008).

An important contribution of our research lies in its focus on an unusual change in invoicing currency induced by an unanticipated political event. Due to the well-known stability of invoicing currency shares, the prior literature focused on cross-sectional variations across firms or industries. Boz et al. (2022) highlight several countries, including Lithuania, Poland and Romania, that had a significant decline in their dollar invoicing shares from 1995 to 2015. Mukhin (2022) shows that these changes can be rationalized by the rise of their trade shares with the EU. In contrast, the swift change in invoicing currency among UK exports since 2016 was not coupled with any notable change in the UK's trade shares with its major trade partners. Rather, our results suggest increased uncertainty surrounding UK government policy and the future value of the sterling following the 2016 Brexit vote had a quick and significant impact on British firms' currency choices.[5]

Relying on our new decomposition, we provide the first evidence on the relevant micro margins of adjustment for invoicing currency in response to a major unanticipated political event, uncovering two novel margins that are crucial to the aggregate changes in currency use: the currency-switch margin and the within-currency trade intensity margin. These two margins are typically overlooked by studies using more aggregated firm-product level trade flows, where only one record is observed in a certain period (usually a year). Our work complements recent event studies focusing a particular country (Berthou 2023, Chupilkin, Javorcik, Peeva and Plekhanov 2023, Benguria and Wagner 2024, Garofalo, Rosso and Vicquéry 2024) and studies of the evolution of aggregate invoicing shares globally (Boz et al. 2022, Mukhin 2022).[6]

Finally, prior research has investigated the importance of the currency used for imports (Chung 2016) and the currency used by the firm's competitors (Goldberg and Tille 2008, 2016 and Amiti, Itskhoki and Konings 2022), in determining the choice of invoicing currency, primarily relying on cross-sectional variation in the data. We quantify the importance

[5]Our findings on the rapid change in currency usage are consistent with the recent papers documenting changes in invoicing currency usage by Russian importers and French exporters to Russia after the introduction of trade and financial sanctions on Russia (Berthou 2023, Chupilkin, Javorcik, Peeva and Plekhanov 2023). Unlike the Brexit vote studied in this paper, changes in Russian trade-invoicing are likely to be driven by (1) the direct effect of trade and financial sanctions and (2) the indirect effect due to the uncertainty brought by the war and the sanctions. In contrast, the Brexit vote has no direct impact on the trade and financial costs for British firms selling to extra-EU trade partners and thus our results appear to be driven by uncertainty.

[6]The rapid decline in sterling invoicing after the Brexit vote is also noted by Garofalo, Rosso and Vicquéry (2024). While we quantify the micro drivers behind shifts in currency choices, Garofalo, Rosso and Vicquéry (2024) focuses on the operational hedging channel and its effects on export value pass-through. We assess the significance of this channel in Section 4.

of these factors, referred to as the 'operational hedging' and 'strategic complementarity' motives, in driving invoicing share changes *over time* among UK exporters.

The paper is organized as follows. Section 2 examines the evolution of each invoicing currency in UK exports over time and across major destinations. Section 3 decomposes the changes in invoicing shares into different trade margins. Section 4 conducts a regression analysis to explore firms' currency switches. Section 5 concludes.

2 Evolution of invoicing currencies in UK exports

Our empirical analysis exploits a unique administrative dataset from HMRC, which maintains records of the entire universe of customs transactions conducted in the UK. For each transaction, the record contains information on the date of transaction, an anonymized firm identifier, an 8-digit Combined Nomenclature product code, the country of destination/origin, transaction value (expressed in sterling) and quantity. Importantly, invoicing currency is recorded for extra-EU trade transactions since January 2010. All UK importers must report their currency of invoicing for every transaction. UK exporters whose annual exports exceed £100,000 must report the invoicing currency for every transaction. Given the availability of data, our analysis focuses on the export transactions to extra-EU destinations over 2010-2019.[7]

Measurement. To account for exchange rate valuation effects on invoicing share changes, we introduce a *constant exchange rate value* measure, utilizing information on each transaction's date. The key idea is to neutralize the artificial changes in invoicing shares caused by exchange rate fluctuations. Specifically, we aggregate the daily data to a weekly frequency and calculate the counterfactual sterling value of transactions invoiced in non-sterling currencies, assuming a constant exchange rate over the entire sample period equal to that from the 25th week of 2016 (i.e., the week of the Brexit referendum). See Online Appendix OA1.2 for details on how this measure helps address valuation effects.[8]

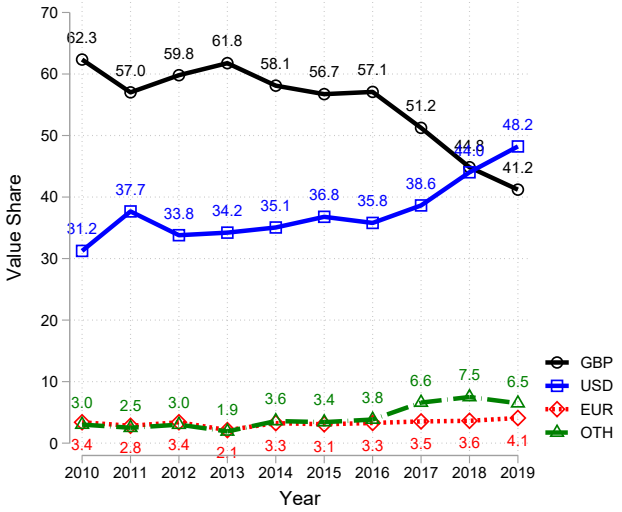
Aggregate patterns. Figure 1 shows the aggregate shares of major invoicing currencies used in UK exports to countries outside the EU from 2010 to 2019. Panel (a) shows the value share of exports invoiced in the pound sterling (GBP) fluctuated around 60% during 2010-2015. However, there is a sharp decline starting in 2016, as indicated by the dashed line, with its share plummeting from 57.1% in 2016 to 41.2% in 2019. Simultaneously, the

[7] See Online Appendix OA1.6 for results of UK imports.

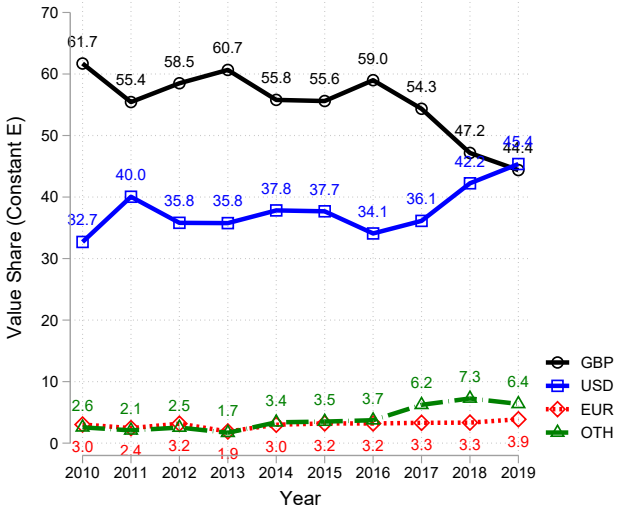
[8] We focus on the constant value results because this measure accounts for the fact that that transactions made in foreign currencies tend to be larger in value on average. In the Online Appendix, we provide estimates from an alternative transaction share measure, which is also robust to the mechanical effects of exchange rate movements. We find similar qualitative patterns using these two measures.

Figure 1: Invoicing currencies in UK exports (2010-2019)

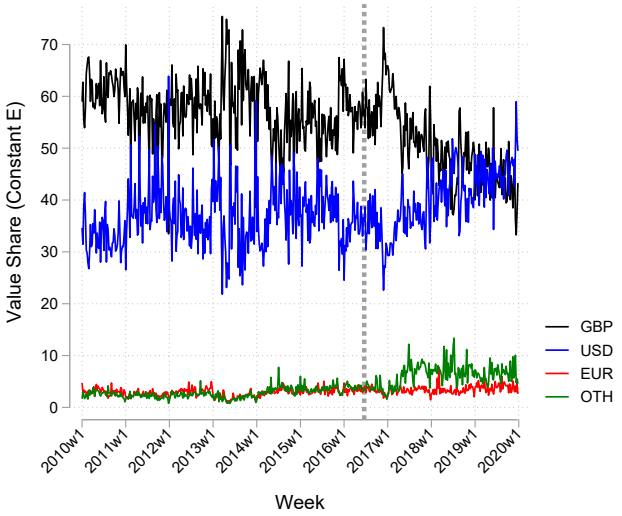
(a) All: Raw value share



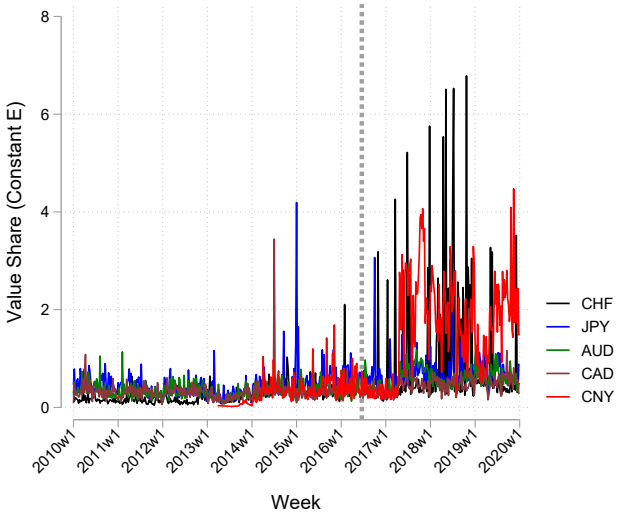
(b) All: Constant value share



(c) All: High frequency (Constant value share)



(d) Others: High frequency (Constant value share)



Note: The figure plots the shares of the UK's extra-EU exports invoiced in each currency from 2010 to 2019. Panel (a) is based on the value of exports and panels (b) to (d) are based on the constant value share of exports. Data source: HMRC administrative datasets.

share of the US Dollar (USD) surged from 35.8% in 2016 to 48.2% in 2019.

The sharp decline in the GBP share beginning in 2016 could be partly driven by the depreciation of its value following the Brexit referendum. Panel (b) presents the shares using the constant value share measure. After accounting for the valuation effect of exchange rate movements, the GBP share falls from 59.0% to 44.4% between 2016 and 2019. As expected, the magnitude of the change is slightly smaller with the constant value measure, a 14.6 percentage point decline.

Higher frequency, *weekly* aggregate invoicing shares are displayed in panels (c) and (d). Interestingly, in the first six months after the Brexit referendum (i.e., 2016w26-2017w1), there is an upward spike in sterling usage (see panel (c)). This temporary increase in late 2016 in the volume of sterling-invoiced exports likely arose because (1) previously contracted sterling prices reflected a substantial discount in foreign currency terms in the weeks after the depreciation, yet (2) production and delivery to satisfy the temporary demand surge likely took several months.[9] Finally, a noticeable trend is the increasing adoption of 'other' non-dominant currencies since 2016. To delve deeper, panel (d) presents the evolution for the five most-used non-dominant currencies: the Swiss Franc (CHF), Japanese Yen (JPY), Australian Dollar (AUD), Canadian Dollar (CAD), and Chinese Yuan (CNY). There is a prominent rise in the usage of all after mid-2016. Notably, the Chinese Yuan (CNY) exhibits a significant increase, with its share surpassing 1%.

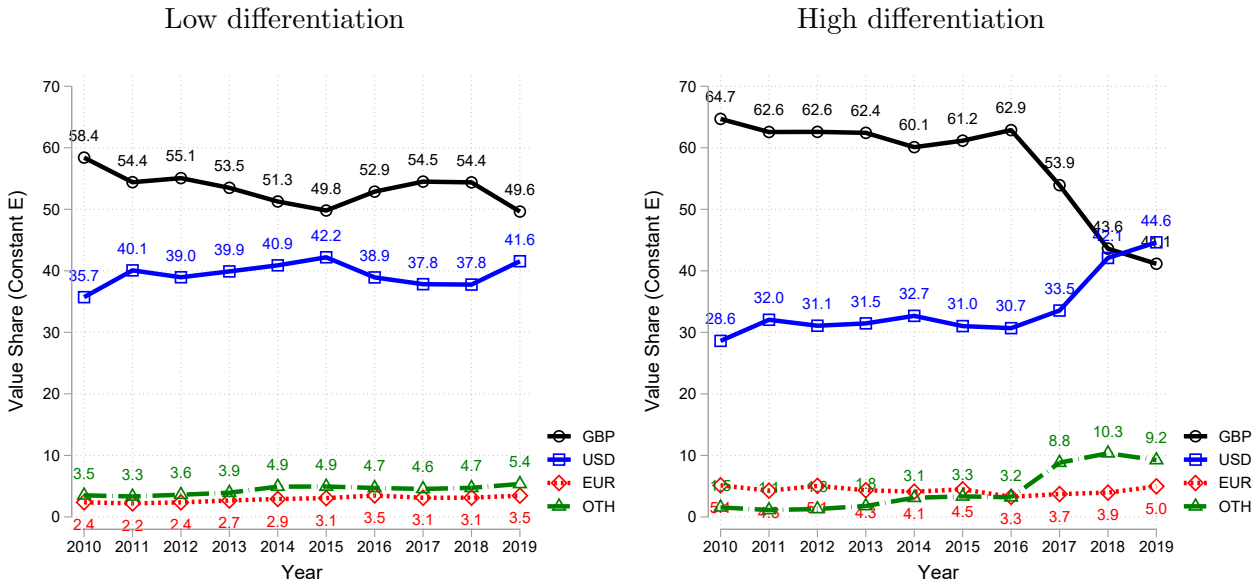
Heterogeneity across products and countries. Figure 2 panel (i) highlights the starkly different evolution of invoicing shares for low versus high differentiation goods, as defined by the classification methodology in Corsetti, Crowley, Han and Song (2018). The decline in sterling invoicing is much more pronounced in the export of highly differentiated goods (falling from 62.9% in 2016 to 40.1% in 2019) compared to less differentiated goods (declining from 52.9% in 2016 to 49.6% in 2019). This suggests firms selling differentiated products tend to have market power and are more likely to switch to vehicle or other local currencies, consistent with recent cross-sectional findings (Amiti, Itskhoki and Konings 2022).

Figure 2 panel (ii) investigates whether shifts in UK exporters' invoicing currency are broad-based across different destinations or specific to a few markets, such as the United States or China. We compare the distributions of the major invoicing currencies for the top 20 extra-EU destination countries between 2016 and 2019. We observe a widespread decline in the use of GBP and a substantial increase in local currency invoicing among UK exporters

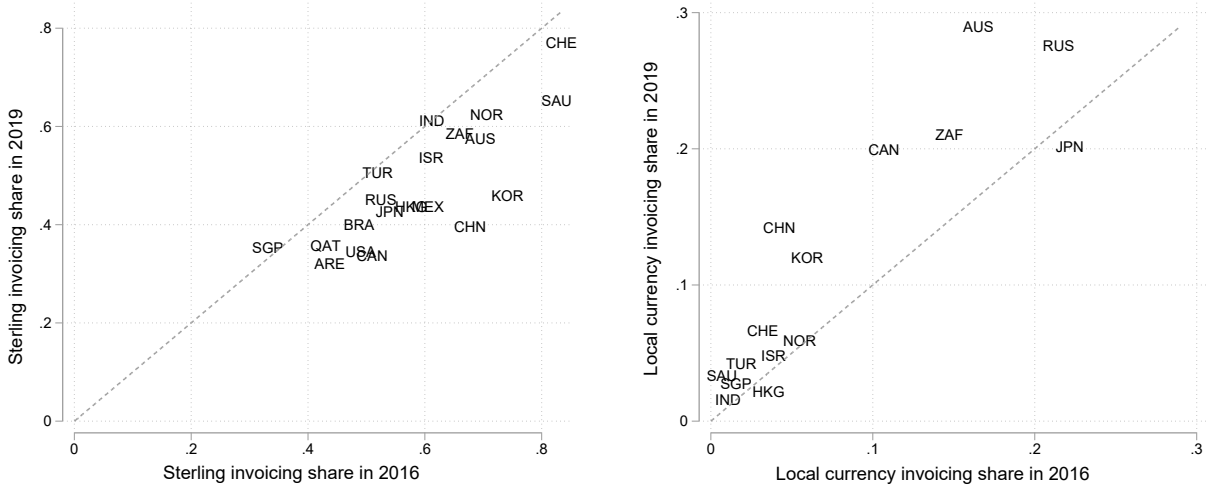
[9] Corsetti, Crowley and Han (2022) document that at the time of the Brexit referendum, the short-term pass through of the sterling depreciation into foreign import prices was about 100%, implying large discounts to foreign customers holding sterling-invoiced contracts.

Figure 2: Heterogeneity cross products and countries

Panel (i): Evolution of constant value share by low vs high differentiation goods



Panel (ii): Invoicing currency for the top 20 destinations: 2016 vs 2019



The panel (i) figures plot the shares of the UK's extra-EU exports invoiced in each currency from 2010 to 2019 for low and high differentiation goods respectively. The panel (ii) figures plot the transaction share of UK exports invoiced in each currency across the top 20 extra-EU destination countries in 2016 on the x-axis and 2019 on the y-axis. Data points falling below (above) the dashed 45-degree line indicate a reduction (increase) in the share of exports invoiced in a particular currency to a specific destination in 2019 compared to 2016. Data source: HMRC administrative datasets.

across diverse destinations. Online Appendix Figure OA1-7 shows that the dramatic change in invoicing patterns is not accompanied by significant shifts in trade shares toward these destination countries.

3 Which margin matters?

In this section, we delve into which margins of trade have contributed most to the changes in invoicing currency for UK exports, building on the approach of Bernard, Jensen, Redding and Schott (2009). We decompose the universe of UK export transactions using the invoicing currency information reported and the contribution of each transaction to the firm, geographic market, product, and invoicing currency margins of adjustment as shown in equation (1).[10]

$$
\begin{aligned}
\Delta_s x^k_t &= \underbrace{\sum_{f\in\mathcal{E}} x^k_{ft} - \sum_{f\in\mathcal{X}} x^k_{ft-s}}_{\text{Net firm entry}} + \underbrace{\sum_{f\in\mathcal{C}} \Delta_s x^k_{ft}}_{\text{Continuing firm margin}}, \\
\Delta_s x^k_{ft} &= \underbrace{\sum_{d\in\mathcal{E}_f} x^k_{fdt} - \sum_{d\in\mathcal{X}_f} x^k_{fdt-s}}_{\text{Net market entry}} + \underbrace{\sum_{d\in\mathcal{C}_f} \Delta_s x^k_{fdt}}_{\text{Continuing market margin}} \qquad \forall f \in \mathcal{C}, \\
\Delta_s x^k_{fdt} &= \underbrace{\sum_{p\in\mathcal{E}_{fd}} x^k_{fpdt} - \sum_{p\in\mathcal{X}_{fd}} x^k_{fpdt-s}}_{\text{Net product entry}} + \underbrace{\sum_{p\in\mathcal{C}_{fd}} \Delta_s x^k_{fpdt}}_{\text{Continuing product margin}} \qquad \forall d \in \mathcal{C}_f, f \in \mathcal{C}, \\
\Delta_s x^k_{fpdt} &= \underbrace{x^k_{fpdt}\mathbb{1}(\mathcal{A}^k_{fpd}) - x^k_{fpdt-s}\mathbb{1}(\mathcal{B}^k_{fpd})}_{\text{Currency switch margin}} + \underbrace{\Delta_s x^k_{fpdt}\mathbb{1}(\mathcal{C}^k_{fpd})}_{\text{Within-currency trade intensity margin}} \qquad \forall p \in \mathcal{C}_{fd}, d \in \mathcal{C}_f, f \in \mathcal{C}.
\end{aligned}
\tag{1}
$$

We use subscripts to indicate the aggregation level of a variable throughout the paper, where $\mathcal{E}$ indicates the set of new entering firms, $\mathcal{X}$ is the set of exiting firms; $\mathcal{E}_f$ and $\mathcal{X}_f$ represent the set of new and exiting destinations of firm f; $\mathcal{E}_{fd}$ and $\mathcal{X}_{fd}$ represent the set of new and exiting products of firm-destination pair f, d; and $\mathcal{C}$, $\mathcal{C}_f$, and $\mathcal{C}_{fd}$ represent continuing firms, continuing markets within a firm and continuing products within a firm-destination pair respectively.

The total change in the total trade value (evaluated at the constant exchange rate) in currency k between $t-s$ and t, denoted $\Delta_s x^k_t$, is categorised into three bins: (a) the firm

[10] In this section, we focus on decomposing the changes in total trade value evaluated at constant exchange rates. Our proposed approach can also be applied to decompose raw trade values or transaction volumes. The related results are reported in Online Appendix OA1.5.

entry margin, summing over the transactions from all firms that used currency k in t but not in $t-s$, denoted $\sum_{f\in\mathcal{E}} x^k_{ft}$; (b) the firm exit margin, summing over the transactions from the firms that used currency k in $t-s$ but not in t, denoted $\sum_{f\in\mathcal{X}} x^k_{ft}$; and (c) the continuing firm margin, summing over the firms that have used currency k in both periods, denoted $\sum_{f\in\mathcal{C}} x^k_{ft}$. Following the same logic, we further decompose the continuing firms into different market margins in the second line of equation (1) and different product margins within the continuing markets in the third line of equation (1).

At the most granular level, the change in use of currency k for firm f selling product p to destination d, denoted as $\Delta_s x^k_{fpdt}$, can be decomposed into: (i) the currency k was used in t but not in $t-s$, i.e., $\mathbb{1}(\mathcal{A}^k_{fpd})=1$, indicating the firm switched from an alternative currency to currency k; (ii) the currency k was used in $t-s$ but not in t, i.e., $\mathbb{1}(\mathcal{B}^k_{fpd})=1$, indicating the firm switched from currency k to an alternative currency; and (iii) the currency k was used in both $t-s$ and t, i.e., $\mathbb{1}(\mathcal{C}^k_{fpd})=1$, but traded value may have changed.[11] We refer to (i)-(ii) as the currency switch margin and (iii) as the within-currency trade intensity margin.

Our approach differs from Bernard, Jensen, Redding and Schott (2009)'s decomposition in three ways. First, we implement the decomposition separately for each invoicing currency.[12] Second, we identify two new margins within the conventional intensive margin of trade: the currency switch and within-currency trade intensity margins. Third, we exploit the transaction date to construct constant (exchange rate) trade values that neutralize the valuation effects of the sterling depreciation.

Table 1 presents the contributions of each trade margin between 2016 and 2019 in terms of the constant trade value in millions. The first three rows show the firm entry margin. Row (1-1) shows that a significant value of trade by new entrants was invoiced in GBP, covering 63.2% (=7,377/11,671) of all exports conducted by new UK exporters during this period. This implies that new exporters, with little experience in using foreign currency and smaller export volumes, tend to opt for producer currency pricing, as in Lyonnet, Martin and Mejean (2021). The GBP also covers over half of exports by firms that ceased exporting (54.6% = 3,447/6,315, row (1-2)). Net firm entry (row (1)), defined as firm entry minus firm exit, positively contributed to sterling usage, offsetting part of the decline from other margins.

The next six rows of Table 1 show the contribution of the market and product margins. Although these margins are volatile, the net contribution to currency changes is small. For example, although the new product margin of GBP accounts for about 40% (=9,685/24,253)

[11] The three categories are mutually exclusive, i.e., $\mathbb{1}(\mathcal{A}^k_{fpd})+\mathbb{1}(\mathcal{B}^k_{fpd})+\mathbb{1}(\mathcal{C}^k_{fpd})=1$ for any k.

[12] The original decomposition of Bernard, Jensen, Redding and Schott (2009) can be obtained by summing over k in each of the margins we defined here.

of the total change in sterling value, its impact is largely offset by the even larger drop in sterling value from retired products. As a result, the net effect is moderate, i.e., -9.8% of the total change. Additionally, the impact of the three extensive margins (i.e., 1, 2, and 3) largely offset each other, leading to a tiny change in aggregate sterling use (-1.6% = 16.2%-8.0%-9.8%).[13]

The significant decline in sterling usage comes from the two novel intensive margins: (4) the net currency switch and (5) the within-currency trade intensity margins. Altogether, these two margins account for 96% [=(-3,193 - 6,412)/-9,995] of the decline in sterling usage between 2016 and 2019. In contrast to the common belief that exporters with established trading relationships in a destination-product market tend to stick to the same currency over time, we find significant changes in currency usage from these continuing firms.[14] Moreover, as suggested by the within-currency trade intensity margin in row (5), firms sticking with sterling-invoicing trade less compared to those firms which switched to other currencies.

Finally, combining all the margins we have explored, row (6) shows a significant decline in sterling usage for UK exports between 2016 and 2019 (41.2% of the change in total trade flows), which has been largely replaced by US dollars (111.5%) and other local currencies (21.9%).

Comparison. Figure 3 compares each trade margin of the pre- (2013-2016) and post-Brexit vote periods (2016-2019). Focusing on the pre-Brexit vote period, in normal times when the aggregate invoicing shares are stable, the three extensive margins (i.e., net firm entry, net market entry, and net product entry) and the currency switch margin play relatively small roles in driving aggregate changes. In most cases, the positive entry margin offsets the negative exit margin, yielding a small aggregate effect. Additionally, changes in the within-currency trade intensity go in the same direction for the major currencies (e.g., sterling and dollar) during 2013-2016, suggesting no systematic change in the aggregate invoicing shares being driven by them.[15]

[13] In Online Appendix Table OA1-2, we show that the net market entry and the net product entry margins positively contributed to the use of sterling *transactions*, leading to an overall positive contribution of sterling usage by extensive margins. Taken together, these results suggest that the values of transactions associated with market and product exits may be higher than the values of transactions associated with market and product entries, resulting in a negative contribution measured by trade values despite a positive contribution measured by the number of transactions.

[14] Online Appendix Table OA1-6 shows, consistent with common beliefs, currency switches play a small role in normal times (2013-2016).

[15] To facilitate understanding of this result, imagine a special case where (i) there is no change in aggregate invoicing shares and (ii) the first four margins are zero. In this case, all changes in trade flow will be reflected in the within-currency trade intensity margin and the percentage contribution of each currency should be equal to their aggregate invoicing share (e.g., 60% for GBP, 33% for USD, 3% for EUR, and 4% for other currencies). What we observed in the data is largely in line with this hypothetical exercise, with the GBP

Turning to the post-Brexit vote period, we see a dramatically different pattern. Apart from the active changes in the extensive margins, the most notable are (a) the large size of currency switches from continuing firms selling to continuing product-markets and (b) the opposite direction of changes in the within-currency trade intensity margin for GBP vs. all other currencies. While the currency switch margin was negligible when currency shares remained relatively stable (2013-2016), it became the second most important margin in driving the rapid decline of sterling use from 2016 to 2019. Additionally, the reduced trading intensity among sterling-loyal firms turns out to be the primary driver of sterling's decline during 2016 to 2019, coinciding with a substantial increase in USD and 'other' local currencies.

In summary, our analysis indicates that the most significant post-Brexit shift in sterling usage was not driven by the firm, market, or product extensive margins of trade. Instead, the shift resulted from the changing invoicing behavior of continuing firms in their established product and destination markets.

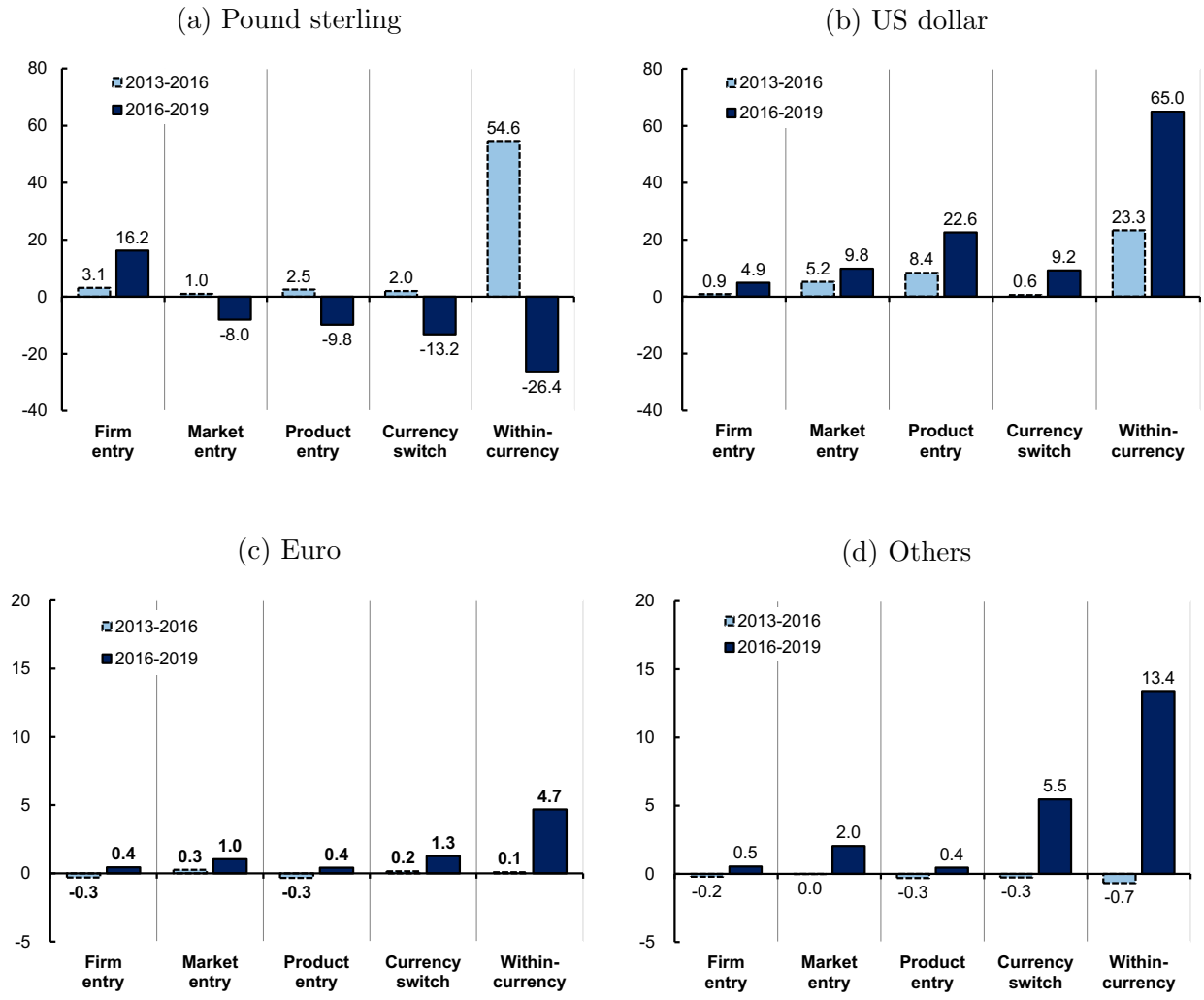
and USD contributions being 54.6% and 23.3%, respectively.

Table 1: Decomposition of invoicing currency changes by trade margin (2016-2019)

Margins	GBP	USD	EUR	Others	All
(1) Net firm entry	**3,930 (16.2%)**	**1,184 (4.9%)**	**109 (0.4%)**	**131 (0.5%)**	**5,355 (22.1%)**
(1-1) Exporter births	7,377 (30.4%)	3,454 (14.2%)	419 (1.7%)	419 (1.7%)	11,671 (48.1%)
(1-2) Exporter deaths	3,447 (14.2%)	2,269 (9.3%)	310 (1.3%)	288 (1.2%)	6,315 (26.0%)
(2) Net market entry	**-1,949 (-8.0%)**	**2,378 (9.8%)**	**251 (1.0%)**	**493 (2.0%)**	**1,175 (4.8%)**
(2-1) Market entries	5,227 (21.6%)	4,454 (18.4%)	719 (2.9%)	699 (2.9%)	11,100 (45.8%)
(2-2) Market exits	7,175 (29.6%)	2,076 (8.6%)	467 (1.9%)	205 (0.8%)	9,925 (41.0%)
(3) Net product entry	**-2,373 (-9.8%)**	**5,473 (22.6%)**	**101 (0.4%)**	**109 (0.4%)**	**3,311 (13.6%)**
(3-1) New products	9,685 (40.0%)	10,682 (44.0%)	892 (3.6%)	672 (2.8%)	21,933 (90.4%)
(3-2) Retired products	12,058 (49.7%)	5,208 (21.5%)	791 (3.3%)	562 (2.3%)	18,621 (76.8%)
(4) Net currency switch	**-3,193 (-13.2%)**	**2,236 (9.2%)**	**305 (1.3%)**	**1,325 (5.5%)**	**674 (2.8%)**
(4-1) Currency added	2,584 (10.7%)	3,697 (15.2%)	730 (3.0%)	1,649 (6.8%)	8,661 (35.7%)
(4-2) Currency dropped	5,777 (23.8%)	1,461 (6.0%)	424 (1.7%)	324 (1.3%)	7,986 (32.9%)
(5) Within currency	**-6,412 (-26.4%)**	**15,762 (64.9%)**	**1,135 (4.7%)**	**3,249 (13.4%)**	**13,736 (56.6%)**
(6) Total changes	**-9,995 (-41.2%)**	**27,036 (111.5%)**	**1,903 (7.8%)**	**5,309 (21.9%)**	**24,253 (100.0%)**

Note: This table presents the decomposition of the changes in the value of the UK's extra-EU exports measured in constant exchange rate by trade margin (rows) and by currency (columns) between 2016 and 2019. The numbers in parentheses represent the currency's percentage contribution to each margin, calculated as the change for that currency divided by the sum of all changes identified in this margin (i.e., the number in the All column). Data source: HMRC administrative datasets.

Figure 3: Comparing the contribution of micro margins during 2013-2016 vs 2016-2019



Note: This figure compares the decomposition for pre- (2013-2016) and post-Brexit vote (2016-2019) periods. The bars represent the contribution of the corresponding currency-margin pair to the total aggregate change in the number of export transactions during the specified period. Data source: HMRC administrative datasets.

4 The role of firm heterogeneity

This section investigates whether the changes in the invoicing behaviour of continuing firms, triggered by the 2016 Brexit vote, varied according to specific characteristics of firms and destination markets. We estimate the following equation for the constant value share of each invoicing currency at the firm-product-country-year level from 2013 to 2019:[16]

$$\begin{aligned} S^k_{fpdt} = \quad & \alpha_0 \cdot imp\_local_{fd} + \alpha_1 \cdot (imp\_local_{fd} \times D_t) \\ & + \alpha_2 \cdot (imp\_USD_f \times D_t) + \alpha_3 \cdot (imp\_EUR_f \times D_t) \\ & + \beta_0 \cdot fshare_{fid} + \beta_1 \cdot (fshare_{fid} \times D_t) + \beta_2 \cdot (fsize_f \times D_t) \\ & + \gamma_1 \cdot (US\_share_{id} \times D_t) + \gamma_2 \cdot (EU\_share_{id} \times D_t) \\ & + FE_f + FE_{pd} + FE_t + \epsilon_{fpdt} \end{aligned} \tag{2}$$

where the subscripts f, p, i, d and t denote a firm, a 8-digit Combined Nomenclature product, a 6-digit Harmonized System product, a destination country, and year, respectively. The outcome variable S^k_{fpdt} represents the invoicing share of currency k in UK firm f 's exports of product p to extra-EU destination d in a given year t. We separately estimate the equation for three currency options: GBP, USD, and the local destination currency.[17]

The choice of regressors draws from prior literature on endogenous currency choices (Goldberg and Tille 2008, 2016; Chung 2016; Crowley, Han and Son 2021; Amiti, Itskhoki and Konings 2022). These studies underscore that firms tend to export in the currency that is also used for their imported intermediate inputs as this helps the firm hedge its exchange rate risk. To capture this channel, we include the average import share of local currency (imp_local_{fd}), of the US dollar (imp_USD_f), and of the euro (imp_EUR_f) in a firm calculated during 2013-2015 before the Brexit referendum.

Another important factor in currency choice is the firm's market power and size. Amiti, Itskhoki and Konings (2022) find large firms with market power are more likely to invoice in vehicle and local currencies. Lyonnet, Martin and Mejean (2021) and Goldberg and Tille (2016) point out that large firms are more likely to use foreign currencies, especially local currency, as they are more capable of handling financial instruments to hedge the exchange rate risk associated with foreign currencies. To account for this channel, we add the firm's average product-market share among UK exporters during 2013-2015 ($fshare_{fid}$) to proxy for the firm's market power and the logarithm of the total value of the firm's exports ($fsize_f$) to proxy for the firm's size.

[16] Results for transaction share measures are in Online Appendix table OA2-1.

[17] To discern the use of local currency from the USD, our regression sample excludes exports to the United States.

Finally, we test the role of strategic complementarities in pricing among firms as documented by Goldberg and Tille (2008, 2016) and Amiti, Itskhoki and Konings (2022), where a firm tends to price in the currency more broadly used by its competitors in order to keep its own price relative to its competitors' prices stable in the face of exchange rate fluctuations. This hypothesis predicts that an exporter is inclined to use the same currency chosen by the majority of its competitors. We approximate the share of dollar and euro competitors using the destination country's average product level import share from the US (US_share_{id}) and EU (EU_share_{id}) during 2013-2015, exploiting the fact that almost all US exporters use US dollars as their invoicing currency and the majority of EU exporters use euro as their invoicing currency (see Boz et al. 2022).

Our key contribution is to examine the heterogeneity in the effect of the 2016 Brexit vote across firms and destinations by introducing a set of interaction terms for each regressor with a time dummy equal to one if the transaction year is on or after 2016 (D_t). To control for other unobserved factors that could independently affect the firm's currency choice, our regression includes a comprehensive array of firm, product-destination, and year fixed effects. Firm fixed effects allow us to examine within-firm changes in invoicing currency over time, particularly before and after the 2016 Brexit vote. Product-destination fixed effects effectively absorb all destination-specific time-invariant factors such as institution, location, language, and the stage of economic development, as well as product-specific characteristics including product differentiation, durability, and the end-use category. Finally, we add year fixed effects to control for the common effect of macroeconomic shocks.

Results are presented in panel (a) of Table 2. Column 1 represents the regression for GBP invoicing, while columns 2 and 3 are for USD and local currency invoicing, respectively. We start by noting that a statistically insignificant coefficient on the interaction term does not falsify the importance of the existing channels documented in the literature.[18] Rather, our coefficients suggest whether the existing channels are stronger or weaker when facing the large uncertainty in exchange rates and economic policy brought by the Brexit referendum. The first two rows suggest, while the local currency import share plays an important role in boosting the local currency in levels, there is no statistically significant additional effect after the referendum. In contrast, the next two rows suggest that firms with higher dollar and euro import shares pre-referendum are more likely to switch to other currencies post-referendum.

Turning to the market power and firm size results, we find that firms with larger market shares are more likely to use US dollars and local currencies. However, the difference in invoicing choices is smaller in the later period. Adding up the coefficients in rows 5 and 6 shows the importance of firms' market shares after the Brexit vote: the coefficients on GBP

[18] Most cross-sectional variation in the data is absorbed by the rich set of these fixed effects.

and USD are no longer significantly different from zero, with a weak positive coefficient on the local currency (0.51 =0.80-0.29). Similarly, we find no difference in the change in invoicing choices by firm size (row 7). Altogether, these results suggest the decline in sterling usage is universal among big and small continuing firms, conditioning on operational hedging (rows 1-4) and strategic pricing complementarity (rows 8-9) motives.

Finally, we find a significant role of strategic complementarity in pricing. Row 8 shows that firms selling to destination markets with many US competitors are significantly more likely to switch to dollars. However, the main substitution is between dollars and local currency (column 3) rather than between dollars and sterling (column 1). Likewise, we find that firms selling to markets with many EU competitors are more likely to switch into euro, and away from dollars and sterling.[19]

Panel (b) assesses the quantitative importance of the three channels in driving the change in invoicing shares post-referendum, accounting for the distribution of firm and market characteristics. Specifically, for each firm or market characteristic, we calculate the difference in the Brexit-induced change in invoicing shares for firms in the 25th percentile versus those in the 75th percentile.[20] We find that operational hedging [≈89%=(-1.20-0.06)/-1.41] and strategic complementarity motives [≈17%=-0.24/-1.41] explain most of the differential decline in sterling usage across firms and markets post-referendum, with a small offsetting force for more sterling usage by UK firms with higher market shares. Within the operational hedging channel, the largest contribution (≈95%) comes from the difference in dollar import shares across firms. A firm with a dollar import share at the 75th percentile (0.95) relative to a firm at the 25th percentile (0.23) reduced its share of sterling invoicing by an additional 1.20 percentage points [=-1.67*(0.95-0.23)], while simultaneously increasing its share of dollar invoicing by an additional 1.42 percentage points.

[19] As shown in Figure 1, GBP, USD, euro, and local currency are the four major invoicing currency choices of British exporters. The fact that the coefficients for GBP, USD, and local currencies are all negative in row 9 suggests a positive change for euro.

[20] We only consider statistically significant coefficients.

Table 2: Regressions for invoicing currency in UK exports

	GBP	USD	Local
(a) Empirical estimates			
[1] Local currency import share	-0.08	-9.27***	21.93***
	(2.25)	(3.16)	(5.68)
[2] Local currency import share × post 2016	0.70	-0.46	0.80
	(1.36)	(1.62)	(2.86)
[3] Dollar import share × post 2016	-1.67***	1.97***	-0.17
	(0.44)	(0.30)	(0.17)
[4] Euro import share × post 2016	-2.12**	0.41	0.12
	(1.05)	(0.69)	(0.35)
[5] Firm's market share (HS6)	-1.46***	1.08***	0.80***
	(0.32)	(0.24)	(0.12)
[6] Firm's market share (HS6) × post 2016	1.80***	-1.15***	-0.29*
	(0.37)	(0.32)	(0.15)
[7] Firm size × post 2016	0.04	-0.04	0.06
	(0.08)	(0.05)	(0.04)
[8] US market share (HS6) × post 2016	-0.09	1.02**	-0.42*
	(0.58)	(0.40)	(0.22)
[9] EU market share (HS6) × post 2016	-0.82*	-0.91***	-0.34
	(0.42)	(0.30)	(0.22)
Observations	3,807,924	3,807,924	3,807,924
R^2	0.47	0.50	0.29
Firm + Country-Product + Year FEs	Yes	Yes	Yes
(b) Quantification of heterogeneity			
— Operational hedging			
Dollar import share	-1.20	1.42	–
Euro import share	-0.06	–	–
— Firm's market share	0.09	-0.06	-0.01
— Strategic complementarity			
US market share	–	0.17	-0.07
EU market share	-0.24	-0.26	–
Sum of all channels	-1.41	1.27	-0.09

Notes: Panel (a) of the table reports the OLS estimates for equation (2). The dependent variable is the constant value share of each invoicing currency in the UK's exports to extra-EU countries, at the firm-product-destination-year level, multiplied by 100. Standard errors, in parentheses, are clustered by firms. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Panel (b) quantifies the contribution of firm and market heterogeneity in the currency switches by the relevant channels, calculated by multiplying the estimated coefficient of the interaction term with the difference between the 75th and 25th percentiles of the corresponding regressor. Data source: HMRC administrative datasets.

5 Concluding remarks

Several recent theoretical models highlight that economic policy uncertainty and its associated exchange rate volatility can significantly affect firms' currency choices.[21] However, direct empirical evidence on firms' currency adjustments to uncertainty shocks remains scarce due to data limitations. Focusing on the uncertainty shock of a unique political event, we provide the first evidence on the key micro margins driving the aggregate decline in sterling invoicing after the referendum. Our results highlight the importance of two intensive margins—currency switching and within-currency trade intensity—in driving the aggregate change. While the currency-switching margin played a minor role during 'normal times,' it became a key driver during the post-referendum era of uncertainty. Our regression analysis underscores the importance of operational hedging and strategic complementarities in explaining the heterogeneous responses of these two intensive margins across firms and markets.

Altogether, our findings support recent empirical work on firms' currency choices using fixed-effects regressions, which, by design, explore the intensive margins of trade. However, our analyses of the extensive and intensive margins of currency choice by firms suggest that aggregate currency trade shares may be less rigid than previously assumed, highlighting the need to account for endogenous currency choices in future international macroeconomic models.

[21] Most recently Mukhin (2022); also see Corsetti and Pesenti (2002); Devereux, Engel and Storgaard (2004).

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Online Appendix for "The Swift Decline of the British Pound: Evidence from UK Trade-invoicing after the Brexit Vote"*

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September 10, 2024

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OA1 Supplementary Statistics

OA1.1 UK policy uncertainty

The Brexit referendum vote ushered in a period of widespread uncertainty about future government policy and exchange rates in the UK. Figure OA1-1 illustrates the changes in economic uncertainty and exchange rates around the Brexit referendum vote. We see in Figure (a) that Nick Bloom's Economic Policy Uncertainty Index peaked around the referendum and remained elevated in the first three years after the referendum.

An alternative measure of economic policy uncertainty is the World Bank's World Governance Indicators, which capture perceptions of the quality of public services, the quality of the civil service, the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Figure (c) shows a 14% decline in the World Bank's average measure of government effectiveness for the UK between 2010-2015 and 2016-2022.

A more heuristic measure of the predictability and stability of future UK government policy (and thus exchange rates) can be seen in the marked decline in the tenure in office of UK prime ministers before and after the referendum vote.[1] The average tenure in office of a (pre-referendum vote) UK prime minister from Thatcher (1979-1990) through Cameron (2010-2016) was 2,653 days (about 88 months or 7 years 4 months). The average tenure in office of a UK prime minister after the referendum vote, from May (2016-2019) through Truss (2022-2022), was only 747 days (about 25 months or 2 years 1 month).[2]

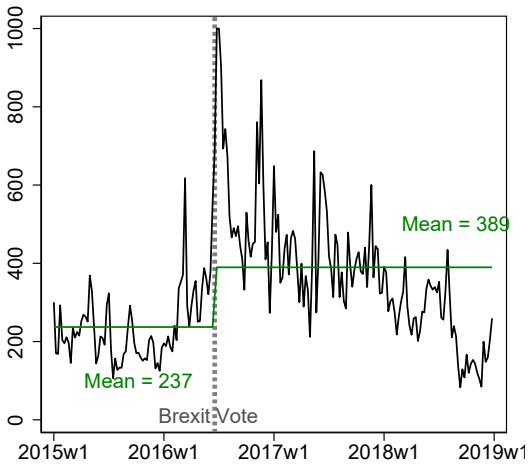
At the same time, sterling depreciated significantly in the week after the referendum vote (see Figure b). The multiple sources of dramatic economic, political and institutional uncertainty that followed the Brexit referendum created huge uncertainty about the future value of sterling at that time. It is worth noting that there was no material change in economic or trade policy as a result of the referendum vote until the UK and the EU reached a deal in early 2020. Therefore, the changes in exporting currency choices we documented during 2016-2019 can be ascribed to uncertainty brought on by the referendum because there were no realized direct economic or trade shocks before Britain's official departure from the European Union in 2020.

[1] In contrast to presidential systems with fixed terms of office, the term of office of a UK prime minister is determined endogenously by the strength of Parliament's support for the prime minister's leadership and policy platforms. Thus, a succession of prime ministers with short tenures can reflect a lack of consensus over future policy within the governing political party.

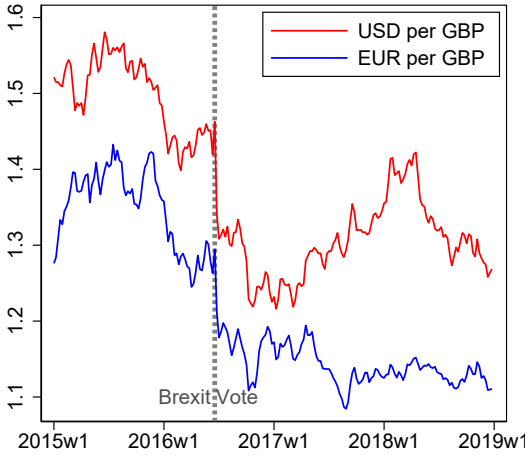
[2] Excluding the unusually short tenure of Elizabeth Truss in 2022, even the average tenure in office of May (2016-2019) and Johnson (2019-2022) of 1,096 days (about 36 months or 3 years) was less than half that of their five predecessors.

Figure OA1-1: UK policy uncertainty

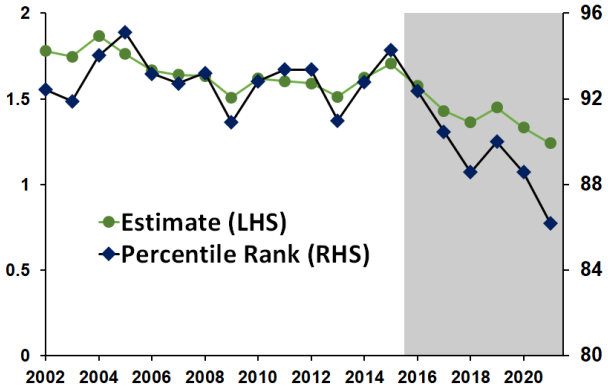
(a) Bloom's policy uncertainty index



(b) Bilateral exchange rate



(c) Government effectiveness



Note: Figure (a) plots Nick Bloom's Economic Policy Uncertainty Index for the UK (capped at 1,000 for illustration purpose). Figure (b) plots the weekly bilateral exchange rate of sterling against the US dollar and the euro. Figure (c) plots the estimate and the percentile rank of the World Bank Government Effectiveness. Data source: Nick Bloom's Economic Policy Uncertainty Index (https://www.policyuncertainty.com/), the Bank of England, and the World Bank.

OA1.2 Measurement

A well-known data feature is that firms' prices tend to be stable in the currency in which they are invoiced. Gopinath, Itskhoki and Rigobon (2010) document that, even conditioning on a price change, there is a large difference in the exchange rate pass-through of US import prices invoiced in dollars (25%) versus non-dollars (95%). An increasing number of studies have confirmed this observation using other datasets (Barbiero (2020), Bonadio, Fischer and Sauré (2020), Auer, Burstein and Lein (2021), Chen, Chung and Novy (2021), and Corsetti, Crowley and Han (2022)). Facing large fluctuations in sterling exchange rates, this means non-trivial changes in aggregate invoicing value shares can arise from the mechanical valuation effect of exchange rate movements.

To illustrate the problem and how we address it, consider the following example with two currencies, sterling and the US dollar. For simplicity, we assume that in period 0 before the referendum, each currency accounts for 50% of trade transactions. We further assume all sterling (dollar) transactions are priced at £1 ($1). The sterling-dollar exchange rate e_0 is normalized to 1 in period 0. In period 1, the Brexit referendum takes place, resulting in a sudden sterling depreciation of 15% (i.e., $e_1 = 0.85$).

Table OA1-1 illustrates that, even without any change in firms' trading behavior, the measured value share of the two currencies can change significantly as a result of the sterling depreciation. When prices are sticky in the invoicing currency, the sterling depreciation makes transactions invoiced in other currencies more valuable, resulting in a lower value share for sterling-invoiced transactions.

Table OA1-1: An example of the construction of the constant value share

	Before ($e_0 = 1.00$)		After ($e_1 = 0.85$)	
	GBP	USD	GBP	USD
Transaction share	50%	50%	50%	50%
Price in invoiced currency	£1	$1	£1	$1
Price in sterling	£1	£1	£1	£1.18
Value share	50%	50%	45.9%	54.1%
Constant value share	50%	50%	50%	50%

To address this problem, we construct two measures that are robust to this valuation effect. First, we exploit the fact that we directly observe the daily transactions in the customs database and construct a simple transaction share measure by summing up the

number of transactions in each currency:

$$\text{Transaction share of USD at } t = \frac{\sum_i \mathbb{I}_{it}^{USD}}{\sum_i (\mathbb{I}_{it}^{USD} + \mathbb{I}_{it}^{GBP})},$$

where i represents a transaction; and $\mathbb{I}_{it}^{k}$ is a dummy equal to 1 if the transaction is invoiced in currency k. This measure is robust to the valuation effect, as the transaction share remains the same without any change in trading and invoicing behavior (as shown in the first row of Table OA1-1).

A small drawback of this transaction measure is that it does not directly account for the size of the transactions. For example, if transactions invoiced in dollars are larger in size, calculating the share by counting the number of transactions may underestimate the importance of dollars.

To address this problem, we construct a constant value share measure. The idea is to neutralize the artificial changes in invoicing shares caused by exchange rate fluctuations while accounting for transaction size. Specifically, we calculate:

$$\text{Constant value share of USD at } t = \frac{\sum_i \mathbb{I}_{it}^{USD} v_{it}^{USD} e_t/e_0}{\sum_i (\mathbb{I}_{it}^{USD} v_{it}^{USD} e_t/e_0 + \mathbb{I}_{it}^{GBP} v_{it}^{GBP})},$$

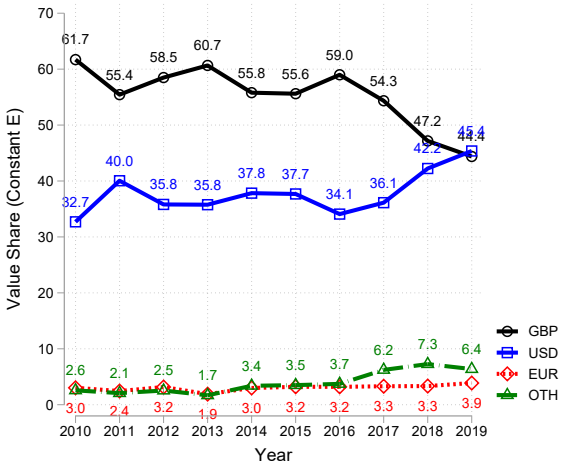
where v_{it}^{k} is the sterling trade value of transaction i in week t invoiced in currency k. In the context of the example constructed in Table OA1-1, $v_{i1}^{USD} = 1.18$ due to the sterling depreciation, and $e_1/e_0 = 0.85$ undoes the mechanical effect of the exchange movement, resulting in the same constant value share (50%) if there is no change in invoicing behavior.

OA1.2.1 Alternative transaction share measures

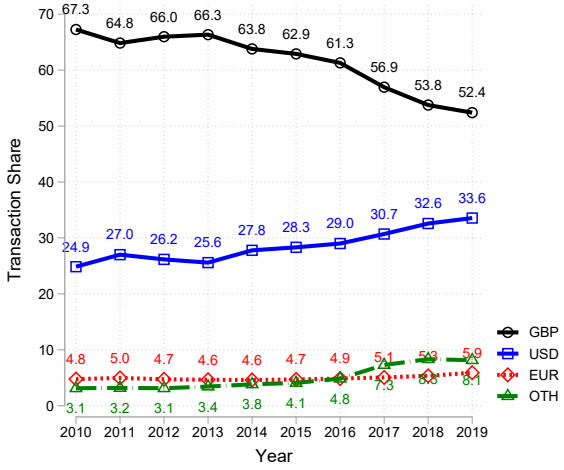
Figures OA1-2 and OA1-3 show the changes in aggregate invoicing patterns measured by the transaction share measure. The qualitative pattern is similar to what we discussed in Section 2 of the paper. We note that the CNY's share remains minimal when considering UK exports to countries other than China. This suggests that the heightened usage of CNY since 2016 is primarily in transactions with China, where it serves as the local currency, rather than as a vehicle currency in trade with non-Chinese partners.

Figure OA1-2: Invoicing currencies in UK's extra-EU exports (2010-2019)

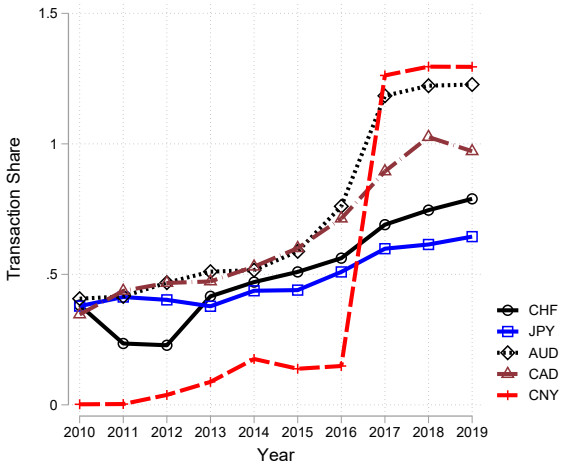
(a) All: Constant value share



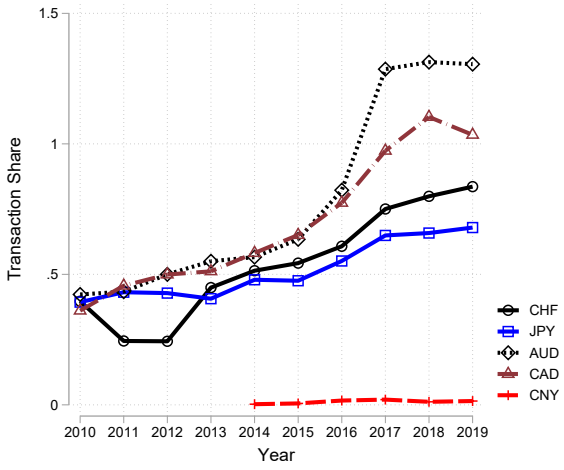
(b) All: Transaction share



(c) Others: Transaction share



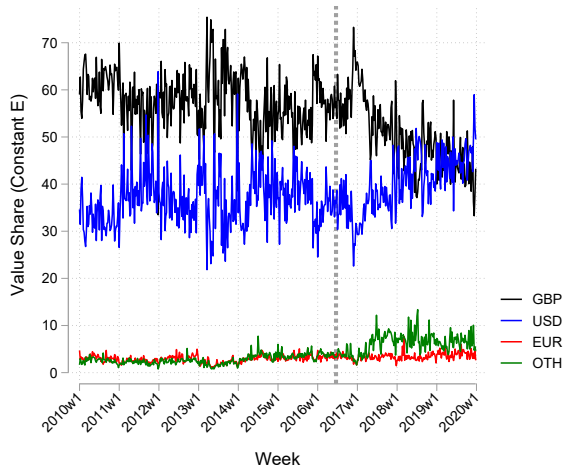
(d) Others: Transaction share (no CHN)



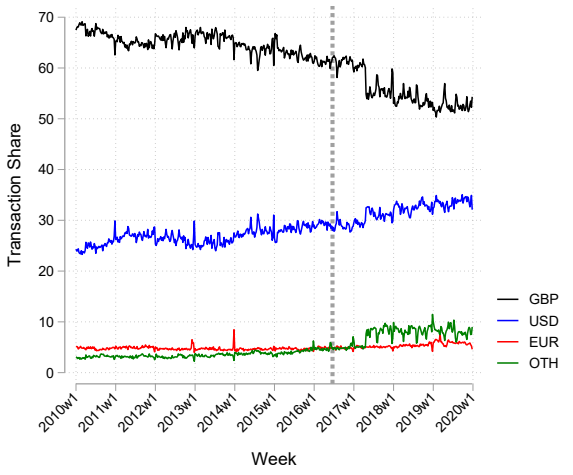
Note: The figure plots the shares of the UK's extra-EU exports invoiced in each currency from 2010 to 2019. Panel (a) is based on the constant exchange rate value of exports and panels (b) to (d) are based on the number of export transactions. Panel (d) drops exports to China. Data source: HMRC administrative datasets.

Figure OA1-3: High frequency: Invoicing currencies in UK's extra-EU exports (2010-2019)

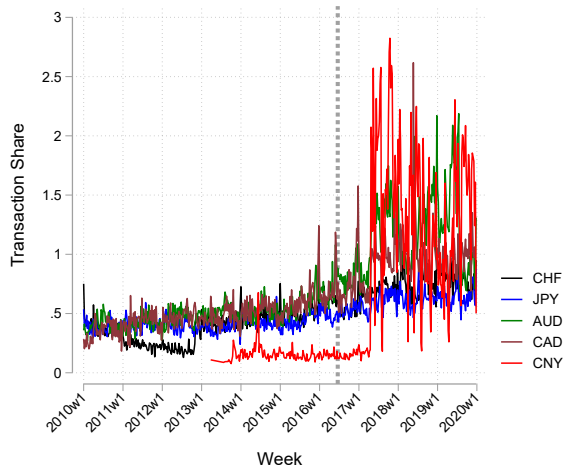
(a) All: Constant value share



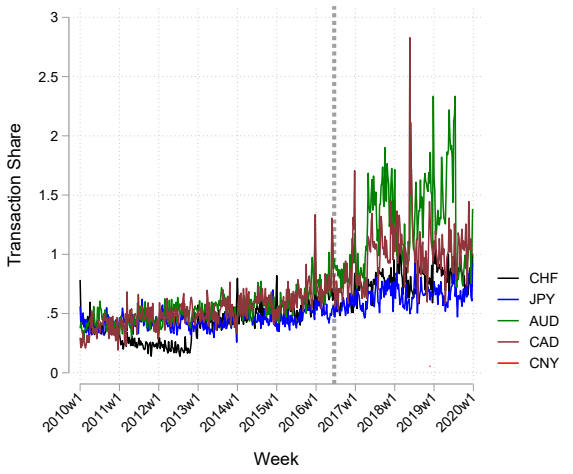
(b) All: Transaction share



(c) Others: Transaction share



(d) Others: Transaction share (no CHN)



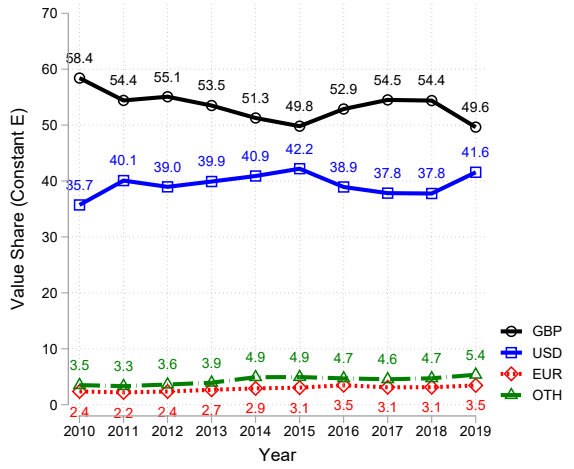
Note: The figure plots the shares of the UK's extra-EU exports invoiced in each currency from 2010 to 2019. Panel (a) is based on the constant exchange rate value of exports and panels (b) to (d) are based on the number of export transactions. Panel (d) drops exports to China. Data source: HMRC administrative datasets.

OA1.3 Further breakdowns of aggregate invoicing share changes

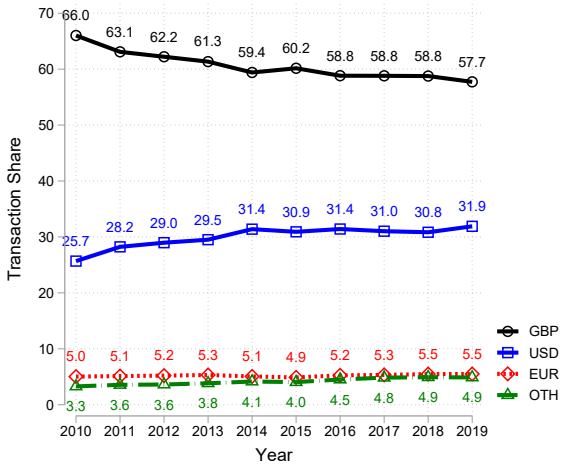
Panels (b) and (d) of Figure OA1-4 show the differential evaluation of aggregate shares for high and low differentiation goods using the alternative transaction share metric. Figures OA1-5 and OA1-6 demonstrate a more marked reduction in sterling transaction share for exports to OECD countries (from 55.2% in 2016 to 45.8% in 2019) and to countries with a dollar-peg regime (from 60.8% in 2016 to 51.4% in 2019), compared to non-OECD countries (from 69.6% in 2016 to 62.0% in 2019) and those without a dollar-peg (from 61.6% in 2015 to 54.2% in 2019).

Figure OA1-4: Invoicing currencies in UK exports by product differentiation

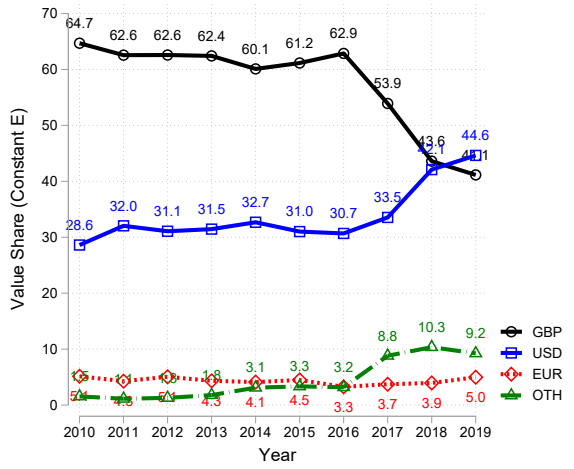
(a) Low differentiation: Constant value share



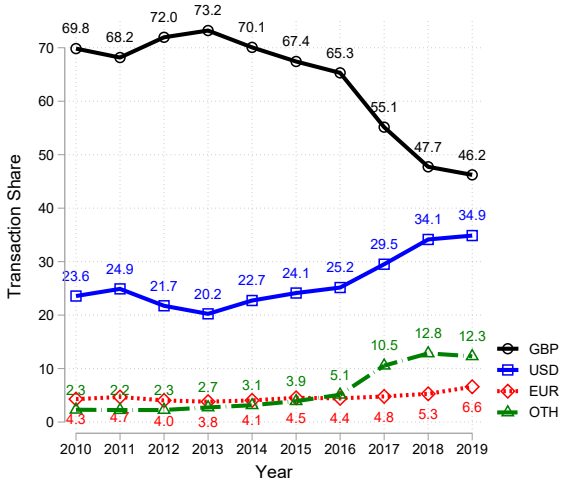
(b) Low differentiation: Transaction share



(c) High differentiation: Constant value share



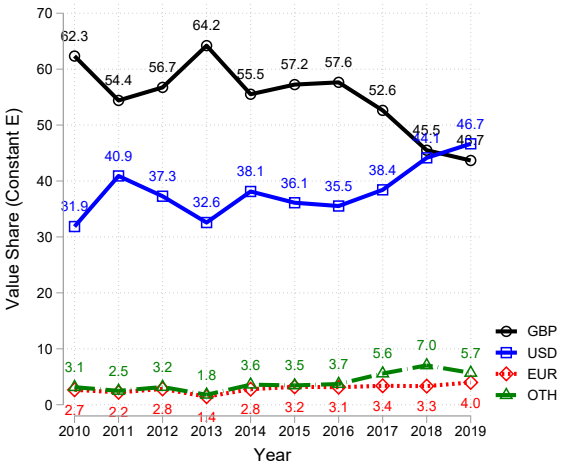
(d) High differentiation: Transaction share



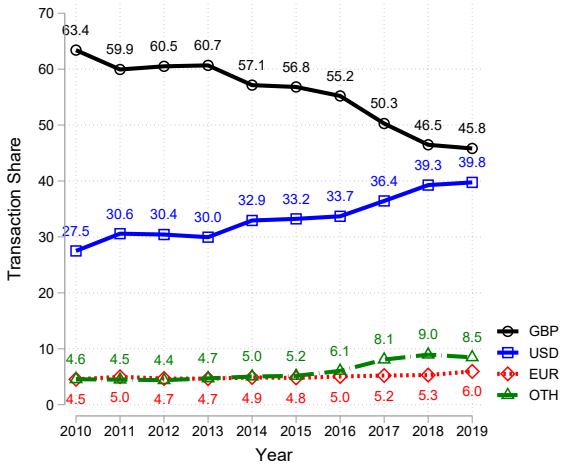
Note: The figure plots the shares of the UK's extra-EU exports invoiced in each currency by product differentiation using the methodology by Corsetti, Crowley, Han and Song (2018). Panels Panels (a) and (c) are based on the constant exchange rate value of exports and (b) and (d) are calculated based on the number of export transactions. Data source: HMRC administrative datasets.

Figure OA1-5: Invoicing currencies in UK exports by OECD

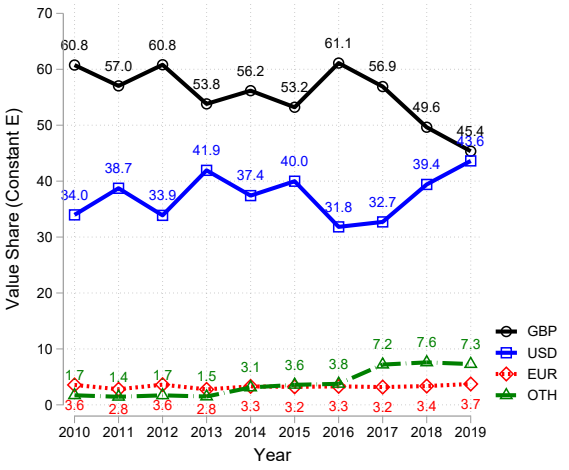
(a) OECD: Constant value share



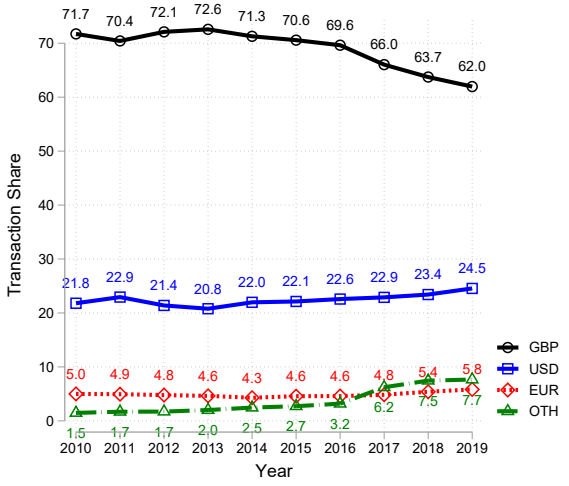
(b) OECD: Transaction share



(c) Non-OECD: Constant value share



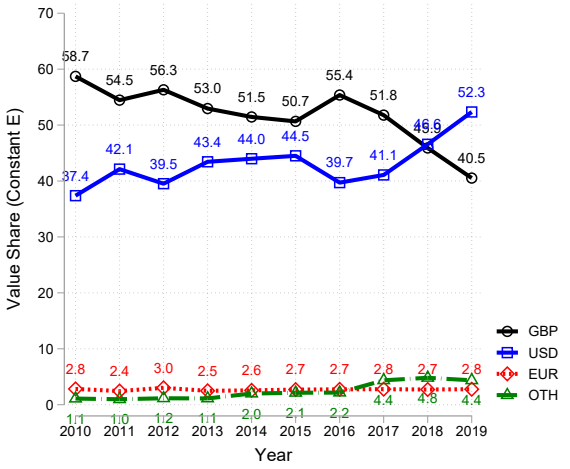
(d) Non-OECD: Transaction share



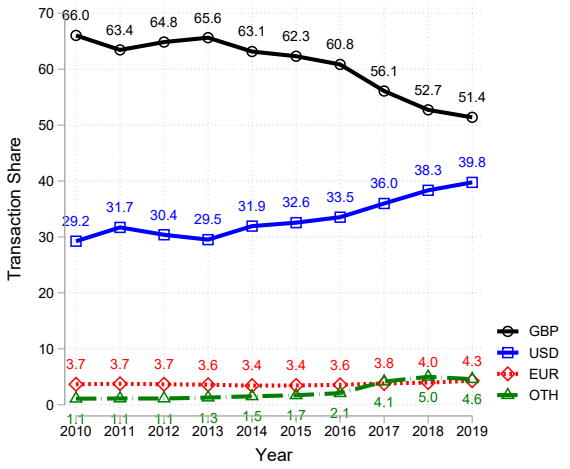
Note: The figure plots the shares of the UK's extra-EU exports invoiced in each currency by OECD group. Panels (a) and (c) are based on the constant exchange rate value of exports and panels (b) and (d) are based on the number of export transactions. Data source: HMRC administrative datasets.

Figure OA1-6: Invoicing currencies in UK exports: dollar peg vs. non-dollar peg

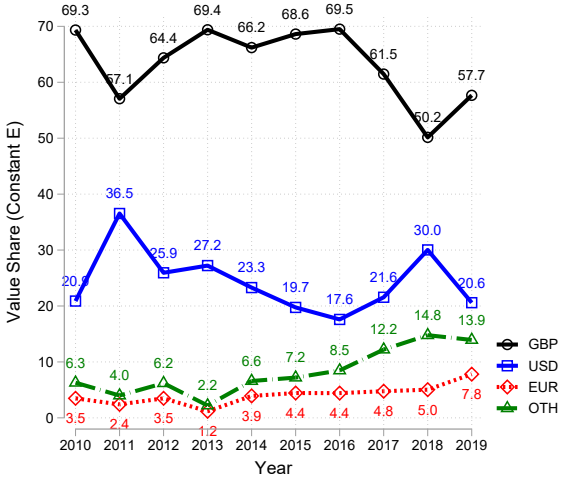
(a) Dollar peg: Constant value share



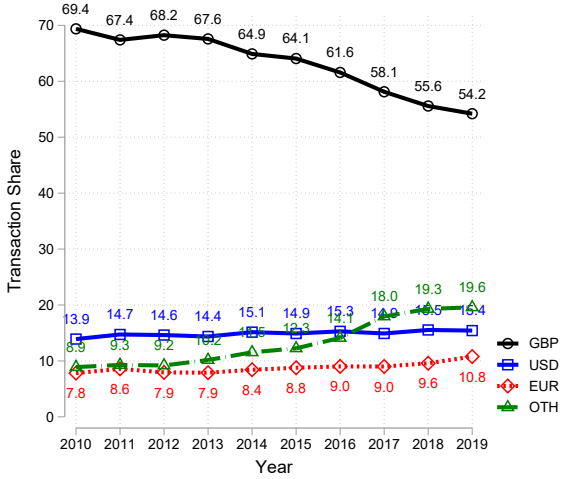
(b) Dollar peg: Transaction share



(c) Non-dollar peg: Constant value share



(d) Non-dollar peg: Transaction share

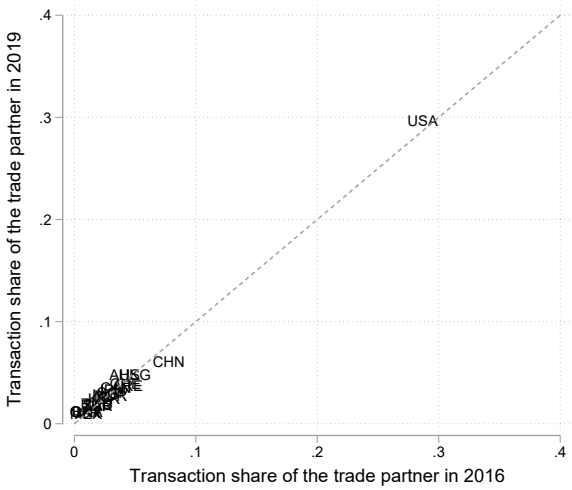


Note: The figure plots the shares of the UK's extra-EU exports invoiced in each currency by dollar-peg countries. Panels (a) and (c) are based on the constant exchange rate value of exports and panels (b) and (d) are based on the number of export transactions. Data source: HMRC administrative datasets.

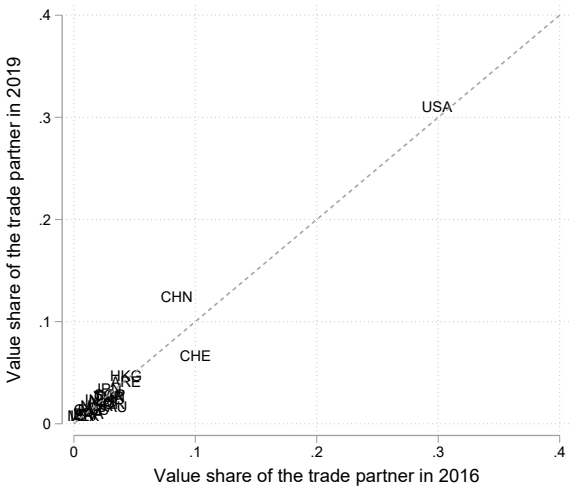
OA1.4 Trade and currency share changes across markets

Figure OA1-7: UK trade size for top 20 countries: 2016 vs 2019

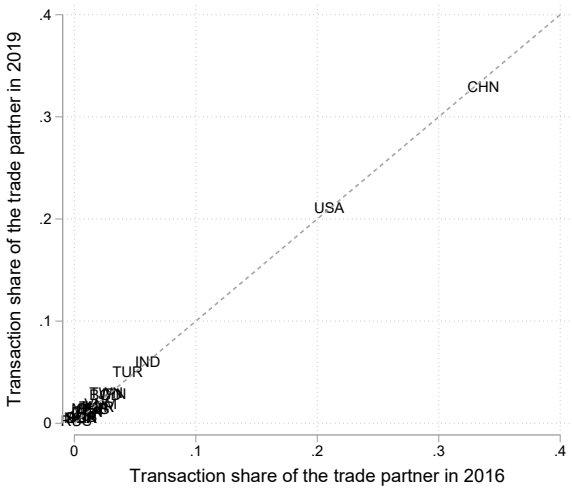
(a) Export transaction share



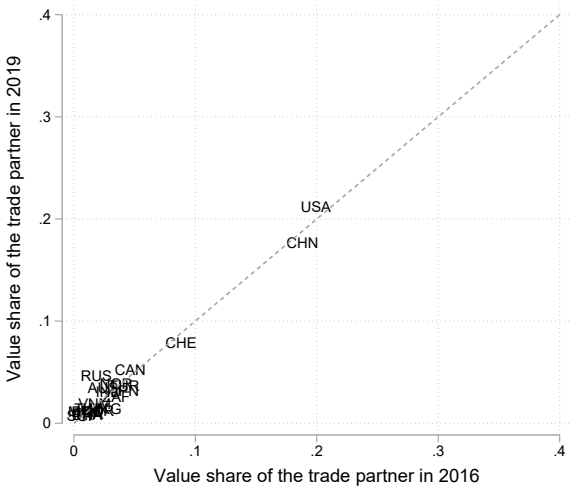
(b) Export value share



(c) Import transaction share



(d) Import value share

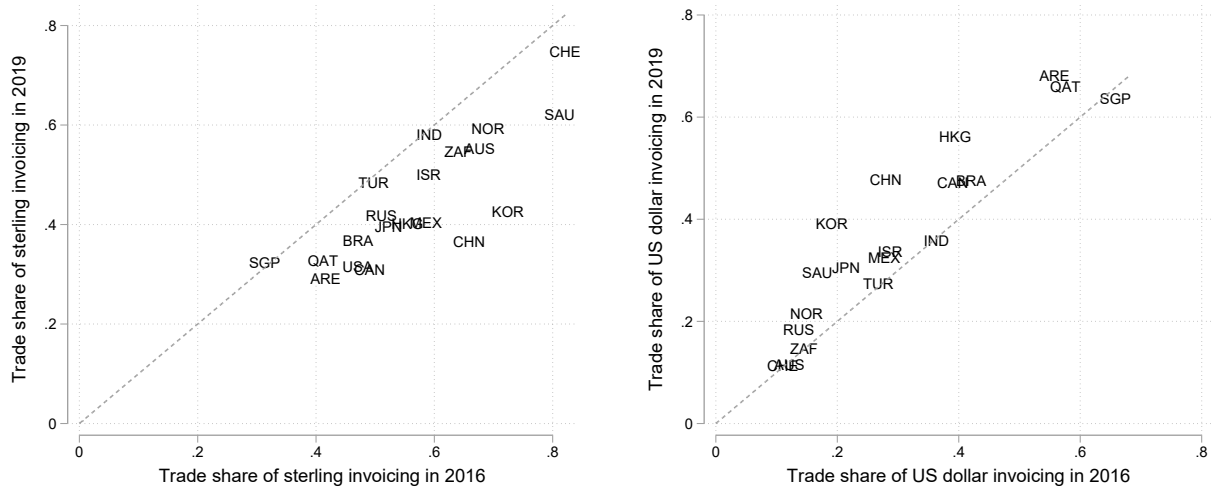


The figure plots the total trade shares of the top 20 non-EU countries for the UK's extra-EU trade in 2016 on the x-axis and 2019 on the y-axis. Panels (a) and (b) are based on the number of export transactions and the value of exports, respectively. Panels (c) and (d) are based on the number of import transactions and the value of imports, respectively. Data source: HMRC administrative datasets.

Figure OA1-8: Invoicing currency for top 20 destinations: 2016 vs 2019
(Raw export value share, not exchange rate adjusted)

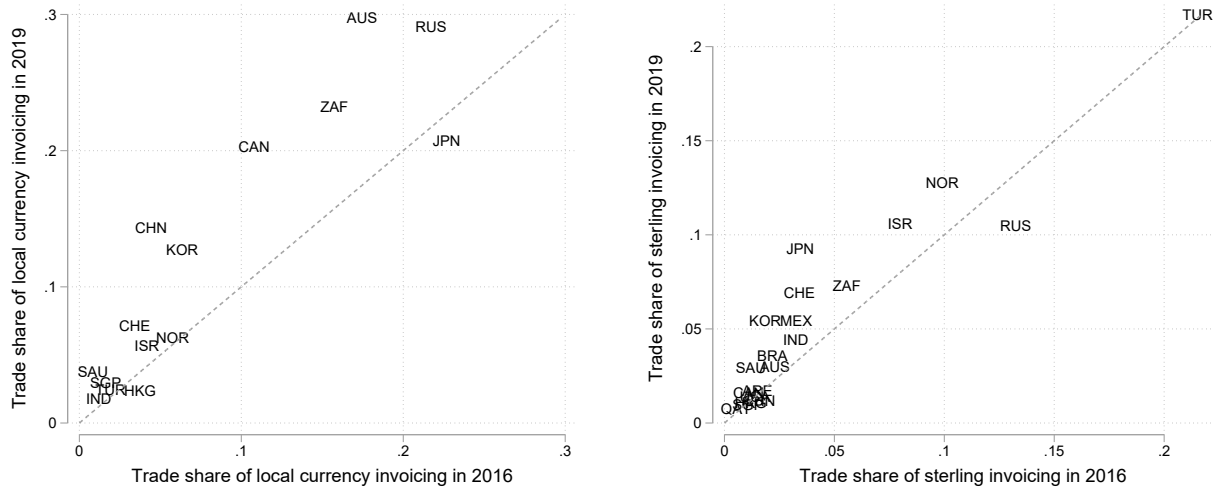
(a) Pound sterling

(b) US dollar



(c) Local currency

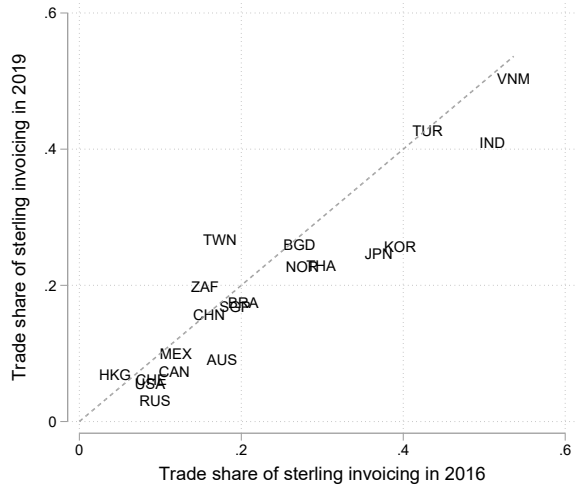
(d) Euro



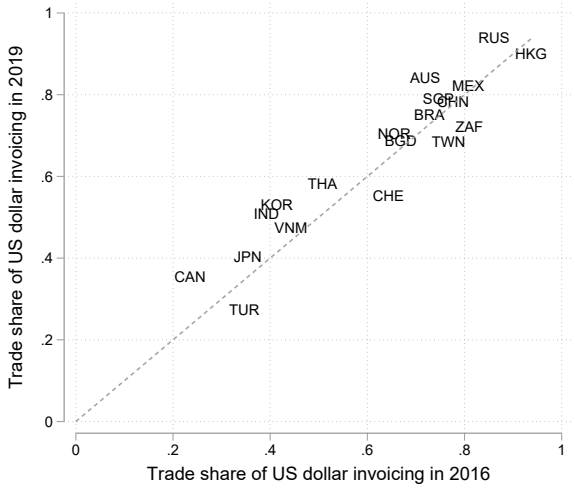
The figure plots the trade value shares of the UK's exports invoiced in each currency across top 20 non-EU destination countries in 2016 on the x-axis and 2019 on the y-axis. Data source: HMRC administrative datasets.

Figure OA1-9: Invoicing currency for top 20 origin countries: 2016 vs 2019
(Raw import value share, not exchange rate adjusted)

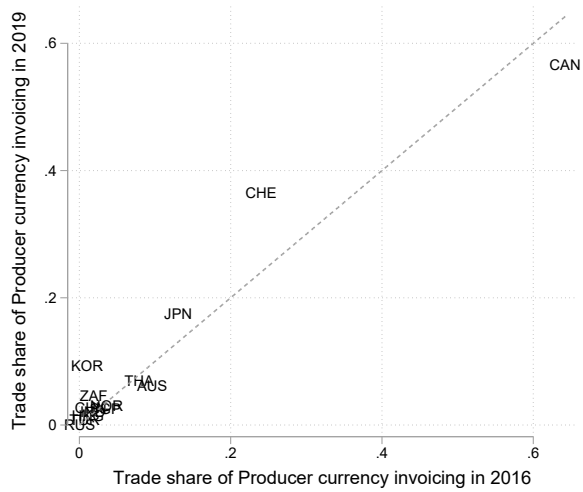
(a) Pound sterling



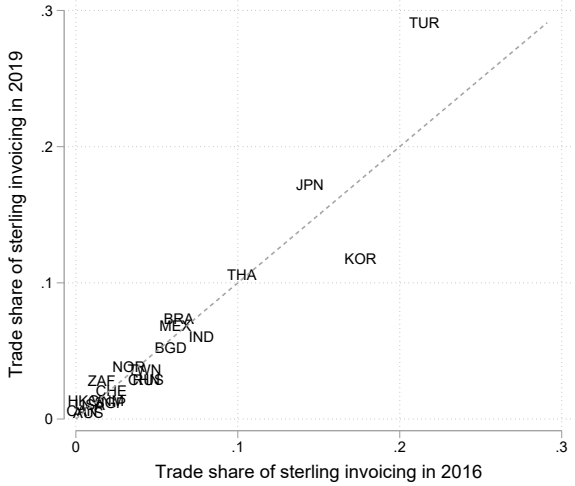
(b) US dollar



(c) Producer currency



(d) Euro

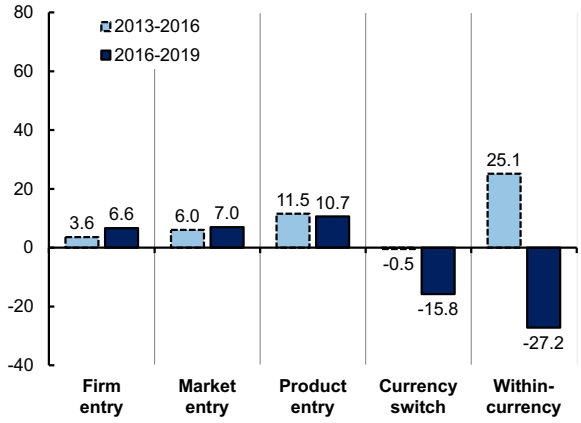


The figure plots the trade value share of the UK's imports invoiced in each currency across top 20 non-EU origin countries in 2016 on the x-axis and 2019 on the y-axis. Data source: HMRC administrative datasets.

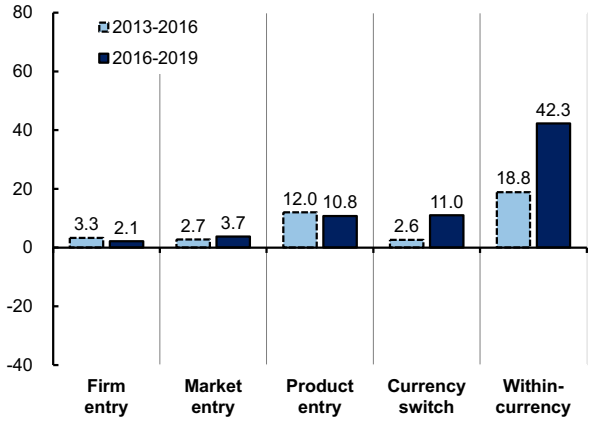
OA1.5 Decomposition based on the number of transactions and raw trade value

Figure OA1-10: Comparing the contribution of micro margins during 2013-2016 vs 2016-2019
(Calculation based on transaction shares)

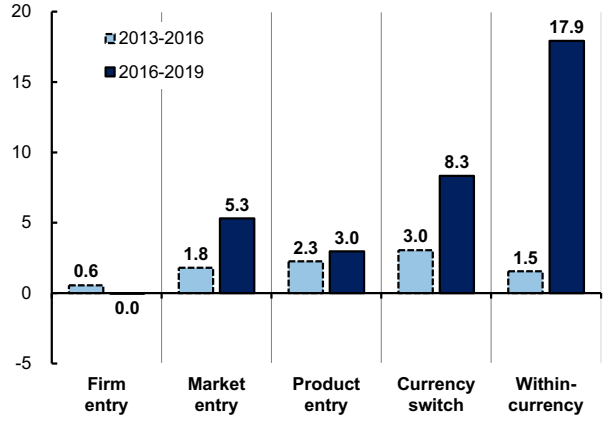
(a) Pound sterling



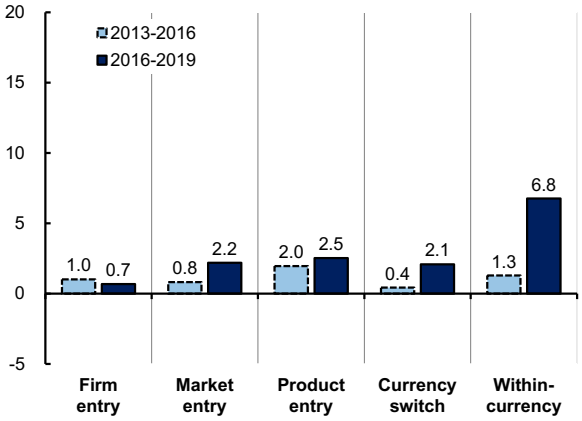
(b) US dollar



(c) Euro



(d) Others



Note: This figure compares the decomposition for pre- (2013-2016) and post-Brexit vote (2016-2019) periods. The bars represent the contribution of the corresponding currency-margin pair to the total aggregate change in the number of export transactions during the specified period. Data source: HMRC administrative datasets.

Table OA1-2: Decomposition of currency changes by trade margin over 2016-2019
(Number of transactions in thousands)

Margins	GBP	USD	EUR	OTH	SUM
(1) Net firm entry	**36.2 (6.6%)**	**11.6 (2.1%)**	**3.7 (0.7%)**	**-0.2 (0.0%)**	**51.3 (9.4%)**
(1-1) Exporter births	180.9 (33.2%)	66.6 (12.3%)	19.6 (3.6%)	6.4 (1.2%)	273.6 (50.3%)
(1-2) Exporter deaths	144.7 (26.6%)	55.0 (10.1%)	16.0 (2.9%)	6.6 (1.2%)	222.3 (40.8%)
(2) Net market entry	**38.2 (7.0%)**	**20.4 (3.7%)**	**11.9 (2.2%)**	**28.9 (5.3%)**	**99.3 (18.3%)**
(2-1) Market entries	237.2 (43.6%)	77.1 (14.2%)	32.6 (6.0%)	35.0 (6.4%)	381.9 (70.2%)
(2-2) Market exits	199.1 (36.6%)	56.7 (10.4%)	20.7 (3.8%)	6.1 (1.1%)	282.5 (51.9%)
(3) Net product entry	**58.0 (10.7%)**	**58.6 (10.8%)**	**13.7 (2.5%)**	**16.1 (3.0%)**	**146.4 (26.9%)**
(3-1) New products	552.5 (101.5%)	261.3 (48.1%)	60.0 (11.0%)	40.7 (7.5%)	914.5 (168.1%)
(3-2) Retired products	494.4 (90.9%)	202.7 (37.3%)	46.3 (8.5%)	24.6 (4.5%)	768.1 (141.2%)
(4) Net currency switch	**-86.0 (-15.8%)**	**59.8 (11.0%)**	**11.3 (2.1%)**	**45.4 (8.3%)**	**30.5 (5.6%)**
(4-1) Currency added	50.5 (9.3%)	105.5 (19.4%)	32.5 (6.0%)	55.9 (10.3%)	244.4 (44.9%)
(4-2) Currency dropped	136.5 (25.1%)	45.8 (8.4%)	21.2 (3.9%)	10.5 (1.9%)	213.9 (39.3%)
(5) Within-currency	**-148.0 (-27.2%)**	**230.3 (42.3%)**	**36.8 (6.8%)**	**97.6 (17.9%)**	**216.6 (39.8%)**
(6) Total changes	**-101.7 (-18.7%)**	**380.6 (69.9%)**	**77.4 (14.2%)**	**187.8 (34.5%)**	**544.2 (100.0%)**

Notes: This table presents the decomposition of the changes in number of the UK' extra-EU export transactions in thousands by trade margin (rows) and by currency (columns) between 2016 and 2019. The numbers in parentheses represent the currency-margin pair's contribution to the total aggregate change. Data source: HMRC administrative datasets.

Table OA1-3: Decomposition of currency changes by trade margin over 2016-2019
(Raw trade value in million pounds)

Margins	GBP	USD	EUR	OTH	SUM
(1) Net firm entry	**3,930 (12.1%)**	**1,505 (4.7%)**	**149 (0.5%)**	**154 (0.5%)**	**5,739 (17.8%)**
(1-1) Exporter births	7,377 (22.8%)	3,953 (12.2%)	476 (1.5%)	460 (1.4%)	12,268 (37.9%)
(1-2) Exporter deaths	3,447 (10.6%)	2,448 (7.6%)	326 (1.0%)	306 (0.9%)	6,528 (20.1%)
(2) Net market entry	**-1,949 (-6.0%)**	**2,837 (8.8%)**	**319 (1.0%)**	**561 (1.7%)**	**1,770 (5.5%)**
(2-1) Market entries	5,227 (16.2%)	5,097 (15.8%)	815 (2.5%)	778 (2.4%)	11,917 (37.0%)
(2-2) Market exits	7,175 (22.2%)	2,259 (7.0%)	495 (1.5%)	216 (0.7%)	10,147 (31.4%)
(3) Net product entry	**-2,373 (-7.4%)**	**6,541 (20.2%)**	**184 (0.6%)**	**153 (0.5%)**	**4,505 (13.9%)**
(3-1) New products	9,685 (30.0%)	12,192 (37.7%)	1,015 (3.1%)	740 (2.3%)	23,633 (73.1%)
(3-2) Retired products	12,058 (37.3%)	5,650 (17.5%)	831 (2.6%)	587 (1.8%)	19,127 (59.1%)
(4) Net currency switch	**-3,193 (-9.9%)**	**2,656 (8.2%)**	**379 (1.2%)**	**1,439 (4.5%)**	**1,282 (4.0%)**
(4-1) Currency added	2,584 (8.0%)	4,240 (13.1%)	828 (2.6%)	1,782 (5.5%)	9,436 (29.2%)
(4-2) Currency dropped	5,777 (17.9%)	1,584 (4.9%)	448 (1.4%)	343 (1.1%)	8,153 (25.2%)
(5) Within-currency	**-6,412 (-19.8%)**	**20,311 (62.8%)**	**1,469 (4.5%)**	**3,679 (11.4%)**	**19,049 (58.9%)**
(6) Total changes	**-9,995 (-30.9%)**	**33,852 (104.7%)**	**2,502 (7.7%)**	**5,987 (18.5%)**	**32,347 (100.0%)**

Notes: This table presents the decomposition of the changes in value of the UK' extra-EU exports in million pounds by trade margin (rows) and by currency (columns) between 2016 and 2019. The numbers in parentheses represent the currency-margin pair's contribution to the total aggregate change. Data source: HMRC administrative datasets.

Table OA1-4: Decomposition of changes by trade margin over 2013-2016
(Number of transactions in thousands)

Margins	GBP	USD	EUR	OTH	SUM
(1) Net firm entry	**38.1 (3.6%)**	**35.0 (3.3%)**	**10.8 (1.0%)**	**6.0 (0.6%)**	**89.9 (8.4%)**
(1-1) Exporter births	219.2 (20.5%)	70.8 (6.6%)	19.1 (1.8%)	10.2 (1.0%)	319.3 (29.9%)
(1-2) Exporter deaths	181.1 (16.9%)	35.7 (3.3%)	8.3 (0.8%)	4.2 (0.4%)	229.3 (21.5%)
(2) Net market entry	**64.4 (6.0%)**	**29.3 (2.7%)**	**8.7 (0.8%)**	**19.2 (1.8%)**	**121.5 (11.4%)**
(2-1) Market entries	243.3 (22.8%)	80.0 (7.5%)	30.0 (2.8%)	23.6 (2.2%)	377.0 (35.3%)
(2-2) Market exits	179.0 (16.8%)	50.7 (4.7%)	21.3 (2.0%)	4.4 (0.4%)	255.4 (23.9%)
(3) Net product entry	**123.3 (11.5%)**	**128.2 (12.0%)**	**21.0 (2.0%)**	**24.1 (2.3%)**	**296.6 (27.8%)**
(3-1) New products	533.3 (49.9%)	271.0 (25.4%)	51.9 (4.9%)	44.0 (4.1%)	900.1 (84.2%)
(3-2) Retired products	409.9 (38.4%)	142.8 (13.4%)	30.9 (2.9%)	19.8 (1.9%)	603.5 (56.5%)
(4) Net currency switch	**-4.9 (-0.5%)**	**27.9 (2.6%)**	**4.6 (0.4%)**	**32.6 (3.1%)**	**60.1 (5.6%)**
(4-1) Currency added	51.8 (4.9%)	69.2 (6.5%)	24.3 (2.3%)	44.0 (4.1%)	189.2 (17.7%)
(4-2) Currency dropped	56.7 (5.3%)	41.3 (3.9%)	19.7 (1.8%)	11.4 (1.1%)	129.1 (12.1%)
(5) Within-currency	**268.7 (25.2%)**	**201.4 (18.9%)**	**13.8 (1.3%)**	**16.5 (1.5%)**	**500.4 (46.8%)**
(6) Total changes	**489.6 (45.8%)**	**421.7 (39.5%)**	**58.9 (5.5%)**	**98.4 (9.2%)**	**1,068.6 (100.0%)**

Notes: This table presents the decomposition of the changes in number of transactions in thousands by trade margin (rows) and by currency (columns) between 2013 and 2016. The numbers in parentheses represent the currency-margin pair's contribution to the total aggregate change.

Table OA1-5: Decomposition of currency changes by trade margin over 2013-2016
(Raw trade value in million pounds)

Margins	GBP	USD	EUR	OTH	SUM
(1) Net firm entry	**-2,839** (3.5%)	**-319** (0.4%)	**295** (-0.4%)	**192** (-0.2%)	**-2,668** (3.2%)
(1-1) Exporter births	4,240 (5.1%)	2,862 (3.5%)	535 (0.7%)	294 (0.4%)	7,933 (9.6%)
(1-2) Exporter deaths	7,079 (8.6%)	3,180 (3.9%)	239 (0.3%)	101 (0.1%)	10,601 (12.9%)
(2) Net market entry	**-946** (1.2%)	**-4,129** (5.0%)	**-277** (0.3%)	**9** (-0.0%)	**-5,342** (6.5%)
(2-1) Market entries	6,200 (7.5%)	2,612 (3.2%)	452 (0.6%)	395 (0.5%)	9,660 (11.7%)
(2-2) Market exits	7,145 (8.7%)	6,741 (8.2%)	729 (0.9%)	385 (0.5%)	15,002 (18.2%)
(3) Net product entry	**-2,298** (2.8%)	**-6,251** (7.6%)	**299** (-0.4%)	**284** (-0.3%)	**-7,965** (9.7%)
(3-1) New products	12,123 (14.7%)	7,367 (8.9%)	1,051 (1.3%)	786 (1.0%)	21,327 (25.9%)
(3-2) Retired products	14,421 (17.5%)	13,617 (16.5%)	751 (0.9%)	501 (0.6%)	29,292 (35.6%)
(4) Net currency switch	**-1,813** (2.2%)	**-109** (0.1%)	**-178** (0.2%)	**237** (-0.3%)	**-1,861** (2.3%)
(4-1) Currency added	2,062 (2.5%)	2,865 (3.5%)	739 (0.9%)	1,089 (1.3%)	6,756 (8.2%)
(4-2) Currency dropped	3,874 (4.7%)	2,974 (3.6%)	916 (1.1%)	851 (1.0%)	8,617 (10.5%)
(5) Within-currency	**-49,804** (60.5%)	**-15,040** (18.3%)	**-175** (0.2%)	**546** (-0.7%)	**-64,471** (78.3%)
(6) Total changes	**-57,697** (70.1%)	**-25,846** (31.4%)	**-34** (0.0%)	**1,271** (-1.5%)	**-82,306** (100.0%)

Notes: This table presents the decomposition of the changes in value of the UK' extra-EU exports in million pounds by trade margin (rows) and by currency (columns) between 2013 and 2016. The numbers in parentheses represent the currency-margin pair's contribution to the total aggregate change. Data source: HMRC administrative datasets.

Table OA1-6: Decomposition of currency changes by trade margin over 2013-2016
(Constant exchange rate value in million pounds)

Margins	GBP	USD	EUR	OTH	SUM
(1) Net firm entry	**-2,839 (3.1%)**	**-802 (0.9%)**	**284 (-0.3%)**	**198 (-0.2%)**	**-3,158 (3.5%)**
(1-1) Exporter births	4,240 (4.6%)	2,636 (2.9%)	502 (0.6%)	283 (0.3%)	7,663 (8.4%)
(1-2) Exporter deaths	7,079 (7.8%)	3,438 (3.8%)	218 (0.2%)	85 (0.1%)	10,821 (11.9%)
(2) Net market entry	**-946 (1.0%)**	**-4,778 (5.2%)**	**-235 (0.3%)**	**14 (-0.0%)**	**-5,943 (6.5%)**
(2-1) Market entries	6,200 (6.8%)	2,389 (2.6%)	427 (0.5%)	369 (0.4%)	9,387 (10.3%)
(2-2) Market exits	7,145 (7.8%)	7,166 (7.9%)	662 (0.7%)	354 (0.4%)	15,329 (16.8%)
(3) Net product entry	**-2,298 (2.5%)**	**-7,630 (8.4%)**	**302 (-0.3%)**	**286 (-0.3%)**	**-9,338 (10.2%)**
(3-1) New products	12,123 (13.3%)	6,781 (7.4%)	986 (1.1%)	741 (0.8%)	20,633 (22.6%)
(3-2) Retired products	14,421 (16.2%)	14,410 (15.8%)	683 (0.8%)	455 (0.5%)	29,971 (32.1%)
(4) Net currency switch	**-1,813 (2.0%)**	**-537 (0.6%)**	**-140 (0.2%)**	**243 (-0.3%)**	**-2,245 (2.5%)**
(4-1) Currency added	2,062 (2.3%)	2,623 (2.9%)	694 (0.8%)	1,016 (1.1%)	6,396 (7.0%)
(4-2) Currency dropped	3,874 (4.3%)	3,159 (3.5%)	833 (0.9%)	773 (0.8%)	8,641 (9.5%)
(5) Within-currency	**-49,804 (54.6%)**	**-21,264 (23.3%)**	**-80 (0.1%)**	**622 (-0.7%)**	**-70,525 (77.4%)**
(6) Total changes	**-57,697 (63.3%)**	**-35,009 (38.4%)**	**134 (-0.1%)**	**1,364 (-1.5%)**	**-91,207 (100.0%)**

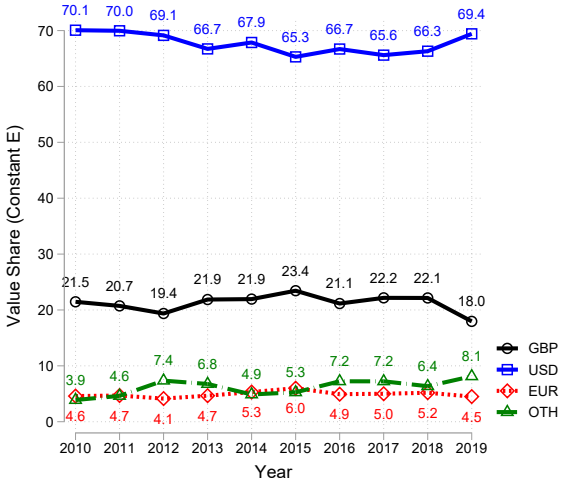
Notes: This table presents the decomposition of the changes in the constant exchange rate trade value of the UK' extra-EU exports in million pounds by trade margin (rows) and by currency (columns) between 2013 and 2016. The numbers in parentheses represent the currency-margin pair's contribution to the total aggregate change. Data source: HMRC administrative datasets.

OA1.6 Aggregate share changes for UK's extra-EU imports

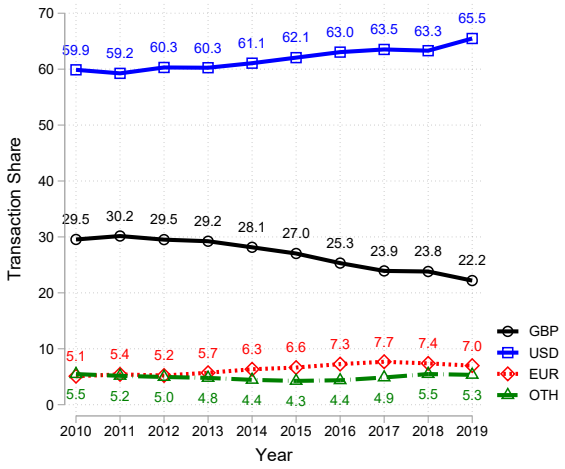
One might question whether there were comparable changes in invoicing patterns for UK imports. To address this question, we investigate the evolution of invoicing currencies in UK imports and compare them for the top 20 extra-EU origin countries between 2016 and 2019. Online Appendix figures OA1-11 to OA1-14 illustrate that, although sterling invoicing declined since 2010, the change was gradual without any significant break in its downward trend after the Brexit vote in 2016. Furthermore, as depicted in figure OA1-8, the shares of each major currency option in UK imports from the top 20 origin countries are located more closely around the 45-degree line. This indicates that the changes in invoicing currency for UK imports between 2016 and 2019 were neither as drastic nor as widespread as those observed in UK exports. This observation is in line with previous theoretical literature, which posits that the choice of invoicing currency is primarily that of exporters and is closely linked to their pricing strategies. Amiti, Itskhoki and Konings (2022) provide empirical support for this assumption in their research on Belgian firms.

Figure OA1-11: Invoicing currencies in UK's extra-EU imports (2010-2019)

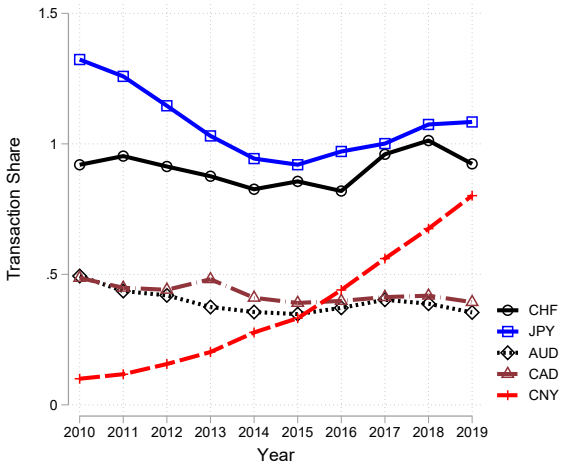
(a) All: Constant value share



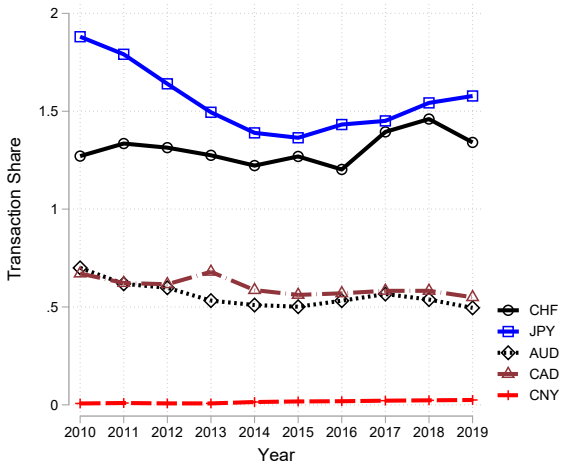
(b) All: Transaction share



(c) Others: Transaction share



(d) Others: Transaction share (no CHN)

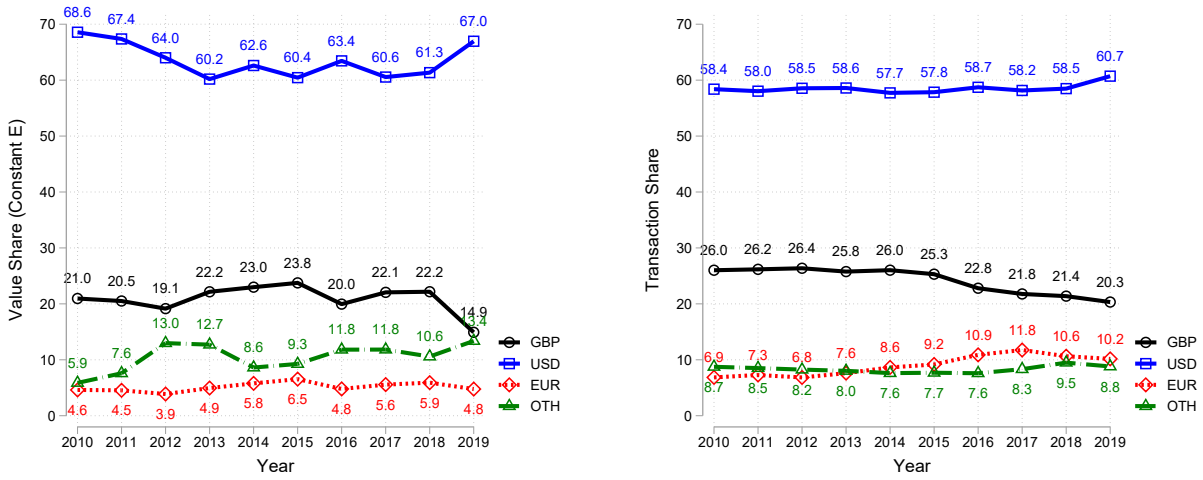


Note: The figure plots the shares of the UK's extra-EU imports invoiced in each currency from 2010 to 2019. Panel (a) is based on the constant exchange rate value of imports and panels (b) to (d) are based on the number of import transactions. Panel (d) drops imports from China. Data source: HMRC administrative datasets.

Figure OA1-12: Invoicing currencies in UK's extra-EU imports by OECD

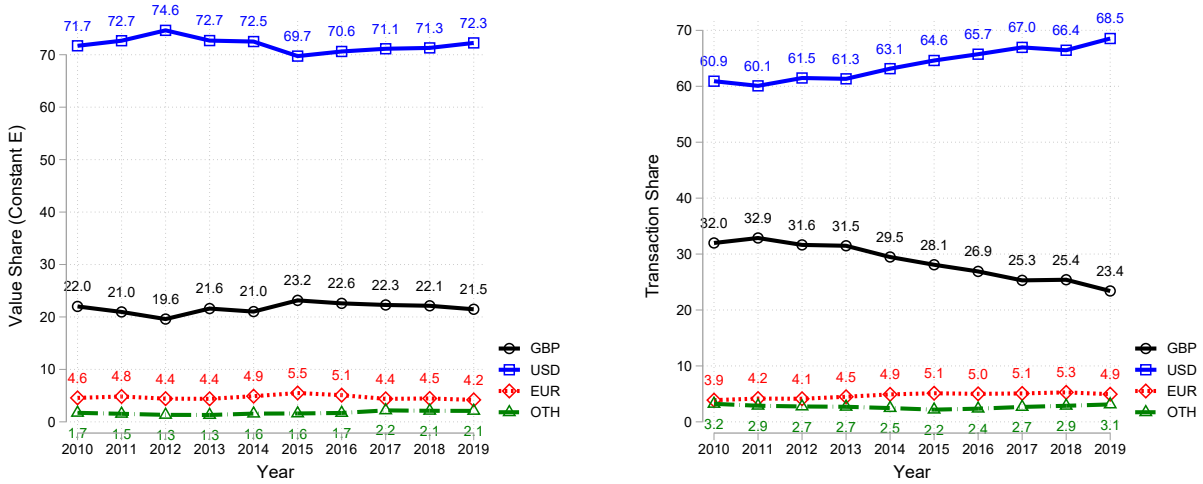
(a) OECD: Constant value share

(b) OECD: Transaction share



(c) Non-OECD: Constant value share

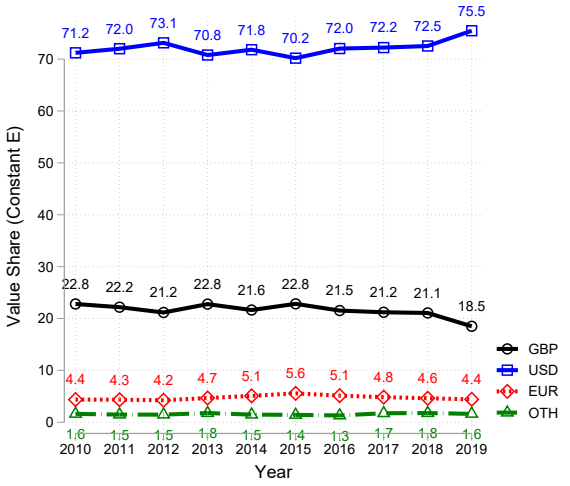
(d) Non-OECD: Transaction share



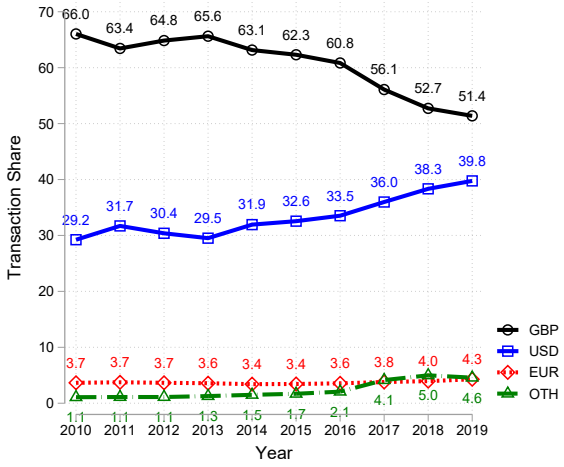
Note: The figure plots the shares of the UK's extra-EU imports invoiced in each currency by OECD group. Panels (a) and (c) are based on the constant exchange rate value of imports and panels (b) and (d) are based on the number of import transactions. Data source: HMRC administrative datasets.

Figure OA1-13: Invoicing currencies in UK's extra-EU imports: dollar peg vs. non-dollar peg

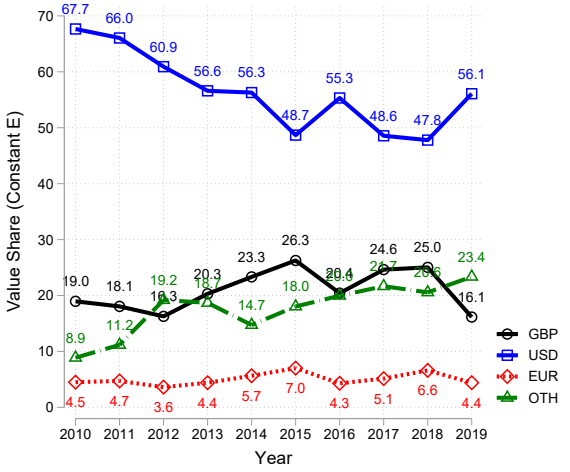
(a) Dollar peg: Constant value share



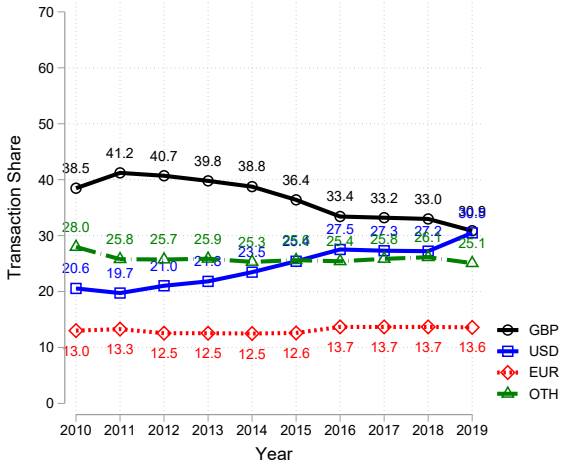
(b) Dollar peg: Transaction share



(c) Non-dollar peg: Constant value share



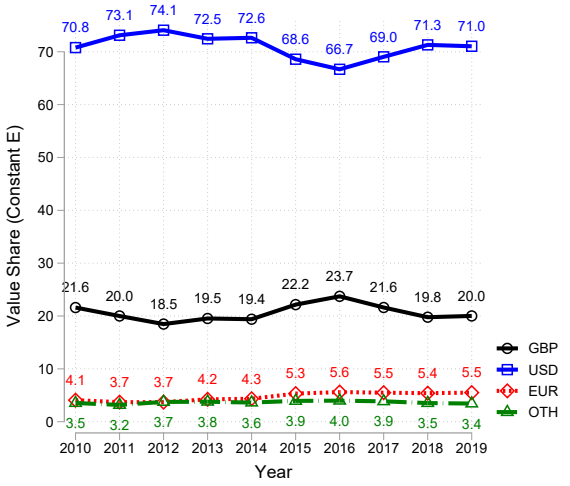
(d) Non-dollar peg: Transaction share



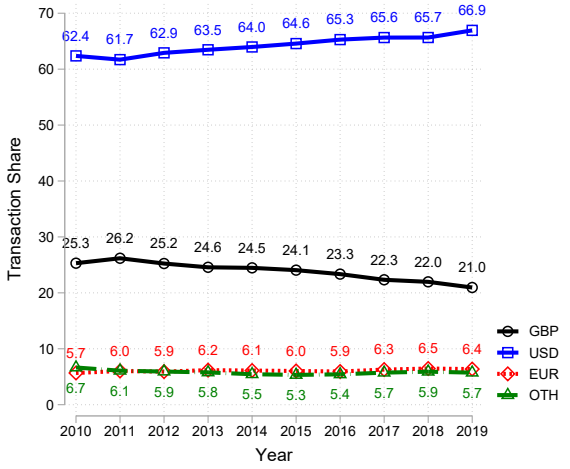
Note: The figure plots the shares of the UK's extra-EU imports invoiced in each currency by dollar-peg countries. Panels (a) and (c) are based on the constant exchange rate value of imports and panels (b) and (d) are based on the number of import transactions. Data source: HMRC administrative datasets.

Figure OA1-14: Invoicing currencies in UK imports by product differentiation

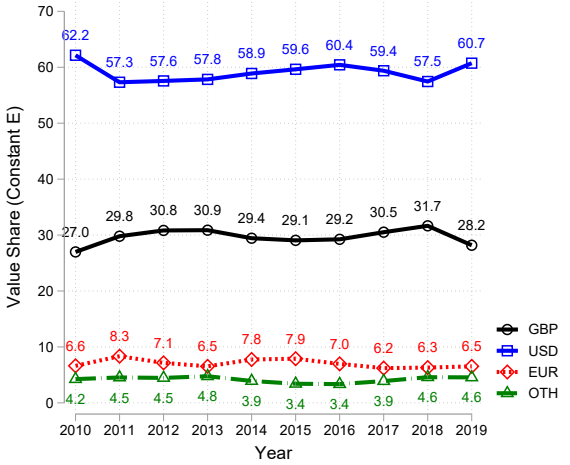
(a) Low differentiation: Constant value share



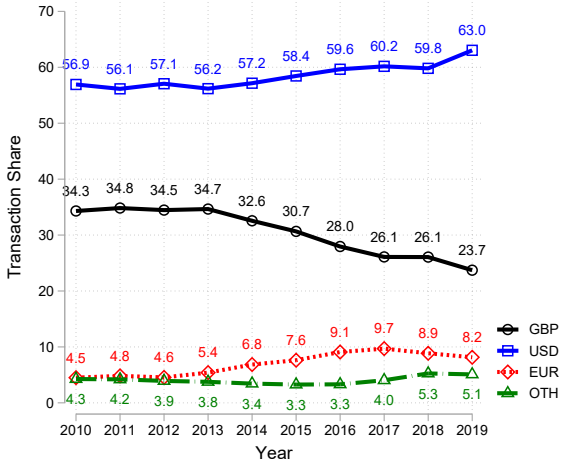
(b) Low differentiation: Transaction share



(c) High differentiation: Constant value share



(d) High differentiation: Transaction share



Note: The figure plots the shares of the UK's extra-EU imports invoiced in each currency by product differentiation using the methodology by Corsetti, Crowley, Han and Song (2018). Panels (a) and (c) are based on the constant exchange rate value of imports and panels (b) and (d) are based on the number of import transactions. Data source: HMRC administrative datasets.

OA2 Supplementary Estimation Results

OA2.1 Robustness: alternative transaction share measure

Table OA2-1: Estimates based on transaction share

	GBP	USD	Local
	(1)	(2)	(3)
Local currency import share	-0.24	-9.19***	22.15***
	(2.24)	(3.18)	(5.69)
Local currency import share × post 2016	0.52	-0.58	1.05
	(1.41)	(1.63)	(2.90)
Dollar import share × post 2016	-1.83***	2.11***	-0.16
	(0.44)	(0.30)	(0.17)
Euro import share × post 2016	-2.10**	0.44	0.08
	(1.04)	(0.69)	(0.36)
Firm's market share (HS6)	-1.68***	1.16***	0.87***
	(0.31)	(0.24)	(0.13)
Firm's market share (HS6) × post 2016	1.55***	-0.96***	-0.28*
	(0.37)	(0.32)	(0.15)
Firm size × post 2016	0.03	-0.03	0.05
	(0.08)	(0.05)	(0.04)
US market share (HS6) × post 2016	-0.37	1.29***	-0.43*
	(0.58)	(0.40)	(0.22)
EU market share (HS6) × post 2016	-0.78*	-0.98***	-0.36
	(0.42)	(0.30)	(0.22)
Observations	3,807,924	3,807,924	3,807,924
R^2	0.48	0.50	0.29
Firm + Country-Product + Year FEs	Yes	Yes	Yes

Notes: The table reports the OLS estimates for equation (2) in the main text with the export *transaction* share of each invoicing currency as the dependent variable. Standard errors in parentheses are clustered by firms. Significance: *** p<0.01, ** p<0.05, * p<0.1. Data source: HMRC administrative datasets.

OA2.2 Role of Exchange Rate Volatility

Table OA2-2: Exchange Rate Volatility – Constant Value Share Results

	GBP	USD	Local
	(1)	(2)	(3)
Local currency import share	1.86	-9.38***	19.46***
	(2.74)	(3.40)	(6.37)
Exchange rate volatility × Firm size	3.54	-3.71	2.44
	(4.62)	(2.43)	(2.31)
Exchange rate volatility × Local currency import share	-48.03	-5.81	94.20
	(84.41)	(104.09)	(191.30)
Exchange rate volatility × Dollar import share	-91.57***	109.71***	-12.58
	(24.48)	(17.21)	(9.43)
Exchange rate volatility × Euro import share	-126.57**	9.66	3.75
	(57.56)	(39.58)	(18.70)
Observations	4,015,174	4,015,174	4,015,174
R^2	0.48	0.51	0.29
Firm + Country-Product + Year FEs	Yes	Yes	Yes

Notes: The table reports estimates interacting with sterling-dollar exchange rate volatility with the export *constant value* share of each invoicing currency as the dependent variable. Standard errors in parentheses are clustered by firms. Significance: *** p<0.01, ** p<0.05, * p<0.1. Data source: HMRC administrative datasets.

Table OA2-3: Exchange Rate Volatility – Transaction Share Results

	GBP	USD	Local
	(1)	(2)	(3)
Local currency import share	1.70	-9.06***	19.37***
	(2.72)	(3.40)	(6.41)
Exchange rate volatility	3.08	-3.05	2.38
	(4.54)	(2.42)	(2.24)
Exchange rate volatility × Firm size	3.54	-3.71	2.44
	(4.62)	(2.43)	(2.30)
Exchange rate volatility × Local currency import share	-51.60	-15.84	108.92
	(86.30)	(105.70)	(193.37)
Exchange rate volatility × Dollar import share	-100.13***	117.07***	-11.90
	(24.29)	(17.23)	(9.31)
Exchange rate volatility × Euro import share	-126.35**	10.50	2.77
	(56.88)	(39.42)	(19.09)
Observations	4,015,174	4,015,174	4,015,174
R^2	0.48	0.51	0.29
Firm + Country-Product + Year FEs	Yes	Yes	Yes

Notes: The table reports estimates interacting with sterling-dollar exchange rate volatility with the export *transaction* share of each invoicing currency as the dependent variable. Standard errors in parentheses are clustered by firms. Significance: *** p<0.01, ** p<0.05, * p<0.1. Data source: HMRC administrative datasets.

OA2.3 Summary statistics for regression variables

Table OA2-4: Summary statistics for estimation Table 2 in the paper

Variables	Observation	Mean	S.D.	p1	p25	p50	p75	p99
Dependent variables:								
Sterling share of exports	3,807,924	0.70	0.45	0.00	0.00	1.00	1.00	1.00
US dollar share of exports	3,807,924	0.20	0.39	0.00	0.00	0.00	0.00	1.00
Local currency share of exports	3,807,924	0.02	0.14	0.00	0.00	0.00	0.00	1.00
Independent variables:								
Local currency import share	3,807,924	0.01	0.06	0.00	0.00	0.00	0.00	0.21
Dollar import share	3,807,924	0.59	0.37	0.00	0.23	0.72	0.95	1.00
Euro import share	3,807,924	0.06	0.16	0.00	0.00	0.00	0.03	0.89
Firm's market share (HS6)	3,807,924	0.10	0.23	0.00	0.00	0.00	0.05	1.00
Firm size (total export value in log)	3,807,924	14.52	3.31	7.26	12.30	14.34	16.53	22.13
US market share (HS6)	3,807,924	0.14	0.17	0.00	0.02	0.07	0.19	0.80
EU market share (HS6)	3,807,924	0.25	0.22	0.00	0.08	0.20	0.37	0.90

Notes: This table reports the distribution of key variables in Table 2 of the paper. Data source: HMRC administrative datasets.

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