# The Swift Decline of the British Pound:

## Evidence from UK Trade-invoicing after the Brexit Vote


Meredith Crowley
Cambridge and CEPR

Lu Han
Bank of Canada and CEPR

Minkyu Son
Bank of Korea


BBL, 20 August 2024

# Disclaimers

This work contains statistical data from HMRC which is Crown Copyright. The research datasets used may not exactly reproduce HMRC aggregates. The use of HMRC statistical data in this work does not imply the endorsement of HMRC in relation to the interpretation or analysis of the information.

The views expressed herein are those of the authors and not necessarily those of the Bank of Canada or the Bank of Korea.

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy
  - Tight link between invoicing currency and exchange rate pass-through
  - Implication of US dollar's dominance (Gopinath et al 20)

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy

- Recent empirical works document rich heterogeneity of firms' currency choices focusing on cross sectional variation
  - Currency of imported inputs; currency of competitors; firm's market power (Goldberg & Tille 08, 16; Chung 16; Amiti, Itskhoki, Konings 22)

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy
- Recent empirical works document rich heterogeneity of firms' currency choices focusing on cross sectional variation
- Less is known about how currency choices change over time
  - Important for understanding future dominant currencies

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy
- Recent empirical works document rich heterogeneity of firms' currency choices focusing on cross sectional variation
- Less is known about how currency choices change over time
  - Important for understanding future dominant currencies
  - Theory: trade shares vs exchange rate volatility/uncertainty (Mukhin 22)

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy
- Recent empirical works document rich heterogeneity of firms' currency choices focusing on cross sectional variation
- Less is known about how currency choices change over time
  - Important for understanding future dominant currencies
  - Theory: trade shares vs exchange rate volatility/uncertainty (Mukhin 22)
  - Empirical: stable aggregate shares for most countries (Boz, Gopinath et al 22)

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy
- Recent empirical works document rich heterogeneity of firms' currency choices focusing on cross sectional variation
- Less is known about how currency choices change over time
  - Important for understanding future dominant currencies
  - Theory: trade shares vs exchange rate volatility/uncertainty (Mukhin 22)
  - Empirical: stable aggregate shares for most countries (Boz, Gopinath et al 22)

    Exceptions: Lithuania, Poland, Romania after joining EU; and recently Russia

    $\Rightarrow$ Lack of micro evidence on how and why the change took place

# Motivation

- Firms' currency choices have important implications for international transmission of shocks and design of stabilization policy
- Recent empirical works document rich heterogeneity of firms' currency choices focusing on cross sectional variation
- Less is known about how currency choices change over time
  - Important for understanding future dominant currencies
  - Theory: trade shares vs exchange rate volatility/uncertainty (Mukhin 22)
  - Empirical: stable aggregate shares for most countries (Boz, Gopinath et al 22)

    Exceptions: Lithuania, Poland, Romania after joining EU; and recently Russia

    $\Rightarrow$ Lack of micro evidence on how and why the change took place
- This paper: Dissect changes in aggregate currency shares for UK exporters, investigating uncertainty brought by a political event

# This paper

Study changes in firms' invoicing currency choices after Brexit referendum, using transnational level data from UK exporters (2010-2019)

**Background:** Brexit referendum on June 23, 2016

- Outcome largely unexpected: 51.9% leave vs 48.1% remain
- Created huge uncertainty about future economic policy and exchange rates

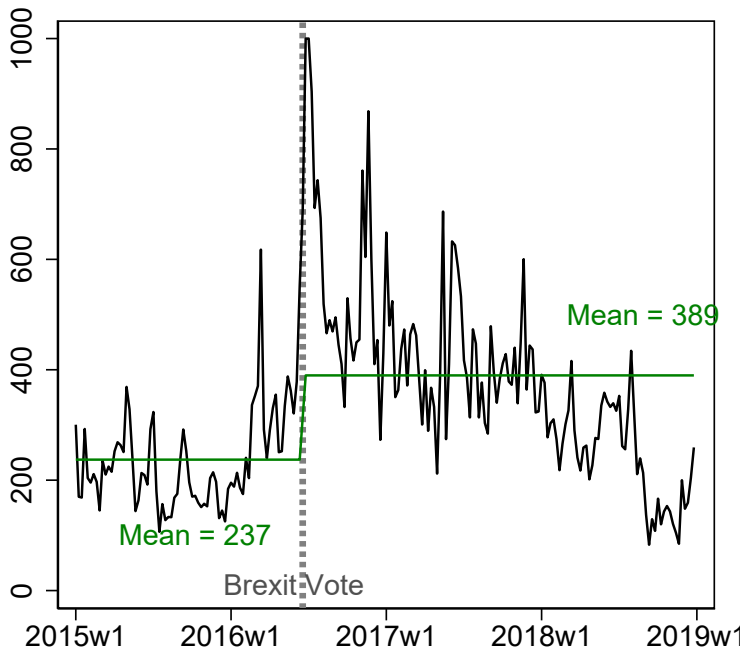
# This paper

Study changes in firms' invoicing currency choices after Brexit referendum, using transnational level data from UK exporters (2010-2019)

**Background:** Brexit referendum on June 23, 2016

- Outcome largely unexpected: 51.9% leave vs 48.1% remain
- Created huge uncertainty about future economic policy and exchange rates

(a) Bloom's policy uncertainty index



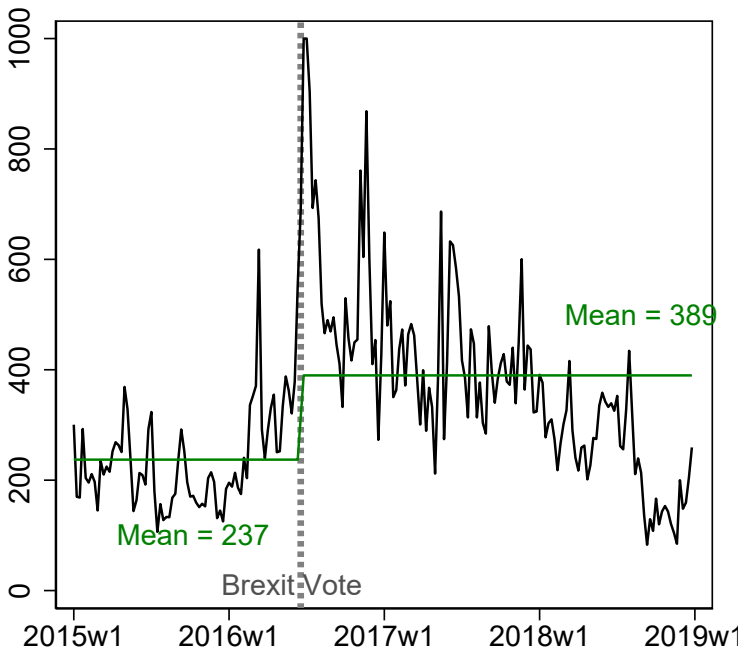
# This paper

Study changes in firms' invoicing currency choices after Brexit referendum, using transnational level data from UK exporters (2010-2019)

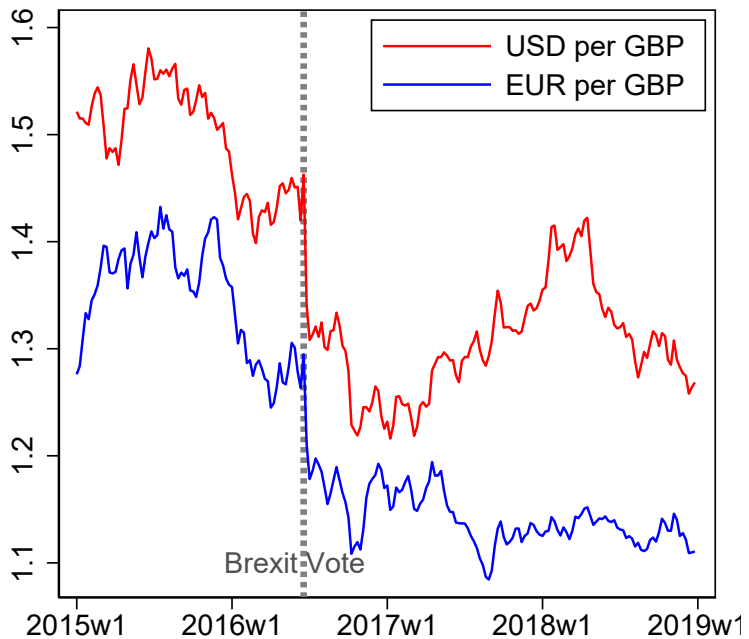
**Background:** Brexit referendum on June 23, 2016

- Outcome largely unexpected: 51.9% leave vs 48.1% remain
- Created huge uncertainty about future economic policy and exchange rates

(a) Bloom's policy uncertainty index




(b) Bilateral exchange rate



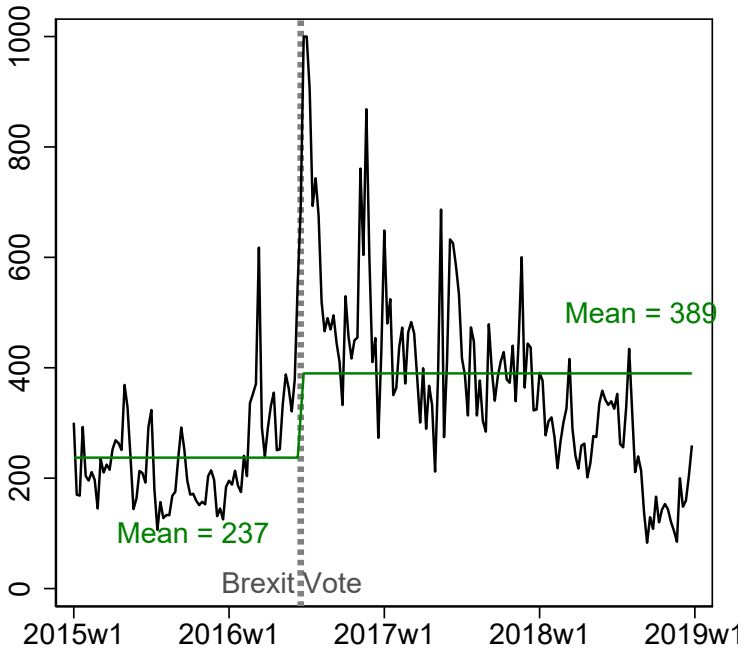
# This paper

Study changes in firms' invoicing currency choices after Brexit referendum, using transnational level data from UK exporters (2010-2019)

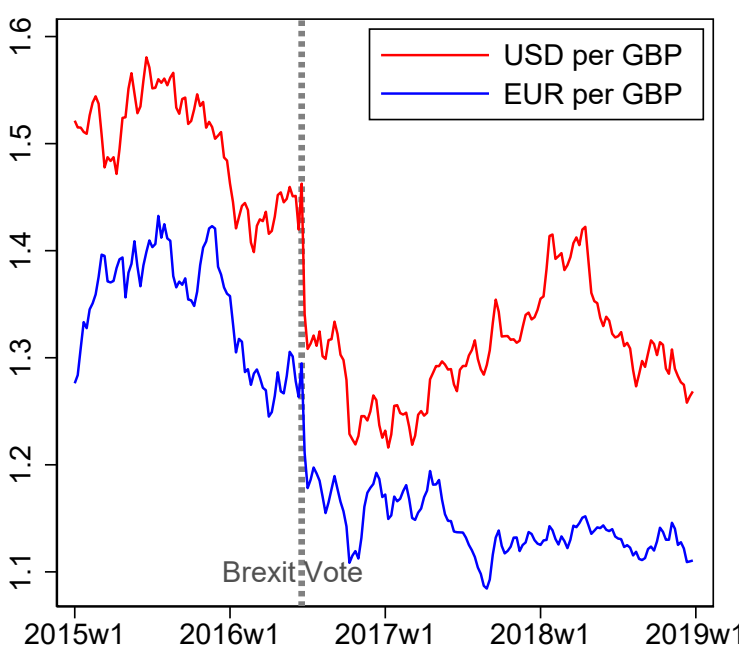
**Background:** Brexit referendum on June 23, 2016

- Outcome largely unexpected: 51.9% leave vs 48.1% remain
- Created huge uncertainty about future economic policy and exchange rates
- **No material change in economic or trade policy until 2020**

(a) Bloom's policy uncertainty index




(b) Bilateral exchange rate



# Key results

Focusing on extra-EU exports where invoicing data is available, we find

1. Swift decline in sterling usage after the Brexit referendum
   - Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
   - Dollar and local currency shares increased
   - Changes were widespread across destination markets
   - More pronounced change in high differentiation goods

# Key results

Focusing on extra-EU exports where invoicing data is available, we find

1. Swift decline in sterling usage after the Brexit referendum
   - Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
   - Dollar and local currency shares increased
   - Changes were widespread across destination markets
   - More pronounced change in high differentiation goods

2. Novel decomposition to understand the underlying micro margins
   - Decompose agg. changes into firm, destination, product, and intensive margins
   - Redefine intensive margin of trade and introduce two new concepts:
     (a) currency switch and (b) within-currency trade intensity
     $\Rightarrow$ Drove majority of the decline in sterling usage

# Key results

Focusing on extra-EU exports where invoicing data is available, we find

1. Swift decline in sterling usage after the Brexit referendum
   - Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
   - Dollar and local currency shares increased
   - Changes were widespread across destination markets
   - More pronounced change in high differentiation goods

2. Novel decomposition to understand the underlying micro margins
   - Decompose agg. changes into firm, destination, product, and intensive margins
   - Redefine intensive margin of trade and introduce two new concepts:
     (a) currency switch and (b) within-currency trade intensity
     $\Rightarrow$ Drove majority of the decline in sterling usage

3. Significant role of firm heterogeneity
   - For more dollar imports $\Rightarrow$ more likely to switch to dollars for exports
   - For markets with more US competitors $\Rightarrow$ more likely to switch to dollars

# Roadmap

- Aggregate patterns
  - Data and measure of invoicing value share
  - Invoicing shares by currency (annual and weekly)
  - Invoicing shares by product type
  - Invoicing shares by destination market
- Decomposition
- Firm heterogeneity

# Data

We use the universe of extra-EU trade transactions of British firms from His Majesty's Revenue and Customs (HMRC) over 2010-2019

- Records at the level of firm, product (CN08), country and date
- Invoicing currency is reported for extra-EU trade
  - All importers
  - Exporters whose annual exports exceed £100k

# Accounting for mechanical valuation effect of exchange rate movements

To fix ideas, consider an example of two currencies:

| | Before ($e_0 = 1.00$) | |
|---|---|---|
| | GBP | USD |
| Transaction share | 50% | 50% |
| Price in invoiced currency | £1 | $1 |
| Price in sterling | £1 | £1 |
| Value share | 50% | 50% |

- The two currencies start with equal share before the Brexit referendum

# Accounting for mechanical valuation effect of exchange rate movements

To fix ideas, consider an example of two currencies:

| | Before ($e_0 = 1.00$) | | After ($e_1 = 0.9$) | |
|---|---|---|---|---|
| | GBP | USD | GBP | USD |
| Transaction share | 50% | 50% | 50% | 50% |
| Price in invoiced currency | £1 | $1 | £1 | $1 |
| Price in sterling | £1 | £1 | | |
| Value share | 50% | 50% | | |

- Sterling depreciates by 10%; Assume no change in trading behaviour

# Accounting for mechanical valuation effect of exchange rate movements

To fix ideas, consider an example of two currencies:

| | Before ($e_0 = 1.00$) | | After ($e_1 = 0.9$) | |
|---|---|---|---|---|
| | GBP | USD | GBP | USD |
| Transaction share | 50% | 50% | 50% | 50% |
| Price in invoiced currency | £1 | $1 | £1 | $1 |
| Price in sterling | £1 | £1 | £1 | £1.11 |
| Value share | 50% | 50% | 47.4% | 52.6% |

- Even without any change in trading behavior, the sterling value share can mechanically decrease due to sterling depreciation

# Accounting for mechanical valuation effect of exchange rate movements

To fix ideas, consider an example of two currencies:

| | Before ($e_0 = 1.00$) | | After ($e_1 = 0.9$) | |
|---|---|---|---|---|
| | GBP | USD | GBP | USD |
| Transaction share | 50% | 50% | 50% | 50% |
| Price in invoiced currency | £1 | $1 | £1 | $1 |
| Price in sterling | £1 | £1 | £1 | £1.11 |
| Value share | 50% | 50% | 47.4% | 52.6% |
| Constant value share | 50% | 50% | 50% | 50% |

- Accounting for this by introducing **constant (exchange rate) value share** measure:

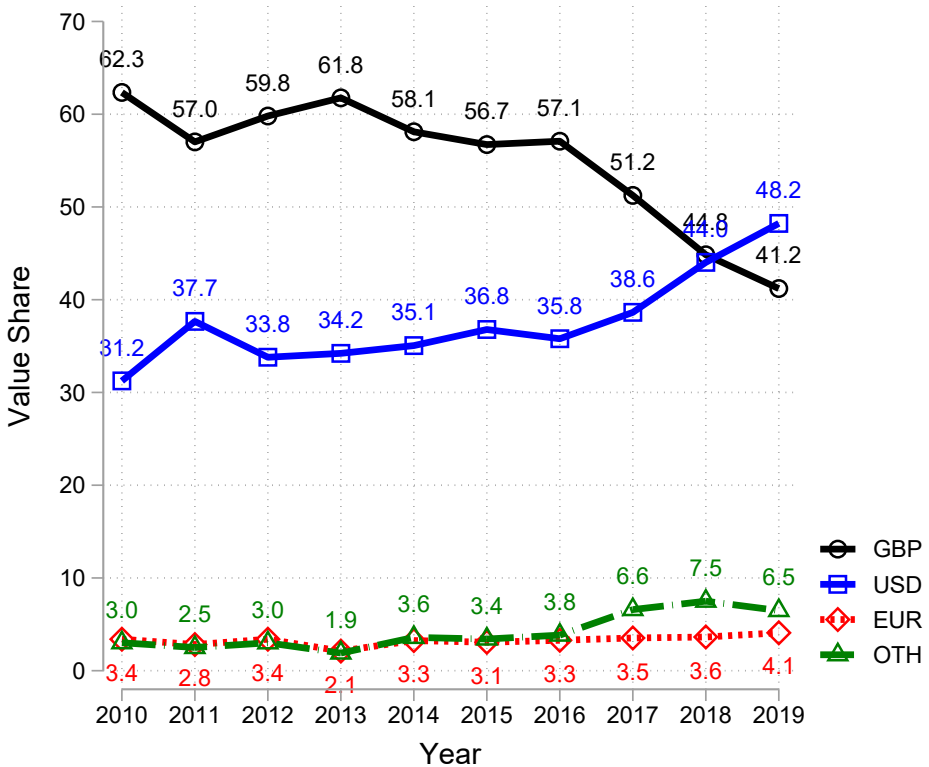
$$\text{Constant value share of USD at } t = \frac{v_t^{USD} e_t/e_0}{v_t^{USD} e_t/e_0 + v_t^{GBP}}$$

$\Rightarrow e_t/e_0$ undoes mechanical valuation effect brought by exchange rates

# The swift decline of the British pound

## Invoicing currencies in UK's extra-EU exports

(a) Trade value share

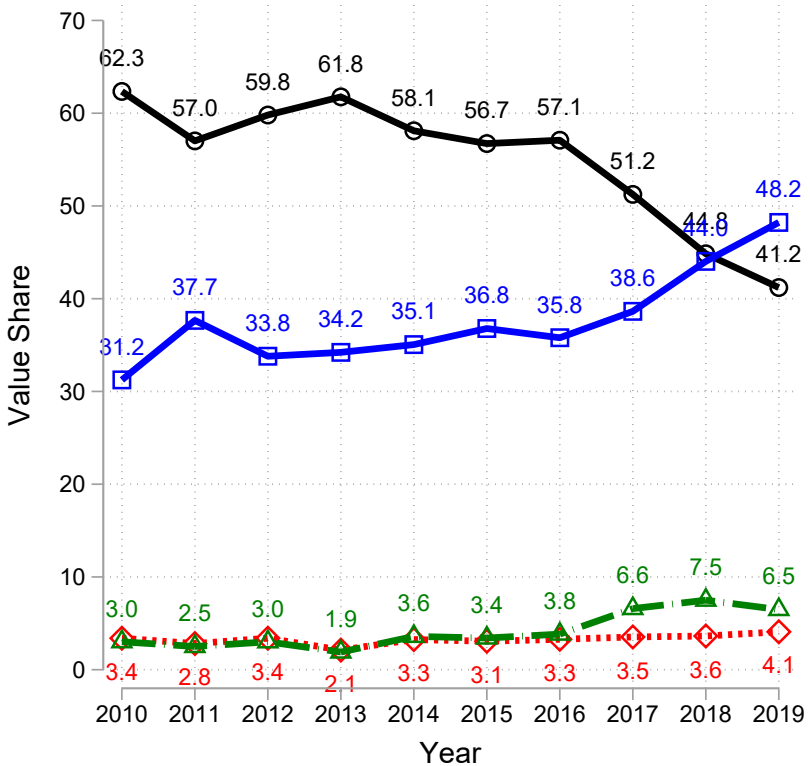



⇒ Fewer firms used sterling after the Brexit referendum

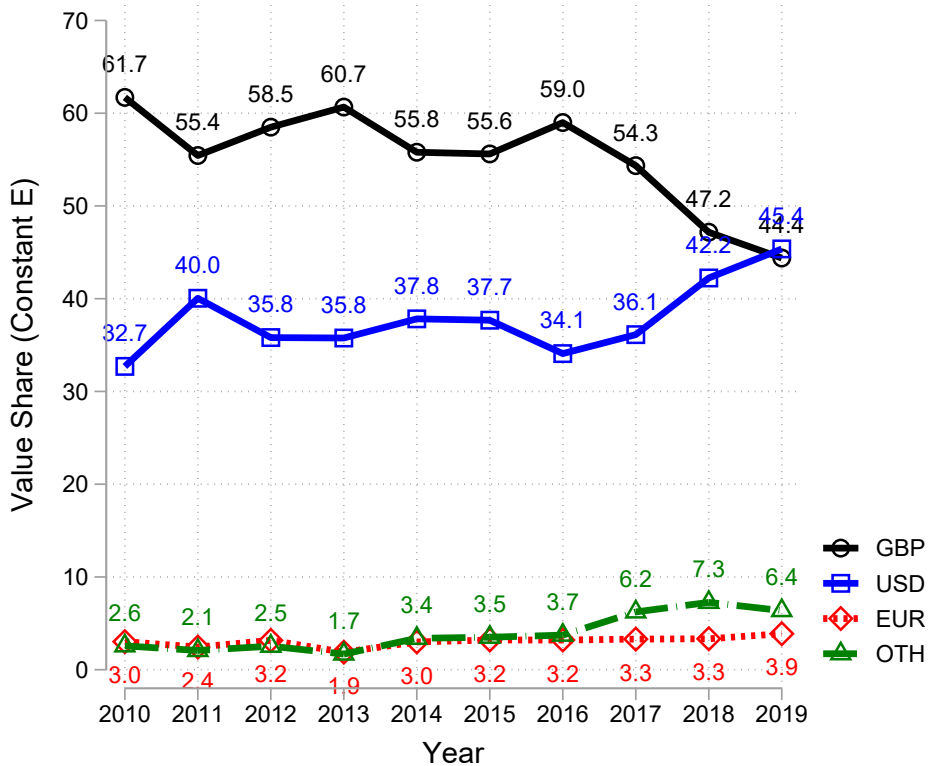
# The swift decline of the British pound

## Invoicing currencies in UK's extra-EU exports

(a) Trade value share




(b) Constant value share

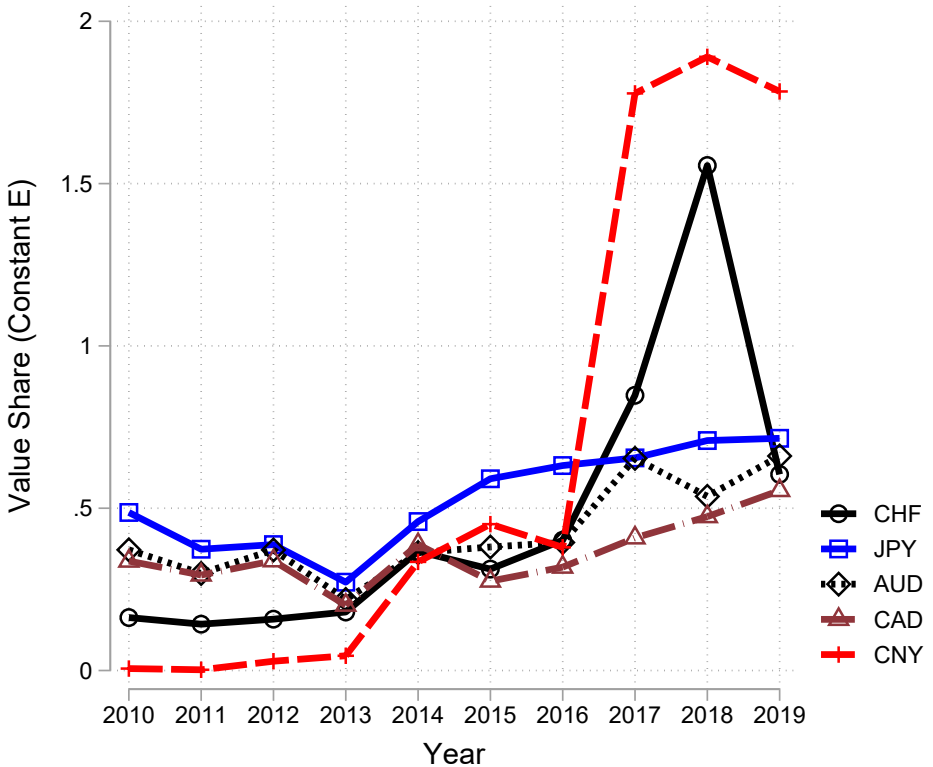



⇒ Fewer firms used sterling after the Brexit referendum

⇒ Smaller decline after accounting for mechanical effect of exchange rate movements

# Other invoicing currencies in UK's extra-EU exports

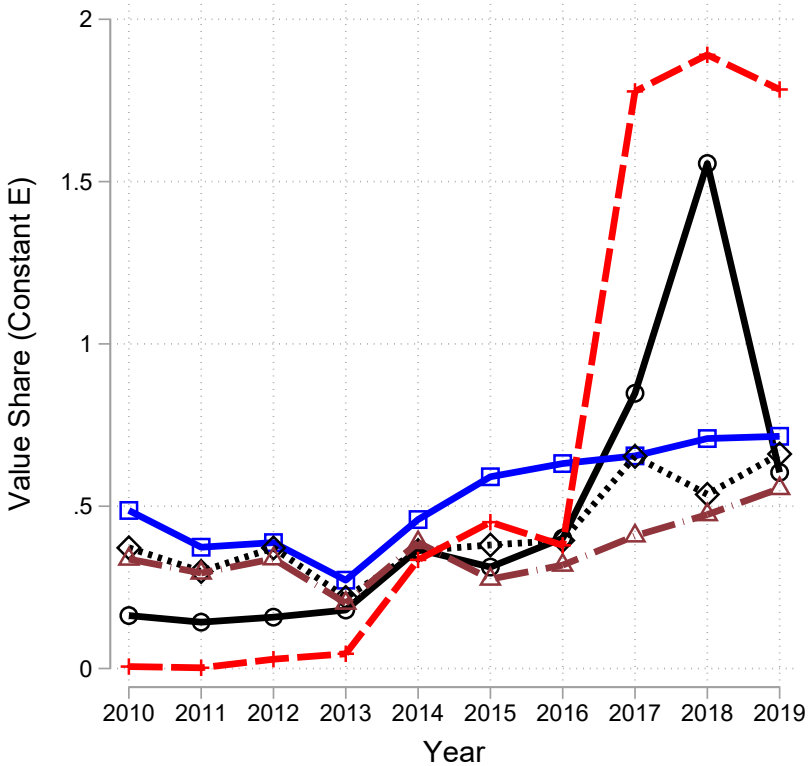
(c) Others: Constant value share



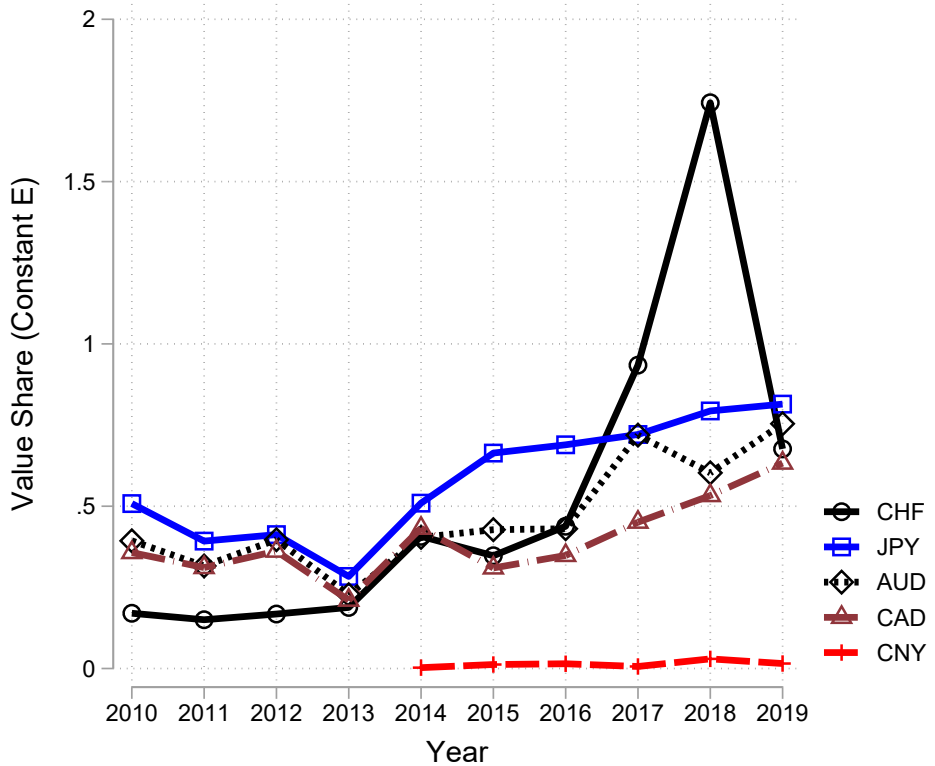

- Aggregate transaction share invoiced in all other currencies rose after Brexit

# Other invoicing currencies in UK's extra-EU exports

(c) Others: Constant value share



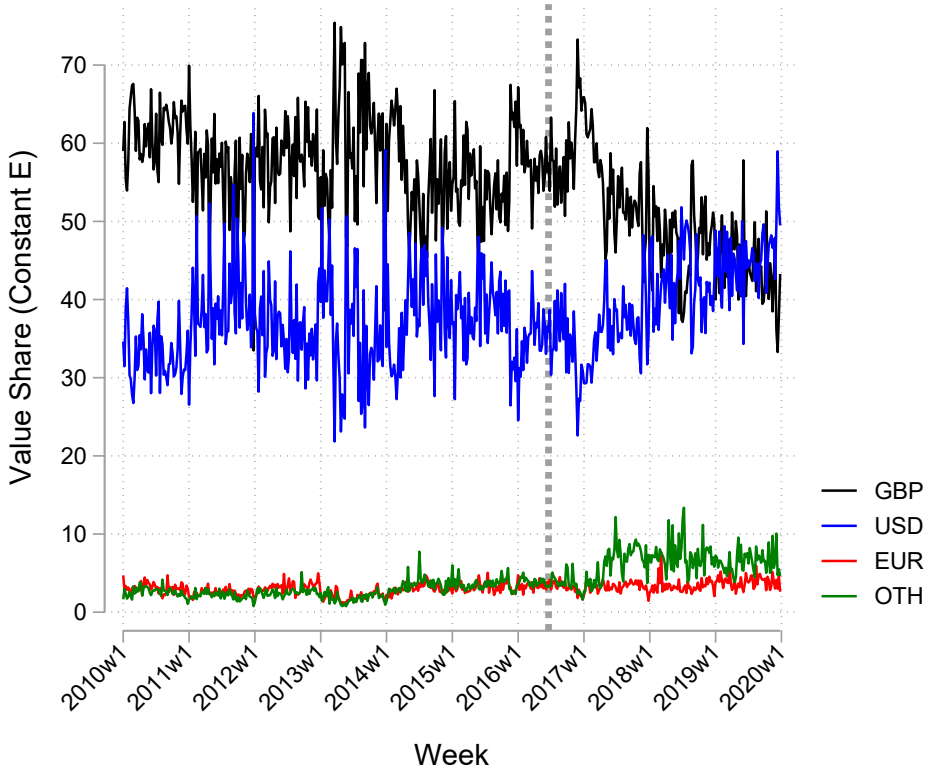

(d) Others excluding China




- Aggregate transaction share invoiced in all other currencies rose after Brexit
- Most changes in CNY were driven by exports to China (local currency pricing)

# High frequency analysis

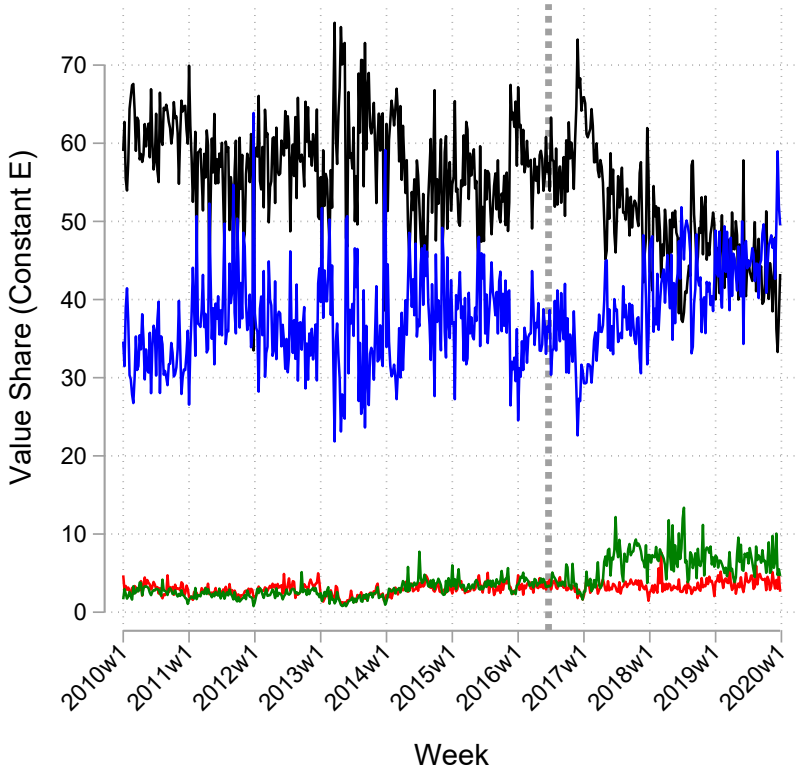
(a) All: Constant value share



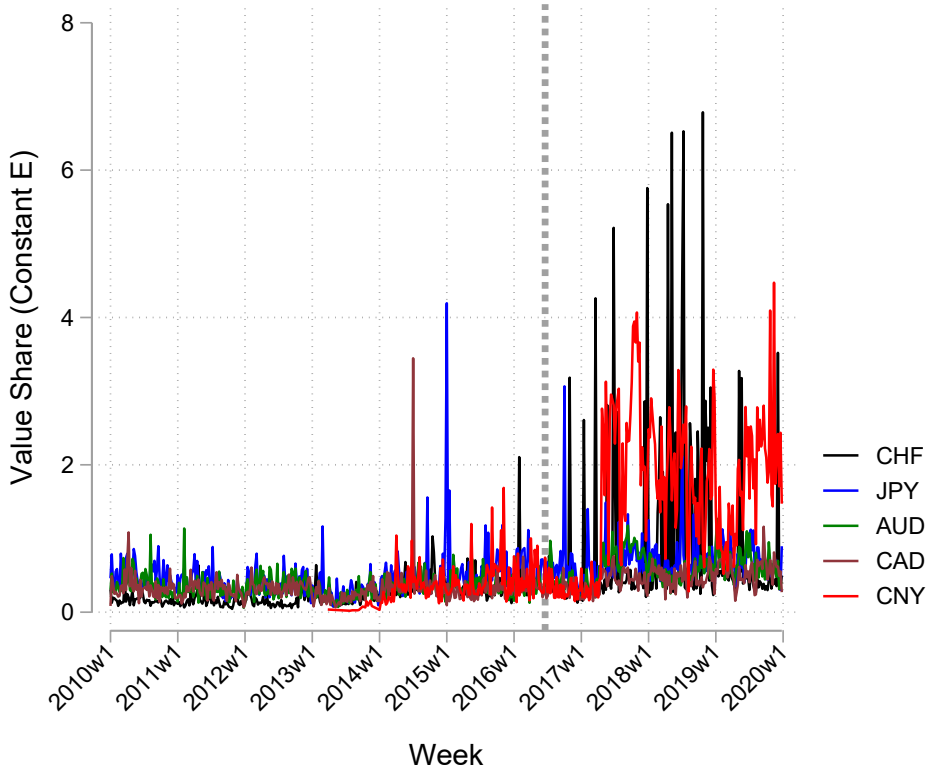

- Sterling share initially rose due to higher demand (when prices are sticky)
- Steady decline after 6 months post Brexit referendum

# High frequency analysis

(a) All: Constant value share



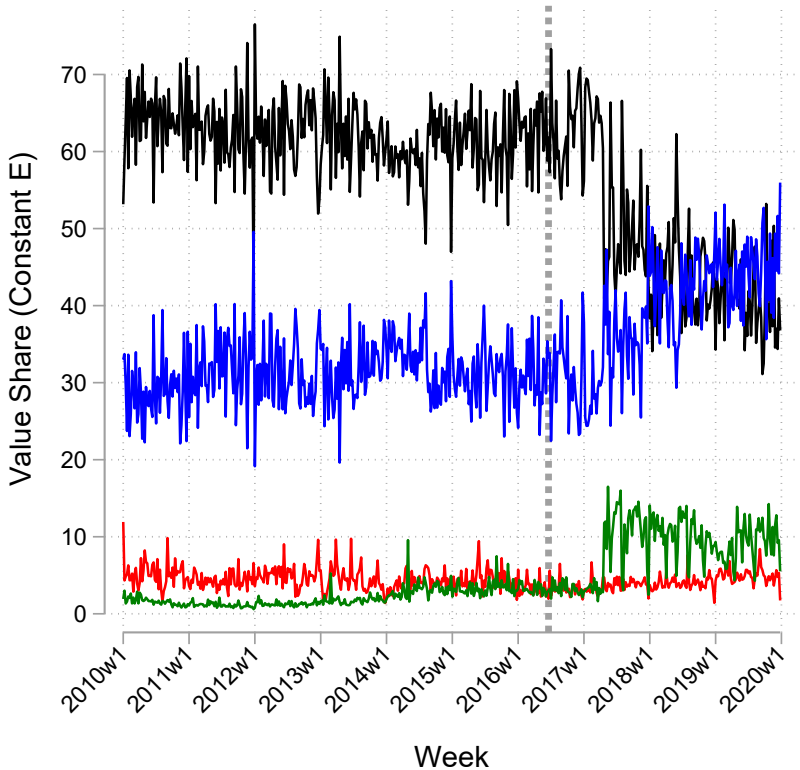

(b) Others: Constant value share



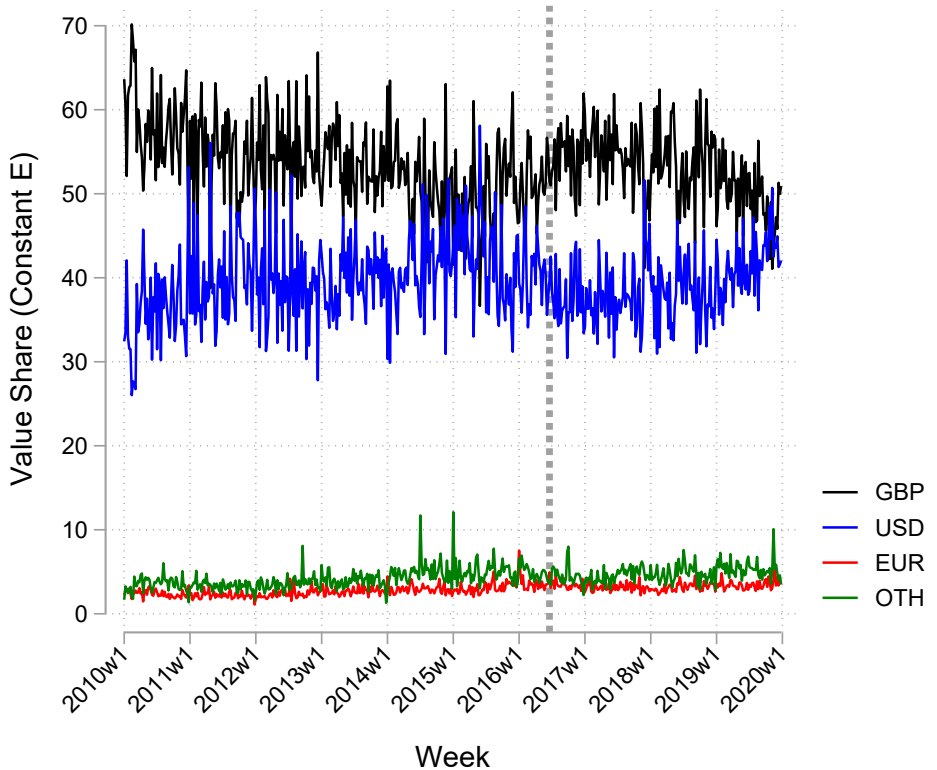

- Sterling share initially rose due to higher demand (when prices are sticky)
- Steady decline after 6 months post Brexit referendum
- Similarly, most increases in other currencies occurred after 2017

# Distinct patterns for high vs low differentiation goods

(a) High differentiation goods




(b) Low differentiation goods

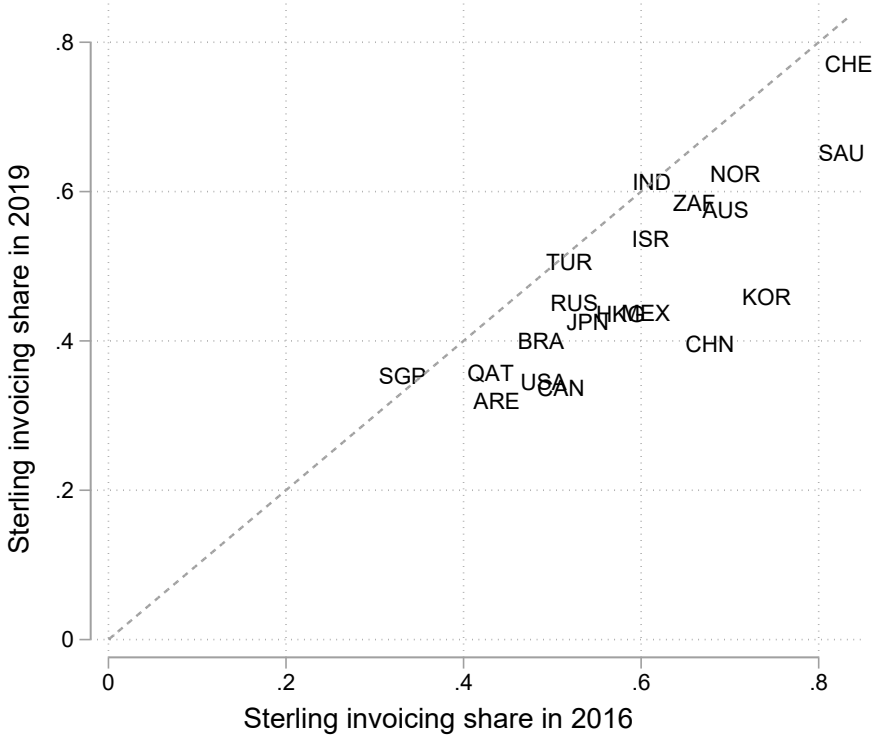



- Most changes were driven by high differentiation goods

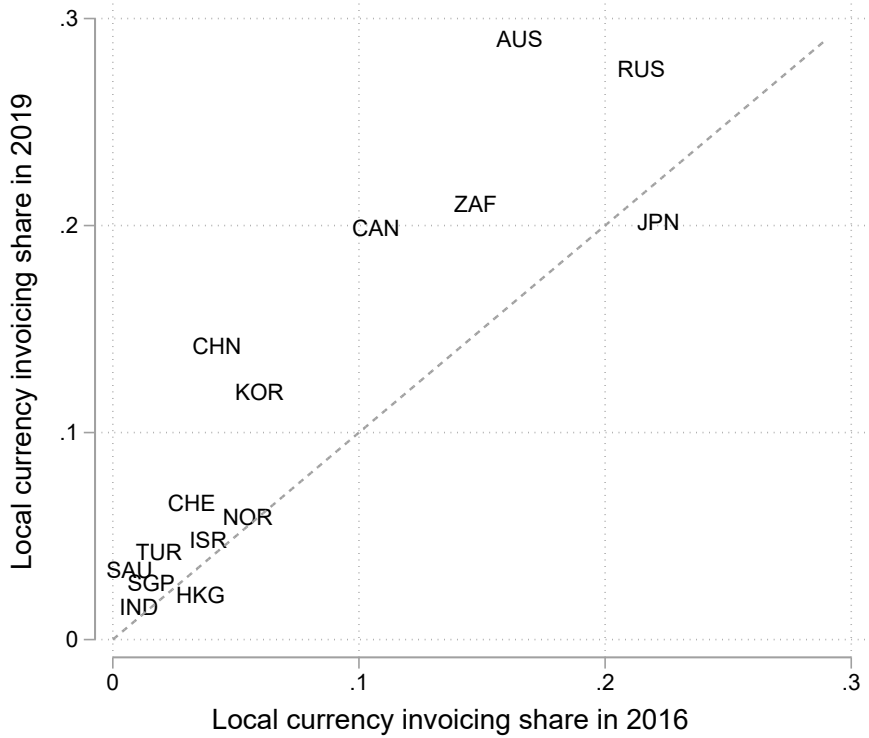
$\Rightarrow$ Firms selling differentiated products tend to have market power and are more likely to use foreign currencies, consistent to 'strategic complementarity' motive (AIK 22)

# Widespread changes across markets

(a) GBP: 2019 vs 2016




(b) Local currency: 2019 vs 2016




- Changes in invoicing patterns were widespread across destination markets

Note: No notable change in trade shares of these countries during 2016-2019 ▸ Detail

# Recap

Swift decline in sterling usage after the Brexit referendum

- Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
- High frequency: sterling share rose initially due to sticky prices
- Type of products: more pronounced for high differentiation goods
- Markets: widespread across destination markets

# Recap

Swift decline in sterling usage after the Brexit referendum

- Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
- High frequency: sterling share rose initially due to sticky prices
- Type of products: more pronounced for high differentiation goods
- Markets: widespread across destination markets

**Next:** Which micro margins matter? Decomposing the swift decline

# Decomposing British invoicing currency choices

**Extensive margins:**

1. Firm margin: Entering, exiting and continuing firms

2. Foreign country margin: Among continuing firms: foreign market entry, exit, and continuation

3. Product margin: Among continuing firm-markets: introduction, removal and continuation of products

**Intensive margins:**

4. Currency switch: Among continuing firm-market-product triplets: change of currency

5. Trade intensity margin: Among continuing firm-market-product-currency quartets: change in value traded

# Decomposition

$$\Delta_s x_t^k = \underbrace{\sum_{f \in \mathcal{E}} x_{ft}^k - \sum_{f \in \mathcal{X}} x_{ft-s}^k}_{\textbf{Net firm entry}} + \underbrace{\sum_{f \in \mathcal{C}} \Delta_s x_{ft}^k}_{\text{Continuing firms}} ,$$

# Decomposition

$$\Delta_s x_t^k = \underbrace{\sum_{f \in \mathcal{E}} x_{ft}^k - \sum_{f \in \mathcal{X}} x_{ft-s}^k}_{\textbf{Net firm entry}} + \underbrace{\sum_{f \in \mathcal{C}} \Delta_s x_{ft}^k}_{\text{Continuing firms}},$$

$$\Delta_s x_{ft}^k = \underbrace{\sum_{d \in \mathcal{E}_f} x_{fdt}^k - \sum_{d \in \mathcal{X}_f} x_{fdt-s}^k}_{\textbf{Net market entry}} + \underbrace{\sum_{d \in \mathcal{C}_f} \Delta_s x_{fdt}^k}_{\text{Continuing markets}} \quad \forall f \in \mathcal{C},$$

# Decomposition

$$\Delta_s x_t^k = \underbrace{\sum_{f \in \mathcal{E}} x_{ft}^k - \sum_{f \in \mathcal{X}} x_{ft-s}^k}_{\textbf{Net firm entry}} + \underbrace{\sum_{f \in \mathcal{C}} \Delta_s x_{ft}^k}_{\text{Continuing firms}} ,$$

$$\Delta_s x_{ft}^k = \underbrace{\sum_{d \in \mathcal{E}_f} x_{fdt}^k - \sum_{d \in \mathcal{X}_f} x_{fdt-s}^k}_{\textbf{Net market entry}} + \underbrace{\sum_{d \in \mathcal{C}_f} \Delta_s x_{fdt}^k}_{\text{Continuing markets}} \quad \forall f \in \mathcal{C},$$

$$\Delta_s x_{fdt}^k = \underbrace{\sum_{p \in \mathcal{E}_{fd}} x_{fpdt}^k - \sum_{p \in \mathcal{X}_{fd}} x_{fpdt-s}^k}_{\textbf{Net product entry}} + \underbrace{\sum_{p \in \mathcal{C}_{fd}} \Delta_s x_{fpdt}^k}_{\text{Continuing products}} \quad \forall d \in \mathcal{C}_f, f \in \mathcal{C},$$

# Decomposition

$$\Delta_s x_t^k = \underbrace{\sum_{f\in\mathcal{E}} x_{ft}^k - \sum_{f\in\mathcal{X}} x_{ft-s}^k}_{\textbf{Net firm entry}} + \underbrace{\sum_{f\in\mathcal{C}} \Delta_s x_{ft}^k}_{\text{Continuing firms}} ,$$

$$\Delta_s x_{ft}^k = \underbrace{\sum_{d\in\mathcal{E}_f} x_{fdt}^k - \sum_{d\in\mathcal{X}_f} x_{fdt-s}^k}_{\textbf{Net market entry}} + \underbrace{\sum_{d\in\mathcal{C}_f} \Delta_s x_{fdt}^k}_{\text{Continuing markets}} \quad \forall f \in \mathcal{C},$$

$$\Delta_s x_{fdt}^k = \underbrace{\sum_{p\in\mathcal{E}_{fd}} x_{fpdt}^k - \sum_{p\in\mathcal{X}_{fd}} x_{fpdt-s}^k}_{\textbf{Net product entry}} + \underbrace{\sum_{p\in\mathcal{C}_{fd}} \Delta_s x_{fpdt}^k}_{\text{Continuing products}} \quad \forall d \in \mathcal{C}_f, f \in \mathcal{C},$$

$$\Delta_s x_{fpdt}^k = \underbrace{x_{fpdt}^k \mathbb{1}(\mathcal{A}_{fpd}^k) - x_{fpdt-s}^k \mathbb{1}(\mathcal{B}_{fpd}^k)}_{\textbf{Currency switch}} + \underbrace{\Delta_s x_{fpdt}^k \mathbb{1}(\mathcal{C}_{fpd}^k)}_{\textbf{Within-currency trade intensity}}$$

$$\forall p \in \mathcal{C}_{fd}, d \in \mathcal{C}_f, f \in \mathcal{C}.$$

$\mathcal{A}_{fpd}^k$ : currency added; $\mathcal{B}_{fpd}^k$ : currency dropped; $\mathcal{C}_{fpd}^k$ : no change in currency

# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| **Net firm entry** | | | | | |
| **Net market entry** | | | | | |
| **Net product entry** | | | | | |
| **Currency switch** | | | | | |
| **Within currency** | | | | | |
| **Total changes** | **-9,995** | **27,036** | **1,903** | **5,309** | **24,253** |

# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| Exporter births | 7,377 | | | | |
| Exporter deaths | 3,447 | | | | |
| **Net firm entry** | **3,930** | | | | |
| Market entries | | | | | |
| Market exits | | | | | |
| **Net market entry** | | | | | |
| New products | | | | | |
| Retired products | | | | | |
| **Net product entry** | | | | | |
| Currency added | | | | | |
| Currency dropped | | | | | |
| **Currency switch** | | | | | |
| **Within currency** | | | | | |
| **Total changes** | **-9,995** | **27,036** | **1,903** | **5,309** | **24,253** |

# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| Exporter births | 7,377 | | | | |
| Exporter deaths | 3,447 | | | | |
| **Net firm entry** | **3,930** | | | | |
| Market entries | 5,227 | | | | |
| Market exits | 7,175 | | | | |
| **Net market entry** | **-1,949** | | | | |
| New products | 9,685 | | | | |
| Retired products | 12,058 | | | | |
| **Net product entry** | **-2,373** | | | | |
| Currency added | | | | | |
| Currency dropped | | | | | |
| **Currency switch** | | | | | |
| **Within currency** | | | | | |
| **Total changes** | **-9,995** | **27,036** | **1,903** | **5,309** | **24,253** |

# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| Exporter births | 7,377 | | | | |
| Exporter deaths | 3,447 | | | | |
| **Net firm entry** | **3,930** | | | | |
| Market entries | 5,227 | | | | |
| Market exits | 7,175 | | | | |
| **Net market entry** | **-1,949** | | | | |
| New products | 9,685 | | | | |
| Retired products | 12,058 | | | | |
| **Net product entry** | **-2,373** | | | | |
| Currency added | 2,584 | | | | |
| Currency dropped | 5,777 | | | | |
| **Currency switch** | **-3,193** | | | | |
| **Within currency** | **-6,412** | | | | |
| **Total changes** | **-9,995** | **27,036** | **1,903** | **5,309** | **24,253** |

# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| Net firm entry | 3,930 | 1,184 | 109 | 131 | 5,355 |
| Net market entry | -1,949 | 2,378 | 251 | 493 | 1,175 |
| Net product entry | -2,373 | 5,473 | 101 | 109 | 3,311 |
| Currency switch | -3,193 | 2,236 | 305 | 1,325 | 674 |
| Within currency | -6,412 | 15,762 | 1,135 | 3,249 | 13,736 |
| Total changes | -9,995 | 27,036 | 1,903 | 5,309 | 24,253 |

# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| **Net firm entry** | 16.21% | 4.88% | 0.45% | 0.54% | **22.09%** |
| **Net market entry** | -8.04% | 9.81% | 1.04% | 2.03% | **4.85%** |
| **Net product entry** | -9.79% | 22.57% | 0.42% | 0.45% | **13.65%** |
| **Currency switch** | -13.16% | 9.22% | 1.26% | 5.46% | **2.78%** |
| **Within currency** | -26.44% | 64.98% | 4.68% | 13.40% | **56.62%** |
| **Total changes** | **-41.21%** | **111.51%** | **7.85%** | **21.89%** | **100%** |

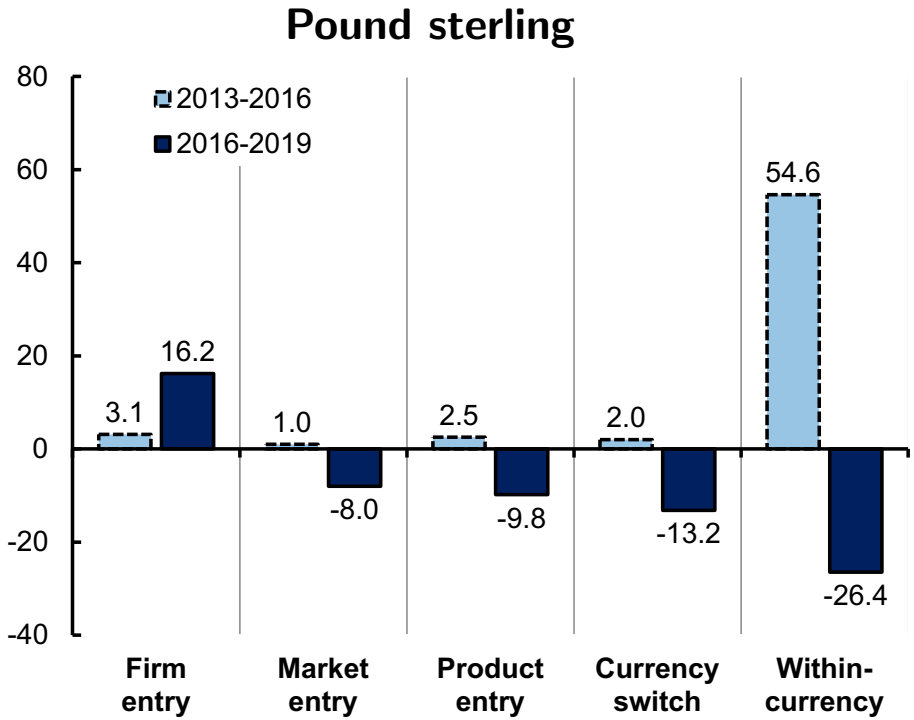
# Changes in invoicing by trade margins: 2016-2019

Measure: constant trade value (in million £)

| Margins | GBP | USD | EUR | Others | Total |
|---|---|---|---|---|---|
| **Net firm entry** | 16.21% | | | | |
| **Net market entry** | -8.04% | | | | |
| **Net product entry** | -9.79% | | | | |
| **Currency switch** | -13.16% | | | | |
| **Within currency** | -26.44% | | | | |
| **Total changes** | **-41.21%** | | | | |

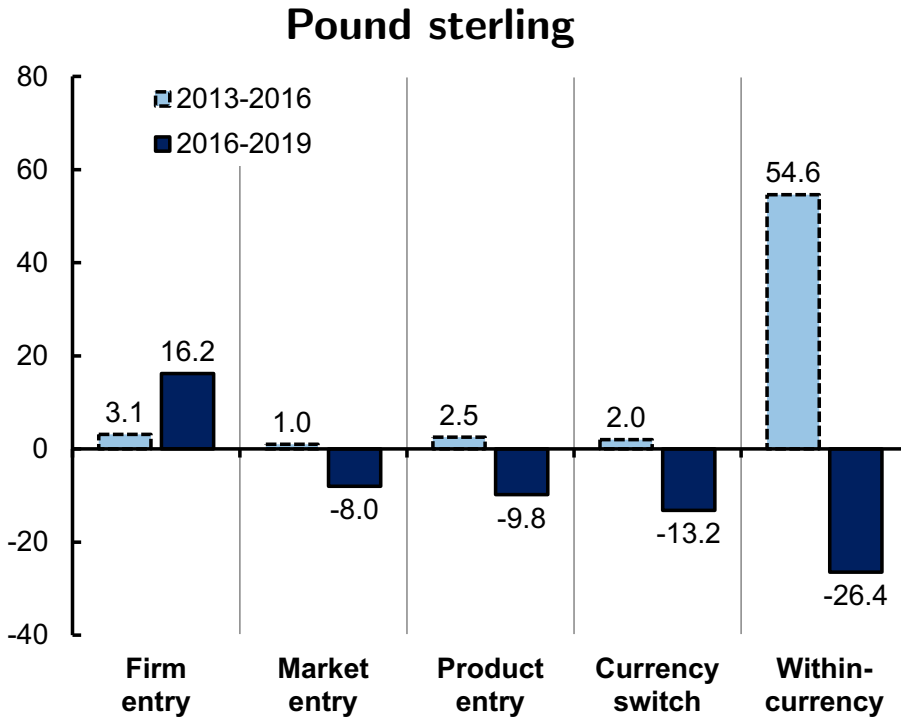
- **Currency switch** and **within currency** explain majority of the decline

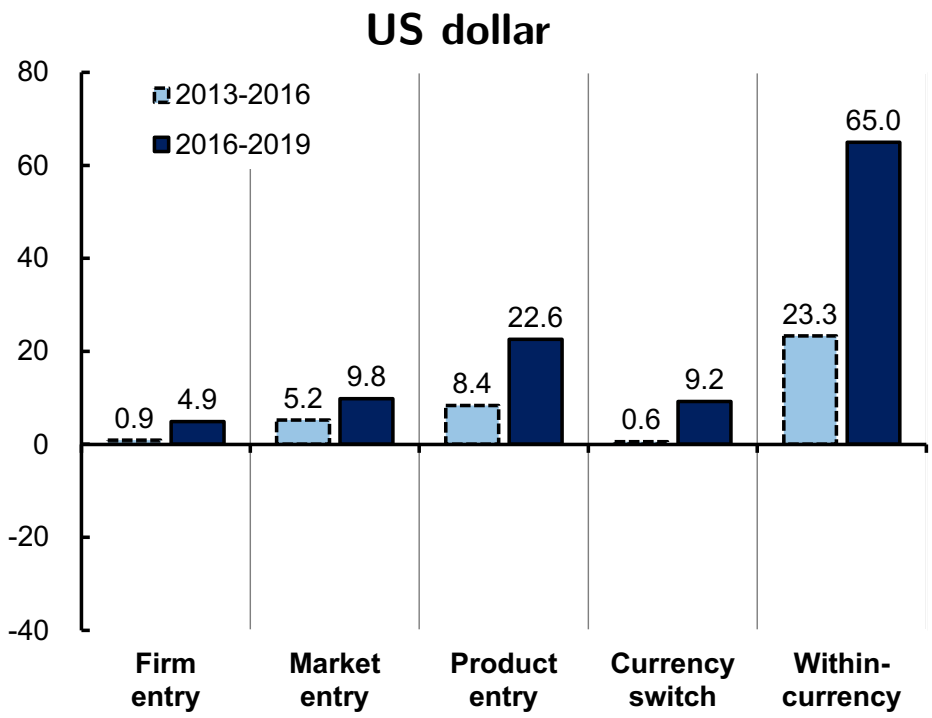
# Comparing contribution of micro margins during 2013-2016 vs 2016-2019




- Differential contribution of the margins during 'normal times' vs 'big changes'

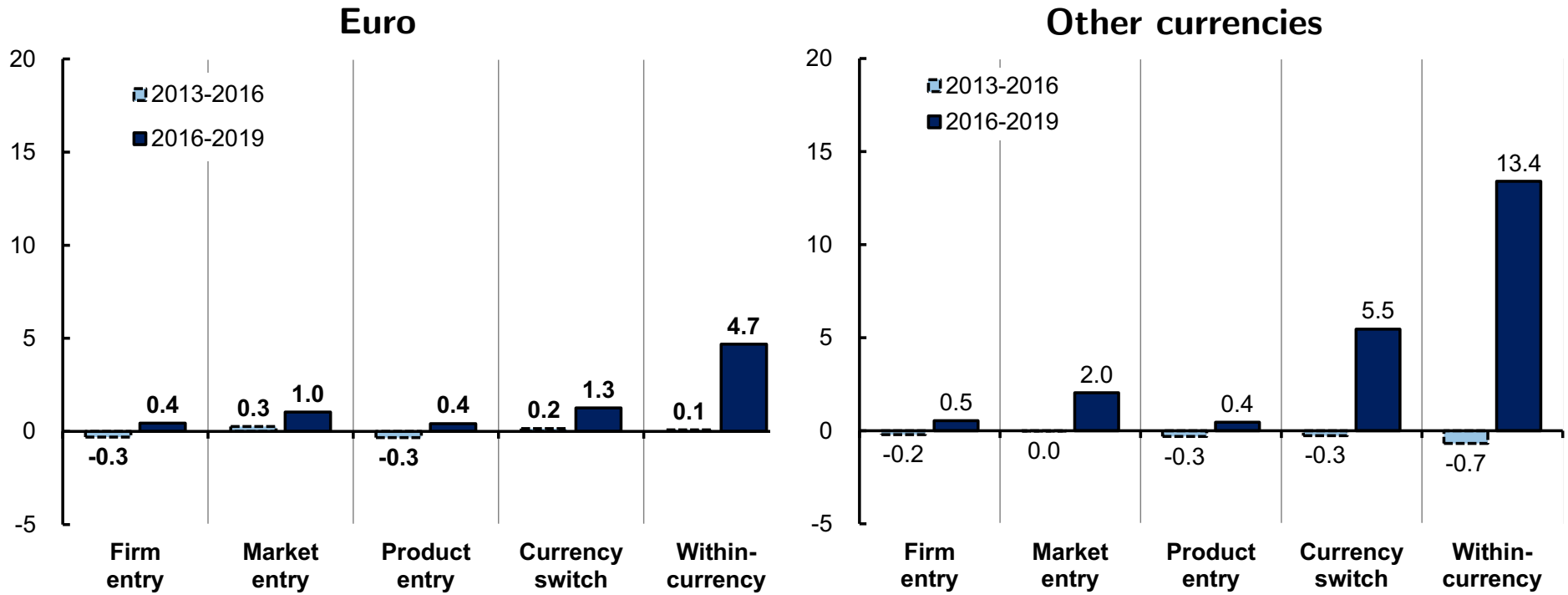
# Comparing contribution of micro margins during 2013-2016 vs 2016-2019




- Differential contribution of the margins during 'normal times' vs 'big changes'

# Comparing contribution of micro margins during 2013-2016 vs 2016-2019




- Currency switch and within-currency trade intensity explain most of the changes

▸ Transaction share results

# Recap

Most decline of sterling invoicing were driven by two intensive margins:

- **Currency switch:** firms continuously operating in foreign product markets switched from sterling into US dollars and local currencies
- **Within-currency trade intensity:** sterling-loyal firms continued operations in foreign product markets but sold less

# Recap

Most decline of sterling invoicing were driven by two intensive margins:

- **Currency switch:** firms continuously operating in foreign product markets switched from sterling into US dollars and local currencies
- **Within-currency trade intensity:** sterling-loyal firms continued operations in foreign product markets but sold less

**Next:** Role of firm and market heterogeneity, focusing on these two margins

# Key determinants of firms' invoicing choices

Existing micro studies have highlighted three key channels, focusing on cross-sectional variation:

1. Operational hedging: firms tend to choose the same export currency as their import currencies – to hedge exchange rate risk

2. Pricing-to-market: larger firms with market power are more likely to price in foreign currencies – to price discriminate across markets

3. Strategic complementarity: firms tend to use the same currency as their competitors – to keep its relative price stable

# Key determinants of firms' invoicing choices

Existing micro studies have highlighted three key channels, focusing on cross-sectional variation:

1. Operational hedging: firms tend to choose the same export currency as their import currencies – to hedge exchange rate risk

2. Pricing-to-market: larger firms with market power are more likely to price in foreign currencies – to price discriminate across markets

3. Strategic complementarity: firms tend to use the same currency as their competitors – to keep its relative price stable

**Next:** study how these channels change facing uncertainty in exchange rates and economic policy brought by Brexit referendum

# Empirical specification

Regress constant value share $S^k_{fpdt}$ on firm and market characteristics:

$$S^k_{fpdt} = \alpha_0 \cdot imp\_local_{fd} + \alpha_1 \cdot (imp\_local_{fd} \times D_t) + \alpha_2 \cdot (imp\_USD_f \times D_t) + \alpha_3 \cdot (imp\_EUR_f \times D_t) + FE_f + FE_{pd} + FE_t + \epsilon_{fpdt}$$

- $f, p, i, d, t, k$: firm, 8-digit product, 6-digit product, destination, year, currency
- $D_t$: Post-Brexit referendum dummy $= 1$ if year $\geq 2016$
- $imp\_local_{fd}, imp\_USD_f, imp\_EUR_f$: firm's import share in local, USD and EUR
- Sample: 2013-2019; Construction of firm and market characteristics: 2013-2016

# Empirical specification

Regress constant value share $S^k_{fpdt}$ on firm and market characteristics:

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

- $f, p, i, d, t, k$: firm, 8-digit product, 6-digit product, destination, year, currency
- $D_t$: Post-Brexit referendum dummy $= 1$ if year $\geq 2016$
- $imp\_local_{fd}, imp\_USD_f, imp\_EUR_f$: firm's import share in local, USD and EUR
- $fshare_{fid}$: firm's product-level market share
- $fsize_f$: firm's size $=$ log total export value in all markets

# Empirical specification

Regress constant value share $S^k_{fpdt}$ on firm and market characteristics:

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

- $f, p, i, d, t, k$: firm, 8-digit product, 6-digit product, destination, year, currency
- $D_t$: Post-Brexit referendum dummy $= 1$ if year $\geq 2016$
- $imp\_local_{fd}, imp\_USD_f, imp\_EUR_f$: firm's import share in local, USD and EUR
- $fshare_{fid}$: firm's product-level market share
- $fsize_f$: firm's size $=$ log total export value in all markets
- $US\_share_{id}, EU\_share_{id}$: US and EU product-level trade share in destination

  (Proxy for competitors' USD/EUR usage; Most US/EU exporters use USD/EUR)

# Heterogeneity in invoicing choices

| | GBP | USD | Local |
|---|---|---|---|
| Local currency import share | -0.08 | -9.27*** | 21.93*** |
| | (2.25) | (3.16) | (5.68) |
| Local currency import share × post 2016 | 0.70 | -0.46 | 0.80 |
| | (1.36) | (1.62) | (2.86) |
| 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 |

# Heterogeneity in invoicing choices

| | GBP | USD | Local |
|---|---|---|---|
| Local currency import share | -0.08 | -9.27*** | 21.93*** |
| | (2.25) | (3.16) | (5.68) |
| Local currency import share × post 2016 | 0.70 | -0.46 | 0.80 |
| | (1.36) | (1.62) | (2.86) |
| Dollar import share × post 2016 | -1.67*** | 1.97*** | -0.17 |
| | (0.44) | (0.30) | (0.17) |
| Euro import share × post 2016 | -2.12** | 0.41 | 0.12 |
| | (1.05) | (0.69) | (0.35) |
| 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 |

# Heterogeneity in invoicing choices

| | GBP | USD | Local |
|---|---|---|---|
| Local currency import share | -0.08 | -9.27*** | 21.93*** |
| | (2.25) | (3.16) | (5.68) |
| Local currency import share × post 2016 | 0.70 | -0.46 | 0.80 |
| | (1.36) | (1.62) | (2.86) |
| Dollar import share × post 2016 | -1.67*** | 1.97*** | -0.17 |
| | (0.44) | (0.30) | (0.17) |
| Euro import share × post 2016 | -2.12** | 0.41 | 0.12 |
| | (1.05) | (0.69) | (0.35) |
| Firm's market share (HS6) | -1.46*** | 1.08*** | 0.80*** |
| | (0.32) | (0.24) | (0.12) |
| Firm's market share (HS6) × post 2016 | 1.80*** | -1.15*** | -0.29* |
| | (0.37) | (0.32) | (0.15) |
| Firm size × post 2016 | 0.04 | -0.04 | 0.06 |
| | (0.08) | (0.05) | (0.04) |
| 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 |

# Heterogeneity in invoicing choices

| | GBP | USD | Local |
|---|---|---|---|
| Local currency import share | -0.08 | -9.27*** | 21.93*** |
| | (2.25) | (3.16) | (5.68) |
| Local currency import share × post 2016 | 0.70 | -0.46 | 0.80 |
| | (1.36) | (1.62) | (2.86) |
| Dollar import share × post 2016 | -1.67*** | 1.97*** | -0.17 |
| | (0.44) | (0.30) | (0.17) |
| Euro import share × post 2016 | -2.12** | 0.41 | 0.12 |
| | (1.05) | (0.69) | (0.35) |
| Firm's market share (HS6) | -1.46*** | 1.08*** | 0.80*** |
| | (0.32) | (0.24) | (0.12) |
| Firm's market share (HS6) × post 2016 | 1.80*** | -1.15*** | -0.29* |
| | (0.37) | (0.32) | (0.15) |
| Firm size × post 2016 | 0.04 | -0.04 | 0.06 |
| | (0.08) | (0.05) | (0.04) |
| US market share (HS6) × post 2016 | -0.09 | 1.02** | -0.42* |
| | (0.58) | (0.40) | (0.22) |
| 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 |

# Conclusions

Using transaction-level data from UK exporters, we document:

1. A swift decline in sterling use after the 2016 Brexit vote
   - Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
   - High frequency: sterling share rose initially due to sticky prices
   - Type of products: more pronounced for high differentiation goods
   - Markets: widespread across destination markets

# Conclusions

Using transaction-level data from UK exporters, we document:

1. A swift decline in sterling use after the 2016 Brexit vote
   - Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
   - High frequency: sterling share rose initially due to sticky prices
   - Type of products: more pronounced for high differentiation goods
   - Markets: widespread across destination markets

2. Most of this decline was driven by:
   - Continuously-operating firms switch from sterling to dollars or local currencies
   - Decline in within-currency trade intensity for sterling loyal firms

# Conclusions

Using transaction-level data from UK exporters, we document:

1. A swift decline in sterling use after the 2016 Brexit vote
   - Sterling share: 60% in 2016 $\Rightarrow$ 45% in 2019
   - High frequency: sterling share rose initially due to sticky prices
   - Type of products: more pronounced for high differentiation goods
   - Markets: widespread across destination markets

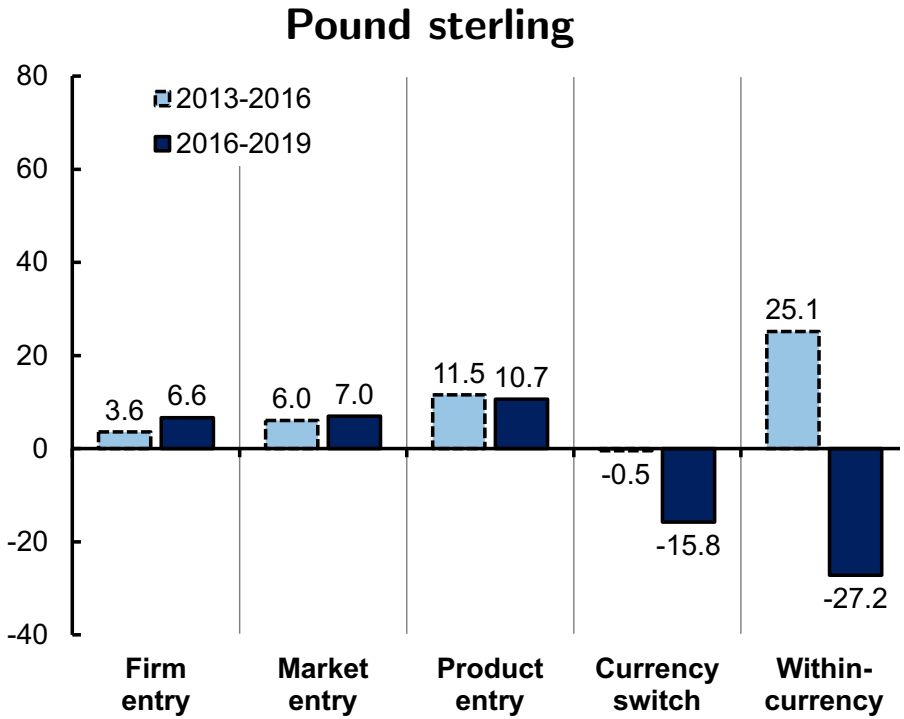
2. Most of this decline was driven by:
   - Continuously-operating firms switch from sterling to dollars or local currencies
   - Decline in within-currency trade intensity for sterling loyal firms

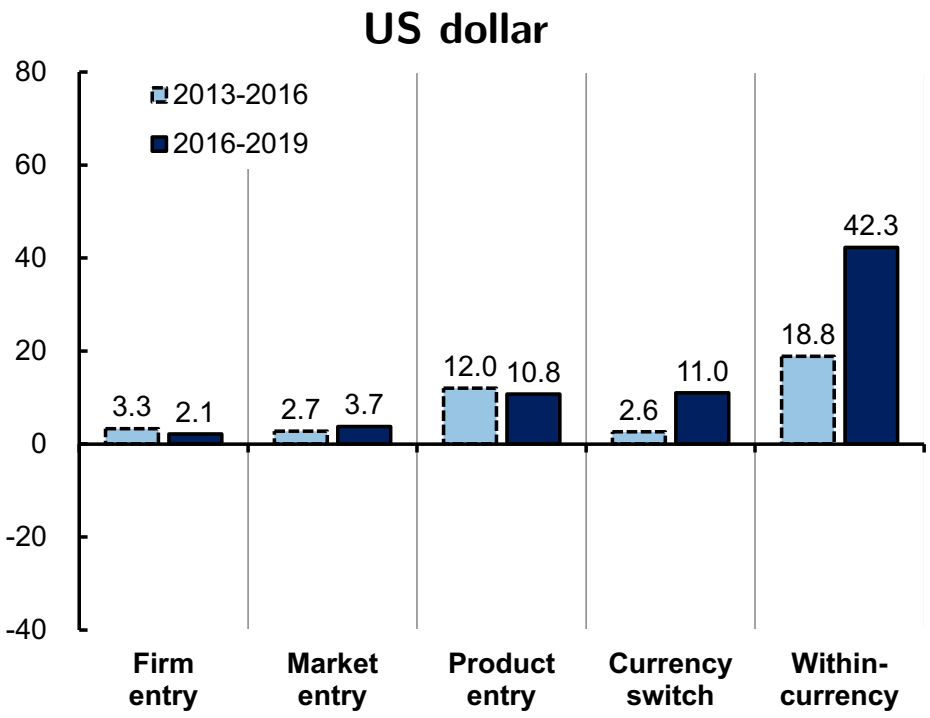
3. Significant role of firm heterogeneity
   - Firms with dollar imports were more likely to switch to dollar invoicing in exports
   - Firms exporting to markets with more US competitors were more likely to switch

# Appendix

# Comparing contribution of micro margins

## Transaction share measure

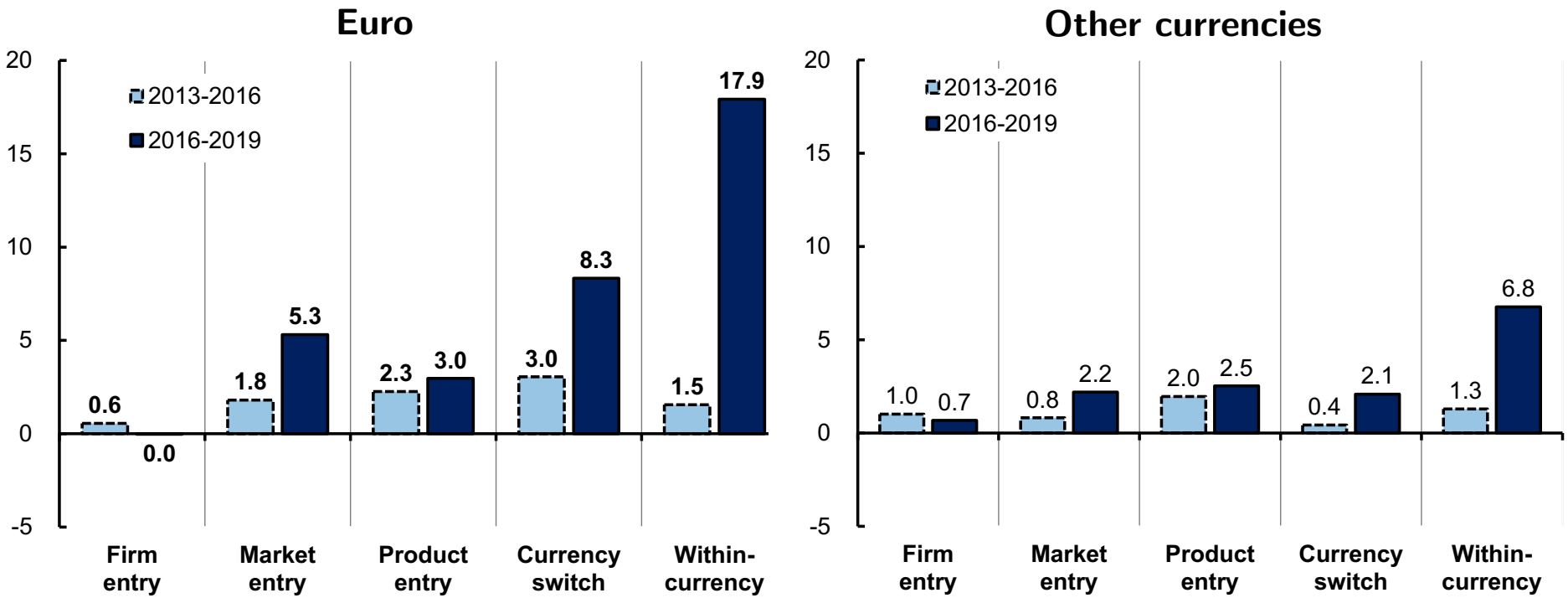



Back

# Comparing contribution of micro margins

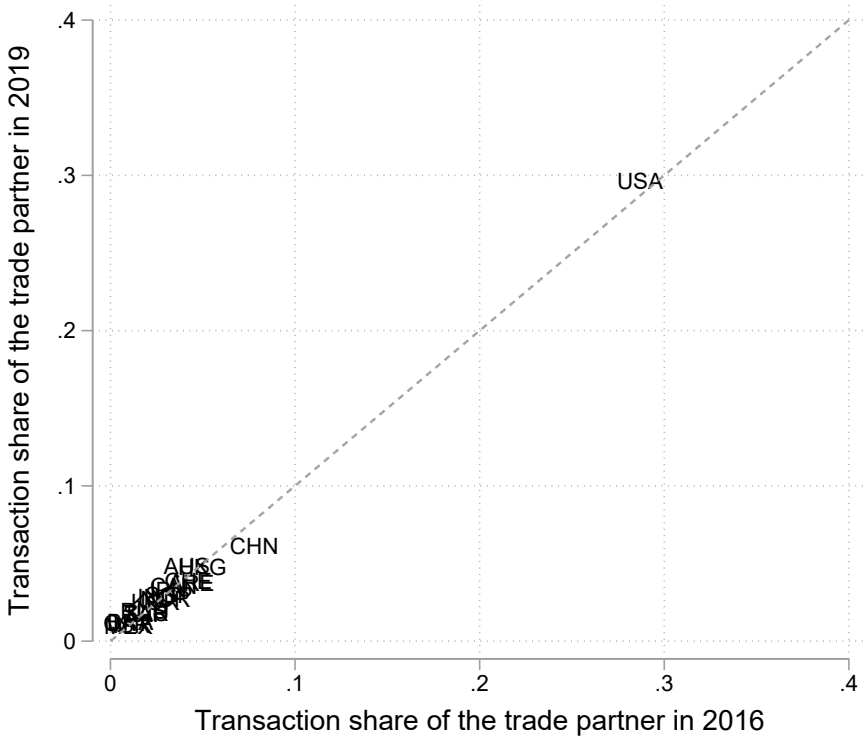
## Transaction share measure



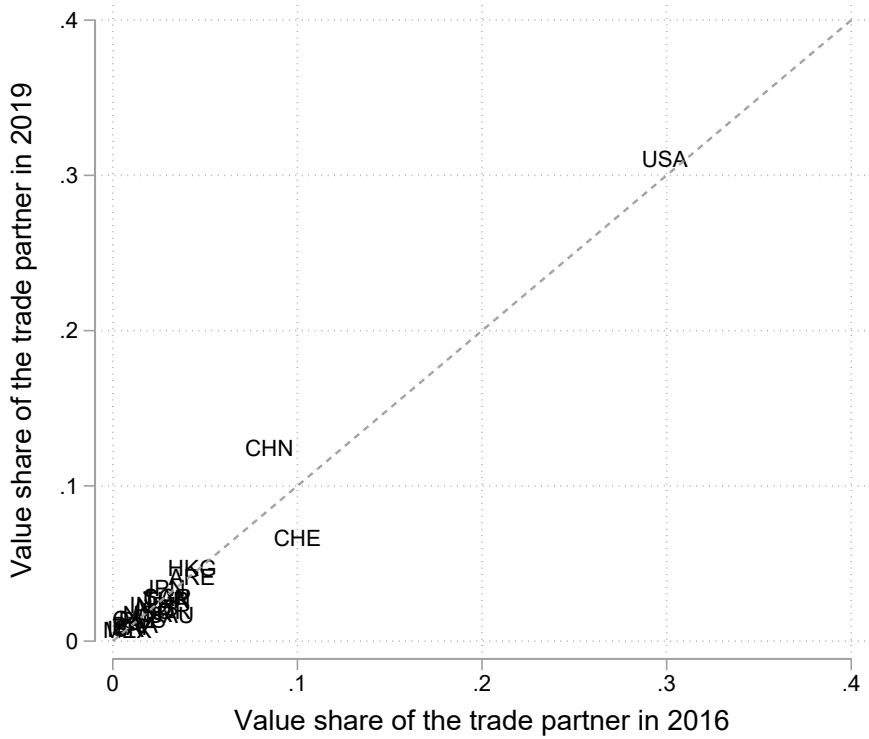

Back

# Trade share across markets

(a) Transaction share: 2019 vs 2016




(b) Value share: 2019 vs 2016




- No notable change in trade shares of these countries during 2016-2019

Back