Dominant currency dynamics:
Evidence on dollar-invoicing from UK exporters

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29 December 2021
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Motivation

- A stunning feature in the data is the abnormally high dollar usage in global trade (Gopinath 2015):
  - world exports: dollar share 40% $\gg$ US share 12%
  - world imports: dollar share 43% $\gg$ US share 9%

- Questions:
  - Which factors drive the invoicing choices of individual firms?
  - How do these factors contribute to the dollar’s global dominance?

- Why important?
  - Recent literature documents firms’ invoicing currencies to be a key predictor of exchange rate pass through.
  - Dollar dominance creates asymmetries in shock transmissions and monetary policies (Gopinath et al 2020; Mukhin 2021)
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A simple hypothesis:

- the US dominated world trade until the rise of China
- a firm using dollars in the past may want to use dollars again

Empirical evidence is scarce:

- transactional level data with invoicing currency is difficult to obtain
- existing studies focused on countries that are (already) dominated by dollars or using relative short panels

UK data present a unique opportunity to study this question:

- diverse invoicing choices: 90% of UK firms invoice in more than one currency
- a long panel of invoicing choices at the transaction level (2010-2016)
- significant rise of UK’s dollar-invoiced export share over time
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Aggregate invoicing shares of UK’s extra-EU trade

- Significant rise of dollar share in exports; relatively stable dollar share in imports
- We investigate firms’ invoicing choices using micro data of 2010-2016 and build a model to explain the evolution of the aggregate invoicing shares

This paper

Using UK trade transactions data (2010-2016), we document

- within-firm spillovers of dollar usage over time and across markets

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- **scale effect**: the more destinations using a currency, the lower the cost

- **joint market decisions**: the pricing and invoicing choices are inter-dependent across markets due to the firm-level cost of currency usage

- **path dependence**: a firm’s invoicing choice in a new market depends on its past invoicing choices in existing markets

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Contribution to the literature

Invoicing currency and ERPT:

Engel (2006); Gopinath, Itskhoki & Rigobon (2010); Devereux, Dong & Tomlin (2017); Auer, Burstein & Lein (2021); Chen, Chung & Novy (2021); Corsetti, Crowley & Han (2021)

Empirics and theory on invoicing choices:

Strategic complementarity: Goldberg & Tille (2008)

Operational hedging: Chung (2016); Amiti, Itskhoki & Konings (2020)

⇒ Document interdependence of invoicing choices across markets and over time

Dominant currency and international shock transmissions:

Gopinath et al (2020); Mukhin (2021)

⇒ Add a cost of currency use that captures dynamic and global spillovers
⇒ Quantify contribution of spillover effects to the rise of a dominant currency
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Roadmap

- Basic model with a fixed cost of currency use
- Empirical results
- Full model with joint invoicing decisions across markets
- Aggregate implications
Conceptual framework

We propose a framework that incorporates:

1. Key elements of invoicing currency choice from the literature
   - Oligopolistic competition à la Atkeson and Burstein (2008)
   - Cobb-Douglas production technology with multiple imported inputs
   - Preset price and invoicing choice à la Engel (2006) and Amiti, Itskhoki and Konings (2020)

2. New dynamic features observed among UK exporters
   - Introduce a (fixed) cost of using a foreign invoicing currency, which generates invoicing dynamics
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Firm’s pricing problem

The firm chooses an invoicing currency $c$ and its one-period ahead pre-set price $\bar{p}_{fd}^c$ to maximize its expected profit in each destination $d$:

$$\max_c \left\{ \max_{\bar{p}_{fd}^c} \mathbb{E} \left[ \pi_{fd}(\bar{p}_{fd}^c - e_d^c) \right] - F_{fd}^c \right\}$$

where $F_{fd}^c$ is the cost of using currency $c$ in destination $d$, e.g.

- cost of conducting transactions in a foreign currency
- cost of managing the risks in holding foreign currencies
- cost of hiring staffs to take care of the above issues

$\Rightarrow$ Functional form of $F_{fd}^c$ to be investigated empirically.

Solution:

- without cost $\rightarrow$ choose currency that most closely mimics its optimal flexible price
- with cost $\rightarrow$ may deviate from the above solution
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Optimal flexible price setting

Log optimal flexible price in local currency:

\[ p_{fd} \propto \frac{\Gamma_{fd}}{1 + \Gamma_{fd}} p_{-fd} + \frac{1}{1 + \Gamma_{fd}} \left( \sum_{j} \psi^j_f e_j - e_d \right) \]

where

- \( p_{fd} \): Log optimal price of firm \( f \) in local currency in destination \( d \)
- \( p_{-fd} \): Log competitors’ prices
- \( e_j \): Log exchange rate in units of producer currency per unit of currency \( j \)
- \( \psi^j_f \): Share of imported inputs invoiced in currency \( j \) in firm’s production cost
- \( \Gamma_{fd} \equiv \Gamma(S_{fd}; \rho, \eta) \): Markup elasticity to price, which is governed by firm \( f \)’s market share in destination \( d \) \((S_{fd})\), elasticity of substitution within \((\rho)\) and across sectors \((\eta)\).
Invoicing currency choice

The expected profit difference of choosing dollars relative to currency $c$ is:

$$
\mathbb{E}[\Pi_{fd}^{USD}] - \mathbb{E}[\Pi_{fd}^{c}] \propto \lambda_{fd} \left[ \frac{\Gamma_{fd}}{1 + \Gamma_{fd}} (\zeta^{USD}_{(-f)d} - \zeta^{c}_{(-f)d}) + \frac{1}{1 + \Gamma_{fd}} (\psi_{USD}^{f} - \psi_{c}^{f}) \right] - (F_{fd}^{USD} - F_{fd}^{c})
$$

where

- $\mathbb{E}[\Pi_{fd}^{c}] \equiv \mathbb{E}[\pi_{fd}^{c}] - F_{fd}^{c}$: firm $f$'s expected profit from invoicing in currency $c$
- $\zeta^{c}_{(-f)d}$: firm $f$'s competitors' invoicing share of currency $c$
- $\psi_{c}^{f}$: the firm's share of imports invoiced in currency $c$
- $\Gamma_{fd} \equiv \Gamma(S_{fd}; \rho, \eta)$: Markup elasticity depends on market share & elasticities of substitution within ($\rho$) & across sectors ($\eta$)

The firm is more likely to use dollars if

1. more competitors use dollars - to keep its relative prices stable
2. it has a larger dollar-invoiced import share - to hedge the exchange rate risk
3. the cost of using dollars is low relative to alternatives
Empirical Analysis

We use the universe of extra-EU trade transactions of British firms from Her Majesty’s Revenue and Customs (HMRC) over 2010-2016.

We estimate our empirical specifications using two samples

1. Full sample to document the static determinants of currency choices
2. A subsample of new markets focusing on dollar dynamics
Empirical specification

Linear probability model for dollar-invoicing by UK exporters (2010-2016):

\[
\mathbb{1}_{USD_{fhdt}} = \beta_1 \zeta_{USD(-f)idt} + \beta_2 \psi_{USD_{ft}} + \beta_3 \psi_{Euro_{ft}} + \beta_4 \psi_{LCI_{ft}} + \gamma \text{size}_{ft} + \text{FEs} + \nu_{fhdt}
\]

where

- \( f \) (firm), \( h \) (product), \( i \) (industry), \( d \) (destination), \( t \) (year)
- \( \mathbb{1}_{USD_{fhdt}} \): equal to one if dollar-invoicing and zero otherwise
- \( \zeta_{USD(-f)idt} \): strategic complementarity measure
  - competitors’ dollar-invoicing export share
  - instrumented using competitors’ dollar-invoiced import shares
- \( \psi_{USD_{ft}}, \psi_{Euro_{ft}}, \psi_{LCI_{ft}} \): operational hedging measures
  - dollar-, euro- and destination- currency invoiced import shares
- \( \text{size}_{ft} \): total export value (in logs) to proxy for firm size
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Addressing endogeneity of competitors’ currency choice

- We build two instruments for the UK competitors’ dollar invoicing export share $\zeta^\text{USD}_{(-f)idt}$:

  1. UK competitors’ average dollar import share

     \[
     \psi^\text{USD}_{(-f)idt} = \sum_{k \neq f} \frac{S_{kidt}}{1 - S_{fidt}} \times \psi^\text{USD}_{kt}
     \]

  2. UK competitor’s average firm size

     \[
     \text{Size}_{(-f)idt} = \sum_{k \neq f} \frac{S_{kidt}}{1 - S_{fidt}} \times \text{Size}_{kt}
     \]

   where $S_{fidt}$ denotes the firm $f$’s export share in 6-digit HS industry $i$ to destination $d$ in year $t$ among all UK firms ($S_{fidt} = \frac{\text{Export}_{fidt}}{\sum_i \text{Export}_{fidt}}$)
Strategic complementarity and operational hedging

<table>
<thead>
<tr>
<th></th>
<th>(1) OLS</th>
<th>(2) OLS</th>
<th>(3) OLS</th>
<th>(4) IV</th>
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</thead>
<tbody>
<tr>
<td><strong>DepVar:</strong> $\mathbb{1}_{fhdt}^{USD}$</td>
<td></td>
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</tr>
<tr>
<td>UK competitors' dollar invoicing share</td>
<td>0.319*** (0.001)</td>
<td>0.041*** (0.001)</td>
<td>0.026*** (0.001)</td>
<td>0.076*** (0.004)</td>
</tr>
<tr>
<td>Dollar import share</td>
<td>0.164*** (0.000)</td>
<td>0.164*** (0.000)</td>
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<tr>
<td>Euro import share</td>
<td>-0.009*** (0.001)</td>
<td>-0.009*** (0.001)</td>
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<tr>
<td>Destination currency import share</td>
<td>-0.018*** (0.001)</td>
<td>-0.018*** (0.001)</td>
<td></td>
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<tr>
<td>Firm size</td>
<td>0.016*** (0.000)</td>
<td>0.016*** (0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>4,719,628</td>
<td>3,052,546</td>
<td>4,719,628</td>
<td>4,719,628</td>
</tr>
<tr>
<td>Firm-Product-Year FE</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Country-Year FE</td>
<td>✓</td>
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</table>

**Strategic complementarity:** more likely to use dollars if more competitors use dollars

**Operational hedging:** more likely to use dollars if the firm uses lots of dollar inputs

**Heterogeneity:** by firm size, by high and low differentiation goods
Dollar invoicing in new destinations

Using a sample of entrants into new destinations, we examine how previous experience with dollar invoicing affects the invoicing choice in new markets:

\[
\mathbb{1}_{fhdt} = \beta_1 \zeta_{(-f)idt} + \beta_2 \psi_{USD} + \beta_3 \psi_{Euro} + \beta_4 \psi_{LCI} \\
+ \left( \delta \omega_{USD}^{ft-1} \text{ or } \sum_{l=0}^{6} \eta_l Spell_{USD,l}^{ft-1} \right) + \gamma_{size}^{ft} + \text{FEs} + \nu_{fhdt}
\]

- **Variables capturing dynamics** due to unobserved factors
  - \( \omega_{USD}^{ft-1} \): dollar export share of firm \( f \) in year prior to entry into new market
  - \( Spell_{USD,l}^{ft-1} = 1 \) if the firm has used dollars for \( l \) years in its existing markets prior to entry into new market

- **Variables capturing static incentives**
  - \( \zeta_{(-f)idt} \): strategic complementarity measure
  - \( \psi_{USD}^{ft}, \psi_{Euro}^{ft}, \psi_{LCI}^{ft} \): operational hedging measures
Impact of prior dollar invoicing on new markets (1)

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<td>UK competitors’ dollar invoicing share</td>
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<td>Firm size</td>
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<tr>
<td>Dollar share in total exports (t-1)</td>
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</tbody>
</table>

A 10 percentage point rise in a firm’s dollar-invoicing share at $t-1$ implies a 2.9 percentage point increase in the probability of dollar invoicing in a new destination.

- strategic complementarities slightly smaller
- operational hedging motive slightly smaller

Note: Observations are of the first-year of exporting in each firm-destination pair. All results are based on 2SLS.
Impact of prior dollar invoicing on new markets (2)

\[ \mathbb{I}_{fhdt}^{USD} = \sum_{l=0}^{6} \eta_l Spell_{ft-1}^{USD,l} + \beta_1 \zeta_{USD}^{(-f)idt} + \beta_2 \psi_{ft}^{USD} + \beta_3 \psi_{ft}^{Euro} + \beta_4 \psi_{ft}^{LCI} + \gamma size_{ft} + FEs + \nu_{fhdt} \]

- Dollar spell length is the number of years the firm has invoiced any foreign sales in dollars prior to its entry into the new market.
- Dollar invoicing probability in a new market is increasing in the dollar spell length.
Impact of prior dollar invoicing on new markets (3)

\[ \mathbb{1}_{fhdt} = \sum_{k=1}^{5} \sum_{l=0}^{k} \eta_{k,l} \text{ExportTenure}_{ft-1}^k \times Spell_{USD,l}^{ft-1} + \beta_1 \zeta_{USD}(-f)_{idt} + \beta_2 \psi_{USD}^{ft} + \beta_3 \psi_{Euro}^{ft} + \beta_4 \psi_{LCI}^{ft} + \gamma size_{ft} + \text{FEs} + \nu_{fhdt} \]

- Estimates obtained by interacting the dollar spell length dummies \( Spell_{USD,l}^{ft-1} \) with export tenure dummies \( \text{ExportTenure}_{ft-1}^k \).
- Dollar invoicing probability is increasing in dollar spell length within each export tenure.
Roadmap

How can we build a model that explains the newly documented dynamic effects and the aggregate evolution of dollar shares?

⇒ Full model with joint invoicing decisions across markets
⇒ Aggregate implications
Shared fixed cost and joint decisions

- **Shared global** fixed cost of using each currency $c$

\[
F^c_{ft} = \begin{cases} 
\frac{\kappa_0^c}{\sum_d \mathbb{1}_{ft}^c} & \text{if } \sum_d \mathbb{1}_{ft}^c > 0 \\
0 & \text{if } \sum_d \mathbb{1}_{ft}^c = 0 
\end{cases}
\]

where $\sum_d \mathbb{1}_{ft}^c = \text{number of markets where the firm uses invoicing currency } c$. ⇒ The cost of using dollars $F^\text{USD}_{ft}$ decreases as the firm adds more dollar markets.

- **Joint market decisions**

\[
\max_{c_1t, \ldots, c_dt, \ldots, c_Dt} \left\{ \sum_{d \in \mathcal{D}_{ft}} \left[ \max_{\bar{\pi}_{ft}} \mathbb{E}\pi_{ft} \left( \bar{p}_{ft}^{c_dt} - e^{c_dt}_{ft} \right) - F^c_{ft} \left( c_1t, \ldots, c_dt, \ldots, c_Dt \right) \right] \right\}
\]

⇒ Invoicing and pricing choices are inter-dependent across markets.
Shared fixed cost and joint decisions

- Shared **global** fixed cost of using each currency $c$

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where $\sum_d \mathbb{1}_{ft}^c = \text{number of markets where the firm uses invoicing currency } c$. \( \Rightarrow \text{The cost of using dollars } F_{ft}^{USD} \text{ decreases as the firm adds more dollar markets.} \)

- Joint market decisions

\[
\max_{c_{1t}, \ldots, c_{dt}, \ldots, c_{Dt}} \left\{ \sum_{d \in D_{ft}} \left[ \max_{\bar{p}_{fdt}^c} \mathbb{E}_\pi_f \left( \bar{p}_{fdt}^c - e_{dt}^c \right) - F_{ft}^c (c_{1t}, \ldots, c_{dt}, \ldots, c_{Dt}) \right] \right\}
\]

\( \Rightarrow \text{Invoicing and pricing choices are inter-dependent across markets.} \)
Shared fixed cost and joint decisions

- Shared **global** fixed cost of using each currency $c$

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- Joint market decisions

\[
\max_{c_1t, \ldots, c_dt, \ldots, c_Dt} \left\{ \sum_{d \in D_{ft}} \left[ \max_{\bar{p}_{ft}} \mathbb{E} \pi_{ft} \left( \bar{p}_{ft}^{c_dt} - e^{c_dt}_{dt} \right) - F_{ft}^{c_dt} (c_1t, \ldots, c_dt, \ldots, c_Dt) \right] \right\}
\]

\(\Rightarrow\) Invoicing and pricing choices are inter-dependent across markets.
Currency choice in new markets

- Assume firms expand globally by adding one foreign market in each period.

- We assume, after controlling for the observable factors of strategic complementarity $\zeta(-f)_d$ and operational hedging $\psi_{fd}$, the expected operational profit differences are uniformly distributed for each destination:

$$
\mathbb{E}[\pi^\text{USD}_{fd} - \pi^\text{PCI}_{fd} | \zeta(-f)_d, \psi_{fd}] \sim U(0, 1);
$$
$$
\mathbb{E}[\pi^\text{LCI}_{fd} - \pi^\text{PCI}_{fd} | \zeta(-f)_d, \psi_{fd}] \sim U(0, 1)
$$

- Firm $f$ chooses dollars in a new destination $d$ if

$$
\mathbb{E}[\pi^\text{USD}_{fd} - \pi^\text{PCI}_{fd} | \zeta(-f)_d, \psi_{fd}] > F^\text{USD}_f(c_1, ..., c_d) - 0 \quad \text{and}
$$
$$
\mathbb{E}[\pi^\text{USD}_{fd} - \pi^\text{LCI}_{fd} | \zeta(-f)_d, \psi_{fd}] > F^\text{USD}_f(c_1, ..., c_d) - F^\text{LCI}_f(c_1, ..., c_d)
$$
Empirical vs model: dollar invoicing by export tenure

(a) Empirical Estimates

(b) Model Estimates

The shared global cost does a reasonably good job in replicating the patterns:

- The dollar spell length within an export tenure is indicative of the profitability of dollar usage in the firm's existing markets
- The higher the profitability of using dollars in other markets → the higher the probability the cost of using dollars can be shared → the higher the probability of using dollars in a new market
Analytical approximation to characterize the evolution of aggregate invoicing shares

- Joint decisions and shared global fixed cost

\[
\max_{c_{1t}, \ldots, c_{Dt}} \left\{ \sum_{d \in D_{ft}} \left[ \max_{p_{fd_{dt}}^c} \mathbb{E}_{\pi_{fd_{dt}}} \left( p_{fd_{dt}}^c - e_{dt}^c \right) - F_{ft}^c \left( c_{1t}, \ldots, c_{dt}, \ldots, c_{Dt} \right) \right] \right\}
\]

→ No closed form solution → can only be solved numerically

- Analytically, we approximate the desired dynamics with:

\[
F(\omega_{ft-1}^c) = \kappa_1 - \kappa_2 \cdot \omega_{ft-1}^c
\]

- \(\kappa_1\) initial cost of invoicing in \(c\) (\(0 < \kappa_1 < 1\))
- \(\kappa_2\) degree of cost reduction due to prior usage (\(0 < \kappa_2 < \kappa_1\))
- \(\omega_{ft-1}^c\) invoicing share of currency \(c\) in firm \(f\)'s global exports at \(t - 1\)
Analytical approximation to characterize the evolution of aggregate invoicing shares

- Joint decisions and shared global fixed cost

\[
\max_{c_{1t}, \ldots, c_{Dt}} \left\{ \sum_{d \in D_{ft}} \left[ \max_{\bar{p}_{ft}^{cdt}} \mathbb{E} \pi_{ft}^{cdt} \left( \bar{p}_{ft}^{cdt} - e_{cdt} \right) - F_{ft}^{cdt} \left( c_{1t}, \ldots, c_{dt}, \ldots, c_{Dt} \right) \right] \right\}
\]

→ No closed form solution → can only be solved numerically

- Analytically, we approximate the desired dynamics with:

\[
F(\omega_{ft-1}^c) = \kappa_1 - \kappa_2 \cdot \omega_{ft-1}^c
\]

- $\kappa_1$ initial cost of invoicing in $c$ ($0 < \kappa_1 < 1$)
- $\kappa_2$ degree of cost reduction due to prior usage ($0 < \kappa_2 < \kappa_1$)
- $\omega_{ft-1}^c$ invoicing share of currency $c$ in firm $f$’s global exports at $t - 1$
The probability of dollar-invoicing in a new market can be derived as:

\[ T(\omega_{ft-1}^{USD}) = \frac{1}{2}(1 + \kappa_2 \omega_{ft-1}^{USD})^2 - \frac{1}{2}(\kappa_1)^2 \]

⇒ No dynamics if \( \kappa_2 = 0 \)
⇒ Rising share if \( \kappa_2 > 0 \)
⇒ Dollar-only eqm if \( \kappa_2 \) is too big

Note: \( \kappa_1 = 0.6 \).
The probability of dollar-invoicing in a new market can be derived as:

\[ T(\omega_{f_{t-1}}^{USD}) = \frac{1}{2} (1 + \kappa_2 \omega_{f_{t-1}}^{USD})^2 - \frac{1}{2} (\kappa_1)^2 \]

\[ \Rightarrow \text{No dynamics if } \kappa_2 = 0 \]
\[ \Rightarrow \text{Rising share if } \kappa_2 > 0 \]
\[ \Rightarrow \text{Dollar-only eqm if } \kappa_2 \text{ is too big} \]

Note: \( \kappa_1 = 0.6 \).
The probability of dollar-invoicing in a new market can be derived as:

\[ T(\omega_{USD}^t) = \frac{1}{2}(1+\kappa_2\omega_{USD}^{t-1})^2 - \frac{1}{2}(\kappa_1)^2 \]

\[ \Rightarrow \text{No dynamics if } \kappa_2 = 0 \]
\[ \Rightarrow \text{Rising share if } \kappa_2 > 0 \]
\[ \Rightarrow \text{Dollar-only eqm if } \kappa_2 \text{ is too big} \]

Note: \( \kappa_1 = 0.6 \).
In the steady state, aggregate level dollar invoicing share is:

\[
\bar{\omega}_{\text{USD}} = \frac{1 - \kappa_2 - \sqrt{(\kappa_1 \kappa_2)^2 - 2\kappa_2 + 1}}{(\kappa_2)^2}
\]

⇒ the positive feedback ($\kappa_2 > 0$) does not necessarily lead to an ever-increasing dollar invoicing share.
Functional forms of the cost of currency use

Dollar invoicing probability is increasing in Dollar Spell Length when fixed cost modelled as

- **Reduced form:**
  \[ F(\omega_{ft-1}) = \kappa_1 - \kappa_2 \cdot \omega_{ft-1} \]

- **Shared global cost:**
  \[ F^{\text{c}}_{ft} = \sum_d \frac{k_d^c}{1 - r_{ft}} \]

One-time sunk and per period fixed costs cannot replicate the empirical pattern.

Notes: Estimates based on simulated data of 200,000 firms with 10 destinations over 10 periods.
Counterfactual analyses: aggregate implications (1)

- **Aggregate dollar invoicing share of extra-EU British exports:**
  - 2010: 31.0%
  - 2019: 48.2%

- Simulate model with reduced form form fixed cost under different cost reduction parameters.

\[
F(\omega^c_{ft-1}) = \kappa_1 - \kappa_2 \cdot \omega^c_{ft-1}
\]
Importance of the feedback from prior dollar use

Aggregate dollar invoicing share of British exporters would be 7% lower without the dynamic channel.
Counterfactual analyses: aggregate implications (2)

- **Spillover effects of destination-specific shocks:**
  - We simulate the model for 20 years. Firms add one destination in each year.
  - A positive shock is given to the profitability of using dollars in destination 1 at year 10.
  - Direct impact: dollar share of destination 1 increases
  - Indirect impact: dollar share of non-shocked destinations rises over time
Notes: The model is simulated for 20 years. Firms add one destination in each period. A positive shock is given to the profitability of using dollars in destination 1 at year 10.
Conclusions

Using transaction-level data for UK exporters over 2010-2016, we uncover a new dynamic channel for dollar-invoicing choices:

- Document firm-level patterns of invoicing dynamics
- Propose a model with a firm-level cost of currency uses
- Results suggest spillover effects over time and across destinations
- We estimate the dollar share of UK’s extra-EU exports would be 7% lower (0.39 → 0.32) without the spillover effect.
# Summary statistics of the main estimation sample

<table>
<thead>
<tr>
<th></th>
<th>Obs</th>
<th>Un-weighted</th>
<th>Weighted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std</td>
<td>Mean</td>
</tr>
<tr>
<td>Dollar invoicing probability</td>
<td>4,719,628</td>
<td>0.229</td>
<td>0.420</td>
</tr>
<tr>
<td>Dollar import share</td>
<td>4,719,628</td>
<td>0.571</td>
<td>0.391</td>
</tr>
<tr>
<td>Euro import share</td>
<td>4,719,628</td>
<td>0.055</td>
<td>0.158</td>
</tr>
<tr>
<td>Destination currency import share</td>
<td>4,719,628</td>
<td>0.113</td>
<td>0.287</td>
</tr>
<tr>
<td>UK competitors' dollar invoicing share</td>
<td>4,719,628</td>
<td>0.254</td>
<td>0.285</td>
</tr>
<tr>
<td>UK competitor’s dollar import share</td>
<td>4,719,628</td>
<td>0.578</td>
<td>0.246</td>
</tr>
</tbody>
</table>

Notes: ‘Weighted’ indicates that the variables are weighted by export values at the firm-product-destination-year level. Data source: HMRC Overseas Trade in Goods Statistics, UK’s extra-EU export transactions, 2010-2016.
## Dollar invoicing probability at entry year

<table>
<thead>
<tr>
<th>Dep. Var.: $1_{USD}^{hdt}$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK competitors’ dollar invoicing share</td>
<td>0.069***</td>
<td>0.071***</td>
<td>0.071***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Dollar import share</td>
<td>0.093***</td>
<td>0.103***</td>
<td>0.103***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Euro import share</td>
<td>-0.014***</td>
<td>-0.017***</td>
<td>-0.017***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Destination currency import share</td>
<td>0.022***</td>
<td>0.014***</td>
<td>0.015***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.013***</td>
<td>0.013***</td>
<td>0.013***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Dollar share in total export (t-1)</td>
<td>0.292***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1)</td>
<td></td>
<td>0.025***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1) = 1</td>
<td></td>
<td>0.039***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1) = 2</td>
<td></td>
<td>0.060***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1) = 3</td>
<td></td>
<td>0.082***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1) = 4</td>
<td></td>
<td>0.097***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1) = 5</td>
<td></td>
<td>0.116***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Dollar invoicing years (t-1) = 6</td>
<td></td>
<td>0.140***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.005)</td>
<td></td>
</tr>
</tbody>
</table>

Observations: 1,181,074  
Country-Year FE: ✓  
Product-Year FE: ✓  
Hansen J-stat [p-value]: 0.0204 [0.886]  
Weak IV F-stat: 15,143 

Note: Observations are of the first-year of exporting in each firm-destination pair. All results are based on 2SLS. Robust standard errors in parentheses. Data source: HMRC Overseas Trade in Goods Statistics, UK’s extra-EU export transactions, 2010-2016.
Variable construction

- **(Strategic complementarity)** $\zeta_{USD}^{(\neg f)idt}$ is the average dollar invoicing share in exports of UK firms excluding firm $f$ at 6-digit HS industry $i$ to destination $d$ in year $t$:

$$\zeta_{USD}^{(\neg f)idt} = \frac{\sum_{k \neq f} \text{Export}_{kidt}^{USD}}{\sum_c \sum_{k \neq f} \text{Export}_{kidt}^c}$$

where $\text{Export}_{fidt}^c$ denotes firm $f$'s export value invoiced in currency $c$ at 6-digit HS industry $i$ to country $d$ in year $t$.

- **(Operational hedging)** $\psi_{ft}^c$ is the share of currency $c$ in firm $f$'s total import in year $t$ and $c \in \{\text{USD, Euro, LCI}\}$:

$$\psi_{ft}^c = \frac{\text{Import}_{ft}^c}{\sum_c \text{Import}_{ft}^c}$$
Comparison of Dynamic Predictions

Notes: Estimates based on simulated data of 200,000 firms with 10 destinations over 10 periods. Dollar Spell Length = the number of dollar invoicing years prior entry.
Reduced form setting

Notes: Estimates based on simulated data of 200,000 firms with 10 destinations over 10 periods. We calibrate $\kappa_1 = 0.6$ and $\kappa_2 = 0.18$. 

Exporting Years
- O 1
- □ 2
- □ 3
- △ 4
- . 5
Heterogeneity over market power

<table>
<thead>
<tr>
<th></th>
<th>(1) Baseline</th>
<th>(2) Large</th>
<th>(3) Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK competitors' dollar invoicing share</td>
<td>0.076***</td>
<td>0.100***</td>
<td>0.046***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Dollar import share</td>
<td>0.164***</td>
<td>0.163***</td>
<td>0.160***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Euro import share</td>
<td>-0.009***</td>
<td>-0.012***</td>
<td>-0.012***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Destination curr. import share</td>
<td>-0.018***</td>
<td>-0.042***</td>
<td>-0.010***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.016***</td>
<td>0.013***</td>
<td>0.018***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>4,719,628</td>
<td>2,359,085</td>
<td>2,354,927</td>
</tr>
<tr>
<td>Country-Year FE</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Product-Year FE</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Hansen J-stat</td>
<td>0.156</td>
<td>0.003</td>
<td>2.389</td>
</tr>
<tr>
<td>[P-value]</td>
<td>[0.693]</td>
<td>[0.956]</td>
<td>[0.122]</td>
</tr>
<tr>
<td>Weak IV F-stat</td>
<td>69,591</td>
<td>36,632</td>
<td>39,551</td>
</tr>
</tbody>
</table>

⇒ Larger firms (based on median export value in a destination) exhibit a stronger tendency to align their currency with their competitors.
## Heterogeneity over product differentiation

<table>
<thead>
<tr>
<th></th>
<th>(1) Homog. (Rauch)</th>
<th>(2) Diff. (Rauch)</th>
<th>(3) Low diff. (CCHS)</th>
<th>(4) High diff. (CCHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK competitors’ dollar invoicing share</td>
<td>0.198** (0.092)</td>
<td>0.075*** (0.004)</td>
<td>0.091*** (0.005)</td>
<td>0.043*** (0.006)</td>
</tr>
<tr>
<td>Dollar import share</td>
<td>0.102*** (0.011)</td>
<td>0.164*** (0.000)</td>
<td>0.150*** (0.001)</td>
<td>0.182*** (0.001)</td>
</tr>
<tr>
<td>Euro import share</td>
<td>-0.015 (0.035)</td>
<td>-0.009*** (0.001)</td>
<td>-0.010*** (0.001)</td>
<td>-0.010*** (0.002)</td>
</tr>
<tr>
<td>Destination currency import share</td>
<td>0.081*** (0.030)</td>
<td>-0.019*** (0.001)</td>
<td>-0.011*** (0.002)</td>
<td>-0.029*** (0.002)</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.007*** (0.001)</td>
<td>0.016*** (0.000)</td>
<td>0.017*** (0.000)</td>
<td>0.015*** (0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>10,663</td>
<td>4,708,964</td>
<td>2,611,076</td>
<td>1,883,102</td>
</tr>
<tr>
<td>Country-Year FE</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Product-Year FE</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Hansen J-stat</td>
<td>0.179 [0.672]</td>
<td>0.154 [0.695]</td>
<td>0.245 [0.621]</td>
<td>0.0368 [0.848]</td>
</tr>
<tr>
<td>Weak IV F-stat</td>
<td>89</td>
<td>69,553</td>
<td>35,952</td>
<td>29,562</td>
</tr>
</tbody>
</table>

⇒ The motive is stronger for less differentiated/more substitutable goods based on both Rauch (1999) and Corsetti, Crowley, Han and Song (2018).