Dominant Currencies

How firms choose currency invoicing and why it matters
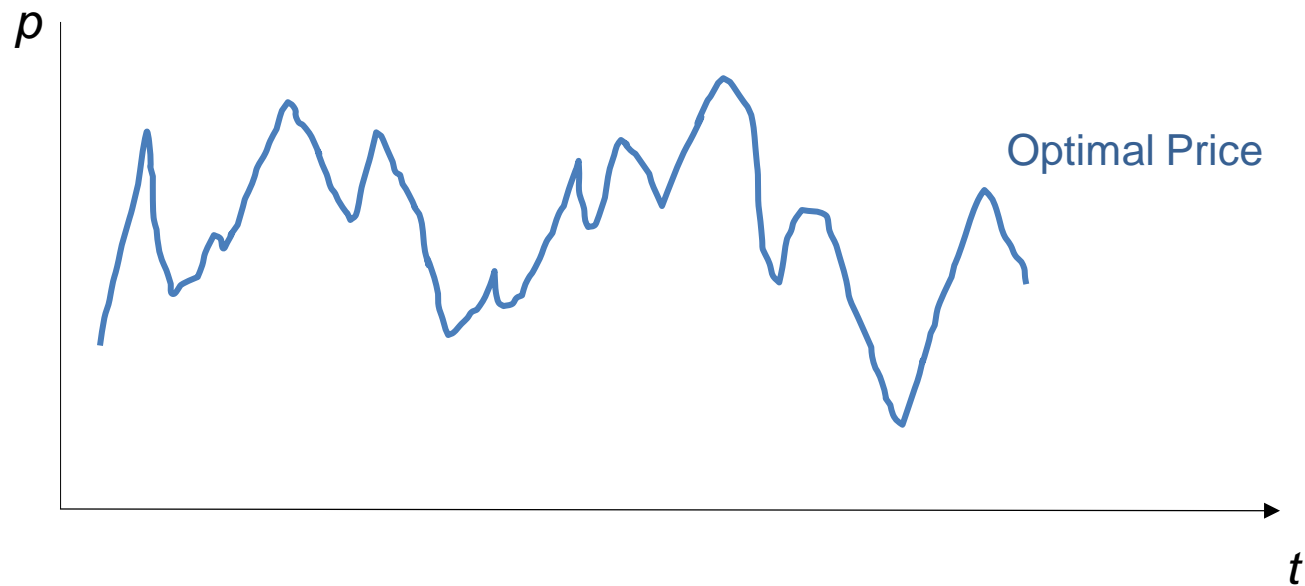
Amiti, Itskhoki, Koening

Discussion

Philip Sauré

Understanding Inflation Dynamics - National Bank of Belgium, October 25-26 2018

Outline

- Summary and Appraisal
- Comments
- Small Points

Summary

Illustration

All prices expressed in destination currency

Summary

Optimal Prices

(All variables expressed in destination currency.)

- Firm i's optimal price maximizes profits in destination market

$$\tilde{p}_{it}^{*} = \underset{p}{arg\,max}\,\Pi_i(p|\Omega_t)$$

...depends on time through the state of the world Ω_t.

JG|U

Summary

Optimal Prices

(All variables expressed in destination currency.)

- Firm i's optimal price maximizes profits in destination market

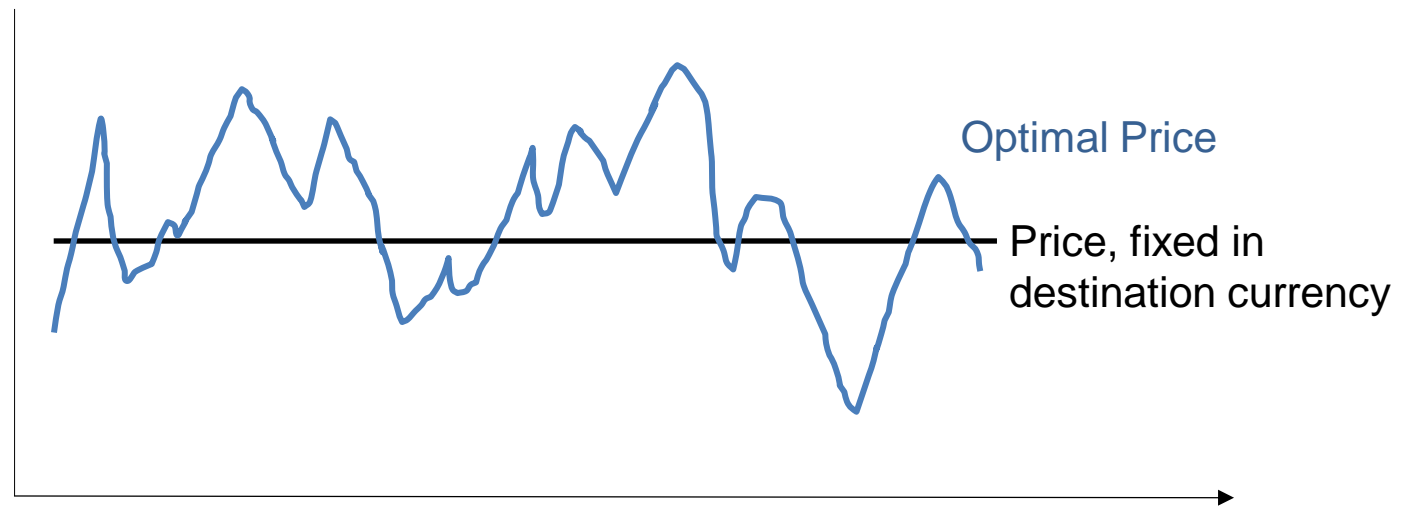$$\tilde{p}_{it}^* = \underset{p}{argmax}\, \Pi_i(p|\Omega_t)$$

  …depends on time through the state of the world Ω_t.

- The actual price $\bar{p}_i$, fixed in destination currency (nominal rigidities), deviates from the optimal price within the period it is not adjusted:

$$\Delta p_{it} = \tilde{p}_{it}^* - \bar{p}_i$$

JG|U

Summary

Illustration

All prices expressed in destination currency

Optimal Price

Price, fixed in destination currency

In 2nd order approx. the (expected) losses are proportional to the sum of squared deviations from optimum (variance).

JG|U

Illustration

Other invoicing currency possible (expressed in destination currency)

Optimal Price

Price, fixed in destination currency

Price, fixed in currency *I1*

Illustration

Other invoicing currency possible (expressed in destination currency)

Optimal Price

Price, fixed in destination currency

Price, fixed in currency *I1*

Price, fixed in currency *I2*

Additional Material

Illustration

Other invoicing currency possible (expressed in destination currency)

Optimal Price

Price, fixed in destination currency

Price, fixed in currency $I1$

Price, fixed in currency $I2$

In 2nd order approx. the (expected) losses are proportional to the sum of squared deviations from optimum (variance).

JG|U

Summary
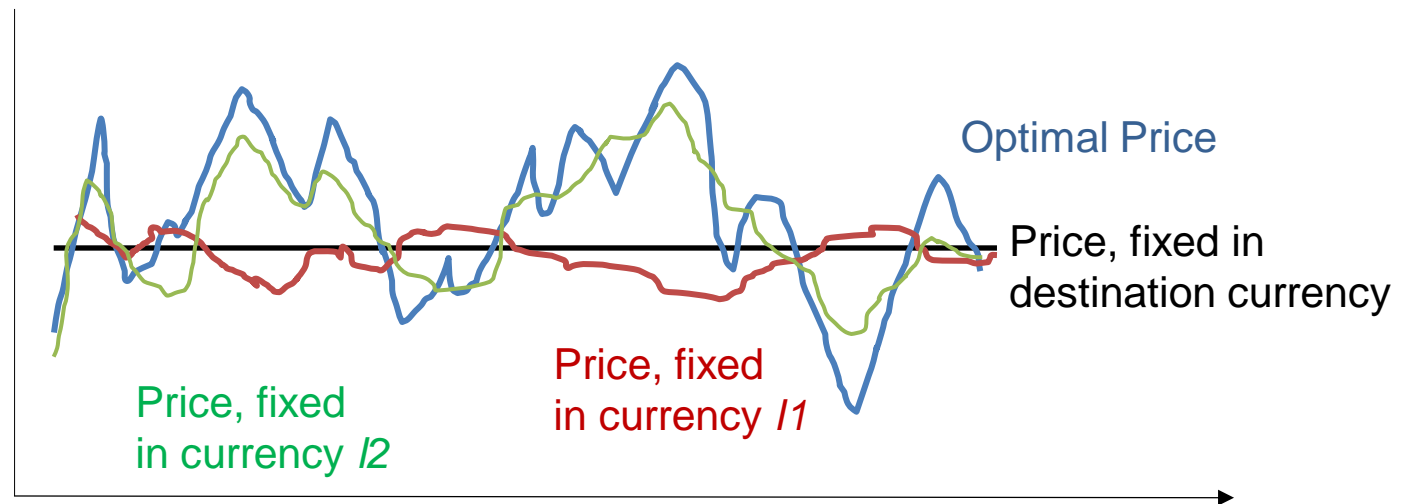
Optimal Currency

- Price fixed in currencies l (converted to destination currency):

$$\bar{p}_{it}^l = \bar{p}_i^l - e_{lt}$$

e_{lt} - log exchange rate between destination currency and currency l.

- Optimal currency reduces variance of deviation:

$$\Delta p_{it}^l = \tilde{p}_{it}^* - \bar{p}_i^l + e_{lt}$$

Lemma 2:

$$\underset{l}{argmin} \quad var(\tilde{p}_{it}^* + e_{lt})$$

Summary

Example: Constant Demand Elasticity

- Optimal price is markup over marginal cost. In logs with constant markups

$$\tilde{p}_{it}^* = \mu_i + mc_{it}$$

the optimal currency is the one that hedges fluctuations in mc_{it}.

$$\underset{l}{argmin} \quad var(mc_{it} + e_{lt})$$

(Recall: mc_{it} are marginal costs expressed in destination currency.)

Summary

Example: Constant Demand Elasticity

The higher the cost share φ_{ik}^X accruing in currency l^*

- the more do costs mc_{it} co-move with $-e_{l^*t}$
- the more invoicing in l^* hedge against fluctuations in mc_{it}
- the higher the likelihood that l^* is the optimal invoicing currency.

- linear prob. model of destination currency invoicing (dummy ι_{ik})

$$\iota_{ik} = \alpha + \beta \varphi_{ik}^X + controls + \varepsilon_{ik}$$

Controls: size, competitor's currency choice ι_{-ik} (strategic complement.).

JG|U

Summary

Results – Currency Choice

$$\iota_{ik} = \alpha + \beta \varphi^X_{ik} + contr + \varepsilon_{ik}$$

Likelihood of invoicing exports in destination/dollar currency…

…increases in the share of imported inputs…

Dep. var.: ι_{ikt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
φ_i	0.403**	0.275**	0.239*				
	(0.187)	(0.130)	(0.140)				
φ^E_i				0.222	0.161	0.110	0.186
				(0.282)	(0.193)	(0.206)	(0.280)
φ^X_i				0.637***	0.419***	0.398***	0.565***
				(0.165)	(0.130)	(0.142)	(0.171)
log Empl$_i$	0.098***	0.085***	0.085***	0.099***	0.086***	0.086***	0.100***
	(0.030)	(0.017)	(0.019)	(0.029)	(0.017)	(0.019)	(0.029)
ι_{-ikt}							0.119***
							(0.024)
# obs.	138,913	138,146	137,988	139,109	138,341	138,185	125,327
R^2	0.259	0.440	0.495	0.263	0.441	0.496	0.275
Fixed Effects:							
year	✓	✓	✓	✓	✓	✓	✓
country	✓	✓		✓	✓		✓
HS8		✓			✓		
country ×HS4			✓			✓	

JG|U

Summary

Results – Currency Choice

$$\iota_{ik} = \alpha + \beta \varphi_{ik}^X + contr + \varepsilon_{ik}$$

Likelihood of invoicing exports in destination/dollar currency…

…increases in the share of imported inputs…

…as long as they are invoiced in foreign currency!

Dep. var.: ι_{ikt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
φ_i	0.403**	0.275**	0.239*				
	(0.187)	(0.130)	(0.140)				
φ_i^E				0.222	0.161	0.110	0.186
				(0.282)	(0.193)	(0.206)	(0.280)
φ_i^X				0.637***	0.419***	0.398***	0.565***
				(0.165)	(0.130)	(0.142)	(0.171)
log Empl$_i$	0.098***	0.085***	0.085***	0.099***	0.086***	0.086***	0.100***
	(0.030)	(0.017)	(0.019)	(0.029)	(0.017)	(0.019)	(0.029)
ι_{-ikt}							0.119***
							(0.024)
# obs.	138,913	138,146	137,988	139,109	138,341	138,185	125,327
R^2	0.259	0.440	0.495	0.263	0.441	0.496	0.275
Fixed Effects:							
year	✓	✓	✓	✓	✓	✓	✓
country	✓	✓	✓	✓	✓		✓
HS8		✓			✓		
country ×HS4				✓		✓	

JG|U

Summary

Results – Currency Choice

$$\iota_{ik} = \alpha + \beta \varphi_{ik}^{X} + contr + \varepsilon_{ik}$$

Likelihood of invoicing exports in destination/dollar currency…

…increases in the share of imported inputs…

…as long as they are invoiced in foreign currency!

…also increases in firm size

…and in competitors' propensity of invoice in destination currency (strategic complement.).

Dep. var.: ι_{ikt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
φ_i	0.403**	0.275**	0.239*				
	(0.187)	(0.130)	(0.140)				
φ_i^E				0.222	0.161	0.110	0.186
				(0.282)	(0.193)	(0.206)	(0.280)
φ_i^X				0.637***	0.419***	0.398***	0.565***
				(0.165)	(0.130)	(0.142)	(0.171)
log Empl$_i$	0.098***	0.085***	0.085***	0.099***	0.086***	0.086***	0.100***
	(0.030)	(0.017)	(0.019)	(0.029)	(0.017)	(0.019)	(0.029)
ι_{-ikt}							0.119***
							(0.024)
# obs.	138,913	138,146	137,988	139,109	138,341	138,185	125,327
R^2	0.259	0.440	0.495	0.263	0.441	0.496	0.275
Fixed Effects:							
year	✓	✓	✓	✓	✓	✓	✓
country	✓	✓	✓	✓	✓		✓
HS8		✓			✓		
country ×HS4			✓			✓	

JG|U

Summary

Moreover…

- Conditional on the invoicing currency, the usual effects operate:
    - cost share invoiced in destination currency
    - Market share (in nested CES)

- Therefore:

$$\Delta p_{ikt} = \alpha + \beta \varphi_{ik}^X \Delta e_{kt} + \gamma \iota_{ik} \varphi_{ik}^X \Delta e_{kt} + contr. + \varepsilon_{kt}$$

JG|U

Summary

Results – ERPT

Dep. var.: Δp_{ikt}	(1)	(2)	(3)	(4)	(5)
Δe_{kt}	0.002	−0.044	−0.048	0.001	−0.048
	(0.031)	(0.030)	(0.032)	(0.032)	(0.032)
$\Delta e_{kt} \cdot \varphi_i$	0.609***	0.366**	0.350**		
	(0.187)	(0.163)	(0.161)		
$\Delta e_{kt} \cdot \varphi_i^E$				0.332	0.144
				(0.266)	(0.274)
$\Delta e_{kt} \cdot \varphi_i^X$				0.846***	0.534***
				(0.253)	(0.192)
$\Delta e_{kt} \cdot S_{ik}$	0.110*	0.098	0.094	0.110*	0.094
	(0.058)	(0.059)	(0.059)	(0.059)	(0.059)
$\Delta e_{kt} \cdot \iota_{ikt}$		0.264***	0.295***		0.291***
		(0.046)	(0.064)		(0.062)
# obs.	73,514	73,514	73,514	73,514	73,514
R^2	0.063	0.064	0.064	0.063	0.064
Fixed Effects:					
year	✓	✓	✓	✓	✓
country×HS4	✓	✓	✓	✓	✓

- $\Delta p_{ikt} = \alpha + \beta \Delta e_{kt} + contr. + \varepsilon_{kt}$

The ERPT into producer-currency export prices…

…increases in the share of imported inputs…

…as long as imported inputs are invoiced in foreign currency!

…absent of size effects…

…also increases in the competitors' propensity of invoice in foreign currency (multiple equilibria).

JG|U

Comments

Econometric specification – currency choice

- Test with probit, multinomial logit, semiparametric, structural breaks (clear prediction, lots of data).

JG|U

Comments

Econometric specification – currency choice

- Test with probit, multinomial logit, semiparametric, structural breaks (clear prediction, lots of data).
- Possibility of simultaneous choices:
  - φ_{ik}^X may adjust to invoicing currency. (How do trade partners agree on invoicing currencies?)
  - given the (mix of) destination markets, what is the right (mix of) source countries?

Comments

Econometric specification – currency choice

- Test with probit, multinomial logit, semiparametric, structural breaks (clear prediction, lots of data).
- Possibility of simultaneous choices:
  - φ_{ik}^X may adjust to invoicing currency. (How do trade partners agree on invoicing currencies?)
  - given the (mix of) destination markets, what is the right (mix of) source countries.
- Scrutinize the role of size

Dep. var.: ι_{ikt}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
φ_i	0.403**	0.275**	0.239*				
	(0.187)	(0.130)	(0.140)				
φ_i^E				0.222	0.161	0.110	0.186
				(0.282)	(0.193)	(0.206)	(0.280)
φ_i^X				0.637***	0.419***	0.398***	0.565***
				(0.165)	(0.130)	(0.142)	(0.171)
$\log \mathrm{Empl}_i$	0.098***	0.085***	0.085***	0.099***	0.086***	0.086***	0.100***
	(0.030)	(0.017)	(0.019)	(0.029)	(0.017)	(0.019)	(0.029)
ι_{-ikt}							0.119***
							(0.024)
# obs.	138,913	138,146	137,988	139,109	138,341	138,185	125,327
R^2	0.259	0.440	0.495	0.263	0.441	0.496	0.275

JG|U

# Comments

Econometric specification – currency choice

- Test with probit, multinomial logit, semiparametric, structural breaks (clear prediction, lots of data).

- Possibility of simultaneous choices:

  - φ_{ik}^{X} may adjust to invoicing currency. (How do trade partners agree on invoicing currencies?)

  - given the (mix of) destination markets, what is the right (mix of) source countries.

- Scrutinize the role of size – does *ln(empl.)* pick up…

  - …market shares S_{ikt}?

  - …quality? (Chen Juvenal 2016, Auer, Chaney, Sauré 2018)

  - …hedging ability of large firms? (limits to risk-neutral firm)

JG|U

Comments

Econometric specification – currency choice

- Test with probit, multinomial logit, semiparametric, structural breaks (clear prediction, lots of data).
- Possibility of simultaneous choices:
  - φ_{ik}^X may adjust to invoicing currency. (How do trade partners agree on invoicing currencies?)
  - given the (mix of) destination markets, what is the right (mix of) source countries.
- Scrutinize the role of size – does *ln(empl.)* pick up…
  - …market shares S_{ikt}?
  - …quality? (Chen Juvenal 2016, Auer, Chaney, Sauré 2018)
  - …hedging ability of large firms? (limits to risk-neutral firm)
- Dominant currency choice: PCP, LCP and DCP (variable ι_{ik} indicates PCP only – connection to title).

JG|U

Comments

Econometric specification – ERPT

- …S_{ikt} defined relative to all suppliers (comtrade.un.org) instead of Belgian exporters (sector-destination effects take out means, estimating slopes)
- …by currency baskets / fully interacted (as theory suggests that market shares and import intensity have familiar effects within currency baskets).
- …with non-monotonic dependence of the ERPT on S_{ikt} as nested CES implies (Atkeson & Burstein 2008, Auer & Schoenle 2016, Devereux et al 2017).
- …with quality proxy.
- …with EURUSD exchange rate in the dollar basket, reflecting *dominant currency paradigm* (Gopinath 2016, Boz et al 2018, Chen et al 2018).

JG|U

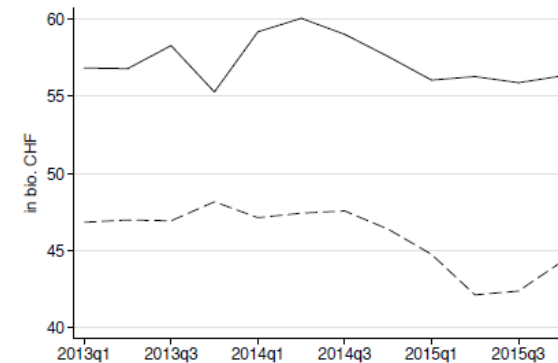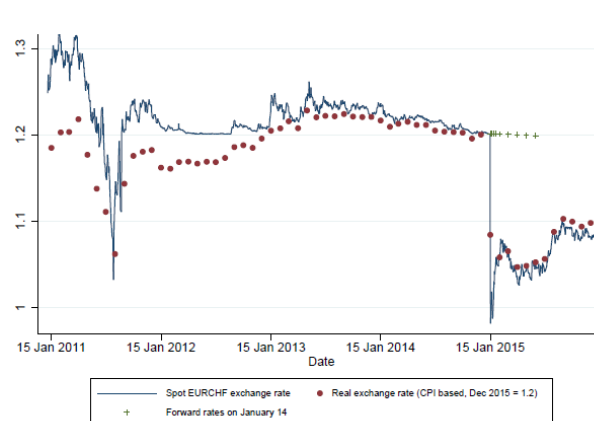# Related Literature

Where to turn from here?

- Go beyond Chung 2016: *Imported inputs and invoicing currency choice: Theory and evidence from UK transaction data*

- State-dependent price adjustment

Bonadio et al. 2018

Related Literature
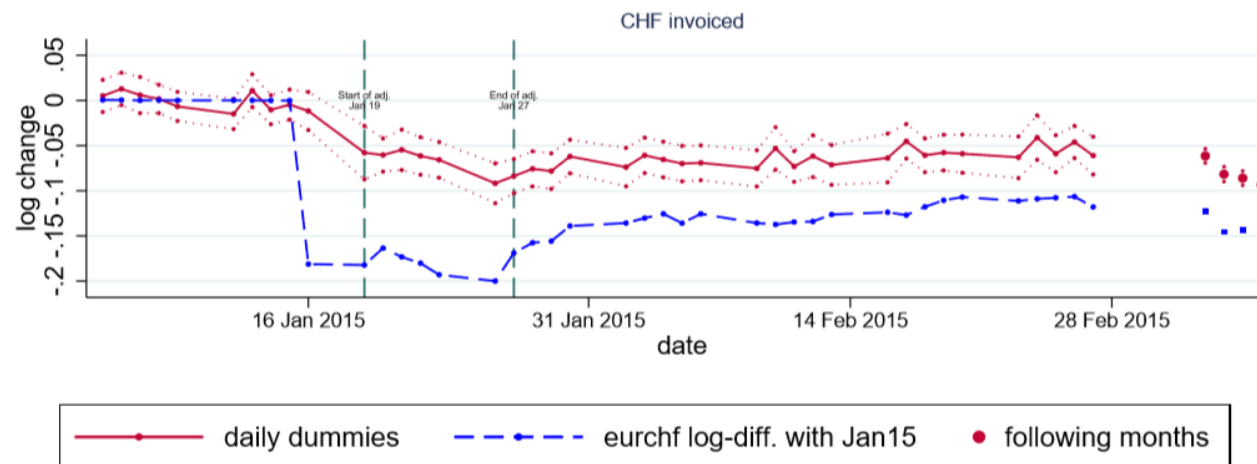
Where to turn from here?

- Go beyond Chung 2016: *Imported inputs and invoicing currency choice: Theory and evidence from UK transaction data*

- State-dependent price adjustment

    - Period of rigid prices depends on variance (feedback loop in currency choice)
    - Fat tails will not matter for risk-neutral firms

Related Literature

Where to turn from here?

- Go beyond Chung 2016: *Imported inputs and invoicing currency choice: Theory and evidence from UK transaction data*

- State-dependent price adjustment

- Authors "…plan […] counterfactual analysis of the gradual increase in the use of the euro in international trade …"

    - Quantity responses.

Example: Switzerland 2015

Bonadio et al. 2018

Related Literature

Where to turn from here?

- Go beyond Chung 2016: *Imported inputs and invoicing currency choice: Theory and evidence from UK transaction data*

- State-dependent price adjustment

- Authors "…plan […] counterfactual analysis of the gradual increase in the use of the euro in international trade …"

  - Quantity responses.
  - Multiple equilibria.

JG|U

Conclusion

- An impressive start to an amazing and important paper
  - …building on Amiti, Itskhoki and Koening 2014, 2018.
  - …with clean, eye-watering empirical results.

- Important insights for the determinants
  - Imported inflation
  - Global rebalancing

Thanks a lot

JG|U

Small Points

- Would love to check whether the invoicing currencies are reported consistently across national datasets (Swiss Customs Data: invoicing currency by 10-digit HS class).

- Title "dominant currencies" – suggest insights towards the choice of vehicle currency (blurred for USD, indistinguishable from PCP for EUR).

- Positive news: the information content of unit values.

- Currency choice is very persistent over time. Do rare, big events change that?

- Discuss causality in ERPT regressions.

JG|U

Typos

- *A firm that choses PCP will have a zero (complete) pass-through into the producer* [not: destination] *(local) currency price before it resets the price, and vice versa for an LCP firm.* (p.7)
- *As we increase* [not: vary] *the horizon, we expect b and c to become significant.*

JG|U