

*How do different exporters react to exchange rate changes?*

*Theory, empirics and aggregate implications*

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## *Motivation*

Real exchange rate movements are large but small effect on prices and quantities

1) incomplete pass-through of ER movements into import prices: Campa and Golberg (2005), OECD: 50% after 1 quarter; 64% after 1 year

Even after conditioning on a price change (Gopinath and Rigobon, 2008): Trade weighted ER pass-through into U.S. import prices is 22%: Price rigidity not the full answer

2) Exchange rate changes have little effect on aggregate quantities (exports):

Typical macro elasticities are around 1 or just above: much lower than elasticities suggested in trade literature

## *What we do: theory*

- model with distribution costs, imperfect competition and firm heterogeneity  
⇒ firms react *differently* to exchange rate depreciation:
- High performance (productivity) firms choose to increase their producer price (increase mark-up) following a depreciation and not their exported volumes. The reverse for low performance firms
- Fixed export costs: only high performance firms can export ⇒ exporters are firms which, by *selection*, are more insensitive (in export volumes) to exchange rate movements than other firms ⇒ low intensive elasticity: the bulk of exports is concentrated on firms (high performers) that optimally set prices such that their sales do not react much to exchange rates

- New firms enter the export market following a depreciation: but they are smaller and less productive than existing ones  $\implies$  low extensive elasticity
- Aggregate implications: with sufficient heterogeneity  $\implies$  small effect of exchange rate changes on quantities (as in empirical studies)

## *What we do: empirics*

Testable implications at the firm level: Very rich firm level data set.

Information on firm-level, destination-specific export values and volume from the French Customs and other firm-level information

Period 1995-2005 to exploit variation across years and destinations.

First paper to exploit such a data set to analyze how different exporters react to ER rate movements: we use directly information on the producer prices

First paper to report impact of ER movements on entry and exit probabilities

## *Main empirical findings*

Firms with performance (labor productivity, TFP, export size, number of destinations...) above the median react to a depreciation of 10%:

- by increasing their producer price by around 2.0% to 3.8%. (others do not change their producer price or markup)
- by not increasing their volumes (others do increase their sales)
- entry probability increases by 1.9% after 10% depreciation; extensive margin  $\approx$  20% of total increase in exports

## *Related literature*

### *Distribution costs and the degree of passthrough:*

Empirics: Campa and Golberg (2007): constitute a share of consumer prices between 40 and 60%; also Burstein, Neves, and Rebelo (2003);

Theory: Corsetti and Dedola (2007); Burstein, Eichenbaum, and Rebelo (2005);  
Closest is Atkeson and Burstein (2008): heterogeneity in market power + trade costs generate deviations from PPP

## *Theory*

Simple model: Home firms export to  $N$  countries, one sector (manufacturing) with monopolistic competition

standard Dixit-Stiglitz utility:

$$U(C_i) = \left[ \int_{\underline{X}} x(\varphi)^{1-1/\sigma} d\varphi \right]^{\frac{1}{1-1/\sigma}} \quad x(\varphi): \text{consumption of variety } \varphi$$

$\varphi$ : productivity of the firm;  $\sigma > 1$

## *Transaction costs*

- iceberg trade cost  $\tau_i > 1$  specific to the pair (Home; country  $i$ )
- fixed cost to export:  $F_i$
- distribution cost: Tirole (1995) "production and retailing are complements".  
Consumer price (in currency  $i$ ):  $p_i^c(\varphi) \equiv \frac{p_i(\varphi)}{\varepsilon_i} \tau_i + \eta_i w_i$

Distribution costs  $\eta_i w_i$ : any additive cost paid in local currency that does not depend on firm productivity  $\varphi$

$\varepsilon_i$ : nominal exchange rate between Home and  $i$  ( $\uparrow \varepsilon_i =$  depreciation vis a vis currency  $i$ ) ;  $p_i(\varphi)$ : producer price to destination  $i$  in *Home* currency;  $w_i$ : wage rate in  $i$  currency

## *Demand*

Demand for a variety:  $x_i(\varphi) = Y_i P_i [p_i^c(\varphi)]^{-\sigma} = Y_i P_i \left[ \frac{p_i(\varphi)}{\varepsilon_i} \tau_i + \eta_i w_i \right]^{-\sigma}$

$Y_i$  income;  $P_i$  price index in  $i$ .

## *Optimal prices*

Producer price  $p_i(\varphi)$  in Home currency of variety  $\varphi$  sold in country  $i$ :

$$p_i(\varphi) = \underbrace{\frac{\sigma}{\sigma - 1} \left( 1 + \frac{\eta_i q_i \varphi}{\sigma \tau_i} \right)}_{m_i(\varphi)} \frac{w}{\varphi}$$

Real exchange rate  $q_i \equiv \frac{\varepsilon_i w_i}{w}$

Mark-up  $m_i(\varphi)$  increases with depreciation and with productivity

Perceived demand elasticity for producer falls with depreciation and productivity

$$\theta_i(\varphi) = \frac{\sigma \tau_i + \eta_i q_i \varphi}{\tau_i + \eta_i q_i \varphi} < \sigma$$

The impact of a (real) depreciation on the producer price (in domestic currency):

$$\frac{dp_i(\varphi)}{dq_i} \frac{q_i}{p_i(\varphi)} = \frac{\eta_i \varphi q_i}{\sigma \tau_i + \eta \varphi q_i} > 0 : \text{Endogenous and heterogenous pricing to market}$$

**Testable Prediction 1.** *The elasticity of the producer price,  $p_i(\varphi)$  to an increase in  $q_i$  is positive and*

*i) increases with the productivity of the firm  $\varphi$  (and more generally export performance)*

*ii) increases with local distribution costs  $\eta_i$*

*iii) increases with the level of the real exchange rate  $q_i$*

Intuition: perceived distribution costs weaken the demand elasticity the more so the lower production costs (the higher the exchange rate and the higher the productivity)

Same result if firms differ by the quality of the good

The impact of a change in bilateral RER on the *volume* of exports:

$$\frac{dx_i(\varphi)}{dq_i} \frac{q_i}{x_i(\varphi)} = \frac{\sigma \tau_i}{\tau_i + \eta_i q_i \varphi} < \sigma$$

**Testable Prediction 2.** *The elasticity of the firm exports,  $x_i(\varphi)$  to a real depreciation (an increase in  $q_i$ ) is positive and*

*i) decreases with the productivity of the firm*

*ii) decreases with the importance of local distribution costs*

*iii) decreases with the level of the real exchange rate*

Intuition follows from endogenous pricing to market

## *Profits and the extensive margin*

Profits for an exporter to  $i$  increase with depreciation:

$$\pi_i(\varphi) = \frac{Y_i}{\sigma} \left( \frac{\sigma}{\sigma-1} \frac{\tau_i}{P_i} \right)^{1-\sigma} \left[ \frac{1}{\varphi} + \frac{\eta_i q_i}{\tau_i} \right]^{1-\sigma} \left( \frac{q_i}{w_i} \right)^\sigma w - F_i$$

—

Threshold productivity of the "zero profit" firm  $\varphi_i^*$  exporting in  $i$ :

$$\frac{Y_i}{\sigma} \left( \frac{\sigma}{\sigma-1} \frac{\tau_i}{P_i} \right)^{1-\sigma} \left[ \frac{1}{\varphi_i^*} + \frac{\eta_i q_i}{\tau_i} \right]^{1-\sigma} \left( \frac{q_i}{w_i} \right)^\sigma = f_i \varphi_i^{*-\alpha} q_i^{1-\alpha}$$

Only high productivity firms can export: those firms price to market and are less sensitive to RER changes: *Selection effect*

Threshold productivity  $\downarrow$  with depreciation

$$\frac{d\varphi_i^*}{dq_i} \frac{q_i}{\varphi_i^*} = -1$$

Entry of less productive and smaller firms triggered by a depreciation

## *Aggregate exports*

Pareto distribution for productivity:  $G(\varphi) = 1 - \varphi^{-k}$ ,  $k$  inverse measure of productivity heterogeneity.  $G(\varphi)$

aggregate exports: all individual exports of firms with productivity  $> \varphi_i^*$  :

$$X_i = \int_{\varphi_i^*}^{\infty} LY_i w_i^{-\sigma} \left( \frac{\sigma}{\sigma-1} \frac{1}{P_i} \right)^{1-\sigma} \left[ \frac{\tau_i}{\varphi q_i} + \eta_i \right]^{-\sigma} dG(\varphi)$$

Elasticity of aggregate exports to RER = intensive + extensive elasticities:

$$\frac{\partial X_i}{\partial q_i} \frac{q_i}{X_i} = \underbrace{\frac{q_i}{X_i} L \int_{\varphi_i^*}^{\infty} \frac{\partial x_i(\varphi)}{\partial q_i} dG(\varphi)}_{\text{intensive} < \sigma} - \underbrace{\frac{q_i}{X_i} L x_i(\varphi_i^*) G'(\varphi_i^*)}_{\text{extensive} > k - \sigma} \times \frac{\partial \varphi_i^*}{\partial q_i} = k$$

## *Quantitative results*

Can our model explain the low aggregate (intensive + extensive) elasticities of exports to RER?

$k = 1.5$  (Mayer and Ottaviano 2008);  $\sigma = 7$

Note: no need to have restriction:  $k > \sigma$  as in Chaney (2008)

Simulate model with  $\tau_i = 1.2$ ;  $\varphi_i^*$  such that  $P(\varphi < \varphi_i^*) = G(\varphi_i^*) = 0.8$ ; 20% of firms export

Share of distribution costs in consumer prices: 0.5

## *Results from simulation*

We can reproduce both low observed intensive (exports from existing exporters) and extensive margins

Standard new trade model: elasticity =  $\sigma + 0 = \sigma$  : too high

Melitz/Chaney model: elasticity =  $\sigma + (k - \sigma) = k$

Table 1: Calibration of aggregate export elasticities to exchange rate

	French data	Benchmark	$k = 1$	$k = 2$	$\sigma = 4$	$s_i = 0.3$
Intensive	0.88	1.16	0.84	1.41	0.80	1.43
Extensive	0.23	0.34	0.16	0.59	0.70	0.07
Total	1.11	1.5	1.0	2.0	1.5	1.5

## *Empirics*

Data: Large database on French firms. 2 sources:

- 1) French customs for firm-level trade data: export, for each firm, by destination-year, both *in value and volume*;
- 2) Firm-level information from INSEE: sales, employment, sector...

Merge the two: virtually all individual French exporters still present (90%)

Period: 1995 to 2005

Two restrictions:

- restrict to single-product firms: proxy of export price = export unit value (ratio of export value/volume per destination): an  $\uparrow$  in export value is an increase in export price only if single product.

At product level, no information on productivity (firm level)

we lose around half of the observations but less than 10% of exporters (most exporters are single product to at least one destination/year)

- restrict to non euro-zone exports

150.000 exporters left

Robustness checks on whole sample and at product level

### *Export unit values.*

Producer prices (proxied by export unit values):  $p_i(\varphi) = \frac{\sigma}{\sigma-1} \left(1 + \frac{\eta_i q_i \varphi}{\sigma \tau_i}\right) \frac{w}{\varphi}$   
depend on

- 1)  $\eta_i, \tau_i$ : firm-destination fixed effects      2)  $w$ : year dummies      3)  $q_i = w_i \varepsilon_i / w$ : real exchange rate      4)  $\varphi$ : lagged firm labor productivity

$$\text{Log}(\text{Unit}_{hit}) = \alpha_1 \text{Log}(\varphi_{ht-1}) + \alpha_2 \text{Log}(\text{RER}_{it}) + \psi_t + \mu_{hi} + \epsilon_{hit}$$

$\text{RER}_{it}$ : average RER between France and  $i$  during year  $t$ .

Also allow delayed effect on producer prices

Testable implication 1:  $\alpha_2$  larger for high performance firms

**TABLE 3 : EXCHANGE RATE AND UNIT VALUES**

Dep. Var. : Unit Value	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Performance Indicator		TFP		TFP(t-2)		Labor Productivity		Nb Destinations		Export Volume	
Sub-sample	All	High	Low	High	Low	High	Low	High	Low	High	Low
TFP(t-1)	0.006 (0.008)	-0.02 (0.013)	0.024* (0.013)					0.002 (0.011)	0.015 (0.013)	0.019* (0.011)	-0.005 (0.014)
Labor Productivity(t-1)						-0.003 (0.013)	0.016 (0.013)				
TFP(t-2)				0.01 (0.020)	0.023 (0.017)						
RER	0.166*** (0.056)	0.212** (0.088)	0.004 (0.083)	0.333*** (0.102)	0.151 (0.096)	0.185** (0.090)	0.006 (0.080)	0.210*** (0.064)	-0.066 (0.127)	0.135* (0.071)	0.143 (0.096)
Observations	159659	80947	78712	55860	54815	74312	85347	103116	56543	92105	67554
R-squared	0.92	0.93	0.91	0.94	0.92	0.93	0.91	0.91	0.93	0.91	0.89

All variables in logarithms. Robust standard errors in parentheses. Panel, within estimations (firm-destination fixed effects) with year dummies. Sub-samples computed by destination-year, except for columns (8) and (9), computed by year. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

## *Export volumes*

*Export Volumes:*  $x_i(\varphi) = Y_i P_i^{\sigma-1} \left[ \frac{\tau_i}{\varphi q_i} + \eta_i \right]^{-\sigma} w_i^{-\sigma} \left( \frac{\sigma-1}{\sigma} \right)$  depend on

-  $Y_i$  (GDP),  $w_i$  (GDP per capita) and  $P_i$  (effective RER)

$$\text{Log}(x_{hit}) = \beta_1 \text{Log}(\varphi_{ht-1}) + \beta_2 \text{Log}(\text{RER}_{it}) + \beta_3 Z_{it} + \psi_t + \mu_{hi} + v_{hit}$$

$Z_i$ : set of destination-year specific variables (GDP, GDP per capita and effective RER).

Firm-destination fixed effects  $\mu_{hi}$  and year dummies  $\psi_t$ .

Testable implication 2:  $\beta_2$  lower for high performance firms

**TABLE 4 : EXCHANGE RATE AND EXPORT VOLUMES**

Dep. Var. : Export Volume	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Performance Indicator	TFP		TFP(t-2)		Labor Productivity		Nb Destinations		Export Volume		
Sub-sample	All	High	Low	High	Low	High	Low	High	Low	High	Low
TFP(t-1)	0.070*** (0.020)	0.076** (0.031)	0.044 (0.033)					0.039 (0.030)	0.080*** (0.028)	0.094*** (0.028)	0.033 (0.030)
Labor Productivity(t-1)						0.067** 0.032	0.063* 0.032				
TFP(t-2)				0.01 0.048	-0.033 0.047						
RER	0.333** (0.130)	0.127 (0.204)	0.630*** (0.207)	-0.093 (0.258)	0.450** (0.229)	0.341* (0.206)	0.566*** (0.204)	-0.183 (0.269)	0.405*** (0.155)	0.330* (0.176)	0.531** (0.209)
Effective RER	-0.227*** (0.081)	-0.196 (0.124)	-0.279** (0.136)	-0.276* (0.151)	-0.329** (0.149)	-0.023 (0.126)	-0.363*** (0.131)	-0.097 (0.154)	-0.193* (0.101)	-0.218** (0.110)	-0.14 (0.131)
GDP	0.810* (0.442)	0.768 (0.666)	0.816 (0.748)	0.905 (0.918)	2.585*** (0.910)	1.084 (0.666)	0.548 (0.722)	1.889* (1.042)	0.308 (0.531)	0.381 (0.589)	2.132*** (0.748)
GDP per capita	0.145 0.450	0.335 (0.677)	0.142 (0.768)	-0.125 (0.984)	-1.956** (0.955)	0.005 (0.676)	0.391 (0.742)	1.925* (1.132)	0.814 (0.524)	0.594 (0.599)	-1.204 (0.763)
Observations	134958	68434	66524	45985	45154	62968	71990	52413	82545	77851	57107
R-squared	0.86	0.87	0.85	0.88	0.86	0.88	0.85	0.87	0.86	0.84	0.76

All variables in logarithms. Robust standard errors in parentheses. Panel, within estimations (firm-destination fixed effects) with year dummies. Sub-samples computed by destination-year, except for columns (8) and (9), computed by year. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**TABLE 5 : DISTRIBUTION COSTS AND NON LINEAR EFFECT OF EXCHANGE RATE VARIATIONS**

	(1)	(2)
Dep. Var.	Unit Value	Export vol.
Sub-sample	All	All
TFP(t-1)	0.004 (0.013)	0.121*** (0.033)
RER	-0.307 (0.211)	0.847* (0.472)
RER*Distribution	1.910** (0.748)	-3.726** (1.625)
...		
Observations	46222	39941
R-squared	0.91	0.87

**Theory:**

**Firms that export in high distribution costs countries and sectors react to a depreciation by:**

- increasing more their producer price (in euro), more pricing to market
- increasing less their export quantities

**We use Campa and Golderg (2008) data on 10 (non euro) OECD countries and 28 sectors**

**On this reduced sample test:**

**Interraction terms:**

- RER \* distribution costs
- positive on unit values
- negative on export volumes

Robust standard errors in parentheses. Panel, within estimations (firm-destination fixed effects) with year dummies.

Destination-specific controls not reported. Subsamples computed by destination. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**TABLE 11 : ROBUSTNESS: PRODUCT LEVEL AND DECILE DECOMPOSITION**

Dependent Variable	(1) (2) (3)			(4)			(5) (6)		(7) (8)	
	PRODUCT LEVEL						DECILE DECOMPOSITION			
	Unit Value			Export Volume			Unit Value		Export Volume	
Performance Indicator: TFP Sub-sample	All	High	Low	All	High	Low	10% High	10% Low	10% High	10% Low
TFP(t-1)	0.016*** (0.004)	0.024*** (0.004)	0.008** 0.004	0.062*** (0.009)	0.038*** (0.011)	0.132*** (0.011)	0.009 (0.015)	0.012 (0.018)	-0.009 (0.037)	-0.016 (0.043)
RER	0.157*** (0.025)	0.205*** (0.026)	0.110*** 0.027	0.407*** (0.059)	0.312*** (0.067)	0.489*** (0.069)	0.227* (0.125)	-0.227 (0.183)	0.121 (0.304)	0.893** (0.442)
...										
Observations	1046447	525545	520902	891184	447378	443806	23779	15073	19851	13239
R-squared	0.78	0.94	0.92	0.58	0.88	0.85	0.95	0.92	0.9	0.86

All variables in logarithms. Robust standard errors in parentheses. Panel, within estimations (firm-destination fixed effects) with year dummies. Destination specific controls not reported. Sub-samples computed by destination-year. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

## *Alternatives*

- imported inputs whose price increase with depreciation: control for each firm average destination imports
- decreasing returns  $\longrightarrow$  higher MCs with higher sales: control for total sales of the firm
- high market power firms price to market: control for share of firms's exports in the country/sector
- competition intensity: when we split between high and low productivity firms, we may split between high and low competition sectors: split firms according to the median level of productivity *inside each sector*

**TABLE 12 : ROBUSTNESS: ALTERNATIVES (1)**

ALTERNATIVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	IMPORTED INPUTS				DECREASING RETURNS			
Dependent Variable	Unit Value		Export Volume		Unit Value		Export Volume	
Performance Indicator: TFP Sub-sample	High	Low	High	Low	High	Low	High	Low
TFP(t-1)	-0.019 (0.012)	0.024* (0.013)	0.067* (0.030)	0.05 (0.034)	-0.027** (0.013)	0.024* (0.013)	0.034 (0.031)	0.027 (0.033)
RER	0.225** (0.088)	0.004 (0.083)	0.107 (0.204)	0.631*** (0.208)	0.211** (0.088)	0.004 (0.083)	0.12 (0.204)	0.628*** (0.207)
Imports / Total Sales	-0.016 (0.054)	0.058 (0.044)	0.038 (0.105)	-0.093 (0.102)				
Total Sales					0.054*** (0.018)	-0.002 (0.011)	0.334*** (0.040)	0.230*** (0.029)
Observations	80400	78032	68017	66018	80947	78712	68434	66524
R-squared	0.92	0.91	0.87	0.85	0.93	0.91	0.87	0.85

All variables but Imports/Total Sales in logarithms. Robust standard errors in parentheses. Panel, within estimations (firm-destination with year dummies. Sub-samples computed by destination-year. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**TABLE 13 : ROBUSTNESS: ALTERNATIVES (2)**

ALTERNATIVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	MARKET POWER				COMPETITION INTENSITY			
Dependent Variable	Unit Value		Export Volume		Unit Value		Export Volume	
Performance Indicator: TFP Sub-sample	High	Low	High	Low	High	Low	High	Low
TFP(t-1)	-0.02 (0.013)	0.024* (0.013)	0.066** (0.030)	0.044 (0.033)	-0.011 (0.013)	0.02 (0.013)	0.078** (0.032)	0.036 (0.033)
RER	0.215** (0.088)	0.004 (0.083)	0.328 (0.201)	0.651*** (0.205)	0.192** (0.092)	0.047 (0.085)	0.207 (0.210)	0.634*** (0.213)
Share of French Exports	0.248 (0.288)	-0.081 (0.414)	21.100*** (2.407)	27.365*** (6.303)				
Observations	81568	78091	68970	65988	80947	78712	68434	66524
R-squared	0.93	0.91	0.88	0.85	0.93	0.91	0.87	0.85

All variables but "Share of french exports" in logarithms. Robust standard errors in parentheses. Panel, within estimations (firm-with year dummies. Sub-samples computed sector-destination-year for columns (5) to (8) \* significant at 10%; \*\* 5%; \*\*\* 1%

### *Exporting decisions and new exporters*

- Depreciation should increase probability of exporting: entry + not exiting
- Exporters entering due to exchange rate depreciation should be smaller

**TABLE 6 : EXCHANGE RATE AND EXPORTING DECISIONS**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. Var.	P(X>0)	P(X>0)	P(X>0)	P(X>0)	P(X>0)	P(X>0)	P(X>0)	P(X>0)	P(X>0)
Condition	All	X(T-1)=0	X(T-1)=1	All	X(T-1)=0	X(T-1)=1	All	X(T-1)=0	X(T-1)=1
Labor Productivity(t-1)	0.228*** (0.002)	0.076*** (0.003)	0.324*** (0.004)	0.053*** (0.001)	0.012*** (0.003)	0.062*** (0.001)	0.183*** (0.005)	0.132*** (0.007)	0.266*** (0.011)
RER	0.898*** (0.033)	1.258*** (0.052)	1.154*** (0.060)	0.199*** (0.007)	0.180*** (0.007)	0.244*** (0.011)	1.582*** (0.045)	1.186*** (0.061)	2.009*** (0.094)
GDP	-0.489*** (0.113)	-0.073 (0.178)	1.224*** (0.197)	-0.123*** (0.026)	-0.015 (0.026)	0.240*** (0.040)	-1.146*** (0.157)	-0.960*** (0.215)	1.501*** (0.403)
GDP per capita	1.648*** (0.112)	1.234*** (0.175)	-0.450** (0.194)	0.382*** (0.025)	0.188*** (0.026)	0.070* (0.040)	3.072*** (0.154)	2.878*** (0.211)	0.33 (0.401)
Effective RER	0.012 (0.021)	-0.110*** (0.034)	0.045 (0.178)	0.004 (0.005)	0.016 (0.030)	0.029 (0.035)	-0.021 (0.029)	0.097** (0.039)	0.465*** (0.064)
<b>Marginal effects (1)</b>									
Labor productivity(t-1)	0.054***	0.012***	0.065***				0.036***	0.021***	0.064***
RER	0.214***	0.193***	0.231***				0.331***	0.266***	0.509***
Observations	2430544	1482033	948511	2430544	1482033	948511	1418476	825367	322999
Estimation		Probit			OLS			FE Logit	

Robust standard errors in parentheses. All estimations include destination fixed effects and year dummies. (1) Marginal effects computed at means. Linear estimations for FE Logit estimations. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

## *Aggregate results*

High performance exporters do not react significantly to RER changes

Aggregate exports should be weakly responsive to RER if exports are concentrated on high performers (high heterogeneity).

Aggregate export volumes by sector / destination and estimate reaction to RER:

$$\text{Log}(X_{sit}) = \gamma_1 \text{Log}(RER_{it}) + \gamma_2 \text{Log}(RER_{it-1}) + \gamma_3 Z_{it} + \psi_t + \mu_{si} + \epsilon_{sit}$$

$Z_i$  is a vector of country-specific controls (GDP, GDP per capita and effective RER) + sector destination fixed effects and year fixed effects

**TABLE 7 : EXCHANGE RATE AND EXPORT VOLUMES, AGGREGATED**

Dep. Var. : Sectoral Export Volume Sectoral Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		κ (Pareto Shape)		10% bigger		10% more productive	
Sub-sample	Whole Sample	High	Low	High	Low	High	Low
RER	0.903*** (0.218)	0.753*** (0.183)	1.133** (0.446)	0.501** (0.215)	1.319*** (0.309)	0.044 (0.535)	1.115*** (0.240)
RER(t-1)	0.206 (0.215)	0.490** (0.211)	-0.24 (0.388)	0.349 (0.261)	-0.037 (0.293)	0.005 (0.355)	0.523** (0.233)
GDP	1.469*** (0.329)	1.505*** (0.325)	1.345** (0.630)	1.189*** (0.383)	1.187*** (0.452)	1.622*** (0.558)	1.353*** (0.462)
...							
Total effect of RER	1.111*** (0.290)	1.244*** (0.287)	0.895* (0.537)	0.850*** (0.292)	1.282*** (0.390)	0.050 (0.541)	1.640*** (0.376)
Observations	8041	4789	3550	4152	3889	3670	4371
R-squared	0.96	0.97	0.96	0.96	0.97	0.96	0.97

Robust standard errors in parentheses. All estimations include sector-destination fixed effects and year dummies.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**TABLE 8 : EXCHANGE RATE AND EXPORT VOLUME OF EXISTING EXPORTERS, AGGREGATED**

Dep. Var. : Sectoral Volume of export, existing exporters Sectoral Indicator	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		κ (Pareto Shape)		10% bigger		10% more productive	
Sub-sample	Whole Sample	High	Low	High	Low	High	Low
RER	0.678*** (0.247)	0.600*** (0.193)	0.808 (0.525)	0.247 (0.254)	1.130*** (0.328)	0.205 (0.544)	0.711** (0.286)
RER(t-1)	0.202 (0.228)	0.254 (0.216)	0.126 (0.439)	0.326 (0.267)	-0.168 (0.278)	-0.348 (0.341)	0.544** (0.254)
GDP	1.691*** (0.377)	1.590*** (0.314)	1.789** (0.784)	1.325*** (0.451)	1.691*** (0.576)	2.078*** (0.712)	1.249*** (0.481)
...							
Total effect of RER	0.880*** 0.325	0.853*** (0.305)	0.934 (0.629)	0.573* (0.311)	0.962*** (0.443)	-0.143 (0.576)	1.255*** (0.391)
Observations	8040	4789	3549	4151	3889	3670	4370
R-squared	0.96	0.97	0.96	0.96	0.96	0.95	0.97

Robust standard errors in parentheses. All estimations include sector-destination fixed effects and year dummies.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**TABLE 9: EXCHANGE RATE, NUMBER OF EXPORTERS AND MEAN VOLUME OF SHIPMENT**

	(1)	(2)	(3)
Dep. Var	Total export volume	Number of Exporters	Mean Vol. of Shipment
RER	0.903*** (0.218)	0.544*** (0.057)	0.359* (0.213)
RER(t-1)	0.206 (0.215)	0.147*** (0.043)	0.059 (0.204)
GDP	1.469*** (0.329)	0.738*** (0.068)	0.731** (0.322)
...			
Total effect of RER	1.111*** (0.290)	0.691*** (0.059)	0.420 (0.285)
Observations	8041	8041	8041
R-squared	0.96	0.99	0.93

Robust standard errors in parentheses. All estimations include sector-destination fixed effects and year dummies.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

## *Conclusion*

- rich description of how firms react to RER changes
- high performance firms/exporters are firms that absorb RER changes in their price: their volumes are less sensitive to RER changes
- with sufficient heterogeneity, implications for aggregate impact of exchange rate change:
  - a large portion of exports is due to "insensitive" firms: weakens intensive margin
  - firms that enter are small: weakens extensive margin

**Table 2: Descriptive Statistics**

	Nb. Obs.	Nb firms	Mean	Median	1st quartile	3rd quartile
<b>ALL OBSERVATIONS</b>						
Nb Employees	4010101	165993	260	36	11	120
VA / L	3931378	162154	81.65	51.99	37.87	111.05
Number of destinations	4248713	175496	14.8	12	5	22
Number of products by dest.	4248713	175496	4.03	2	1	4
<b>SINGLE-PRODUCT OBS.</b>						
Nb Employees	1852521	154216	164	27	9	78
VA / L	1812482	150548	73.45	50.15	36.6	72.04
Number of destinations	1986168	164479	6.4	2	5	9
<b>SINGLE-PRODUCT, NON EURO</b>						
Nb Employees	1183693	138416	187.7	30	9	91
VA / L	1156355	135084	76.77	50.86	37.1	73.15
Number of destinations	1275684	148356	4.76	3	2	7

**TABLE 10 : EXCHANGE RATE AND EXPORT VALUES**

Dep. Var. : Export value	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Performance Indicator		TFP		TFP(t-2)		Labor Productivity		Nb Destinations		Export Volume	
Sub-sample	All	High	Low	High	Low	High	Low	High	Low	High	Low
TFP(t-1)	0.080*** (0.018)	0.059** (0.027)	0.078*** (0.030)					0.055** (0.027)	0.086*** (0.025)	0.095*** (0.026)	0.039 (0.029)
Labor Productivity(t-1)						0.068** (0.029)	0.084*** (0.029)				
TFP(t-2)				0.031 (0.043)	-0.006 (0.042)						
RER	0.462*** (0.112)	0.332* (0.175)	0.542*** (0.182)	0.213 (0.218)	0.536** (0.210)	0.496*** (0.176)	0.502*** (0.176)	-0.27 (0.234)	0.609*** (0.134)	0.308* (0.166)	0.463** (0.183)
Effective RER	-0.069 (0.069)	-0.028 (0.104)	-0.092 (0.116)	-0.089 (0.126)	-0.161 (0.129)	0.094 (0.106)	-0.17 (0.111)	0.098 (0.132)	0.101 (0.085)	0.014 (0.097)	-0.114 (0.114)
GDP	0.591 (0.386)	0.847 (0.587)	0.498 (0.654)	0.601 (0.803)	2.086** (0.818)	1.149* (0.591)	0.164 (0.628)	2.110** (0.880)	0.243 (0.464)	0.504 (0.524)	0.815 (0.660)
GDP per capita	0.4 (0.394)	0.29 (0.597)	0.523 (0.669)	0.174 (0.853)	-1.286 (0.861)	0.069 (0.600)	0.809 (0.644)	-1.866* (0.954)	0.911** (0.459)	0.584 (0.536)	-0.152 (0.672)
Observations	134958	68434	66524	45985	45154	62968	71990	52413	82545	77851	57107
R-squared	0.76	0.78	0.75	0.8	0.77	0.79	0.74	0.78	0.76	0.77	0.63

All variables in logarithms. Robust standard errors in parentheses. Panel, within estimations (firm-destination fixed effects) with year dummies. Subsamples computed by destination-year, except for columns (8) and (9), computed by year. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

TABLE 5 : DISTRIBUTION COSTS AND NON LINEAR EFFECT OF EXCHANGE RATE VARIATIONS

Dep. Var.	Theory predicts: High exchange rate (depreciated level) is like high productivity		(3)	(4)	(5)	(6)
			Unit Value		Export volume	
Sub-sample	Split sample at median for each destination: for high RER observations: - high elasticity of export price to RER - low elasticity of export quantity to RER		High RER	Low RER	High RER	Low RER
TFP(t-1)					0.009 (0.012)	0.018 (0.015)
RER			0.326** (0.128)	0.035 (0.125)	-0.333 (0.284)	0.882** (0.351)
RER*Distribution						
...						
Observations	46222	39941	98654	81035	87397	65319
R-squared	0.91	0.87	0.92	0.92	0.87	0.87

Robust standard errors in parentheses. Panel, within estimations (firm-destination fixed effects) with year dummies. Destination-specific controls not reported. Subsamples computed by destination. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%