
The Dynamics of International Trade Invoicing

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Motivation

- An exporter can set the price of his goods in his currency (producer currency pricing, PCP), the customer's currency (local currency pricing, LCP) or another currency (vehicle currency pricing, VCP).
 - ❑ Determines who bears exchange rate volatility (exchange rate pass-through).
 - Literature identifies three drivers of the choice.
 - ❑ Transaction costs in FX markets (Devereux and Shi 2005, Portes and Rey 2001).
 - ❑ Exposure to macroeconomic uncertainty (hedging motive) (Devereux, Engel and Storgaard 2004, Novy 2006).
 - ❑ Industry and market structure (coalescing motive), with role of market share (Bacchetta and van Wincoop 2005).
 - Goldberg and Tille (2008) find coalescing, industry structure.
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Two Limitations of the Literature

- Theory focuses on *unilateral* invoicing: exporters set invoicing and prices taking the downward-sloping demand of consumers into account.
 - ❑ Not consistent with the survey evidence of Friberg and Wilander (2008) that invoicing is largely set through *bargaining* between exporters and customers.
 - Empirical assessment relies on aggregate data.
 - ❑ Difficult to explore the expected heterogeneity across industries. The strength of coalescing and hedging motives can differ at the disaggregated level.
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Our Contribution

- Present drivers of individual and aggregate invoicing in a standard model.
 - Develop a bargaining model.
 - Larger use of the destination currency likely (but it could be the opposite).
 - Larger use of destination currency for large customers, especially if bargaining is otherwise dominated by the exporter.
 - Econometric analysis using a novel dataset of all individual Canadian import transactions (44.5 million observations between 2002 and 2009).
 - Support for coalescing and hedging/volatility effects, for exchange rate regimes, as well as for the bargaining view of invoicing.
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Modeling of Invoicing

- Exporter from country e sells brand z to country d invoicing in a basket k (Goldberg and Tille 2008). Shares of currency d and v :

$$\beta_{e,d}^d \quad ; \quad \beta_{e,d}^v$$

- Ex-post prices in destination and exporter currency reflect invoicing share and the preset price:

$$P_{e,d}(z) = (S_{e,d})^{\beta_{e,d}^d - 1} (S_{e,v})^{\beta_{e,d}^v} P_{e,d}^k(z) \quad ; \quad S_{e,d} P_{e,d}(z)$$

- Demand and technology (decreasing returns):

$$C_{e,d}(z) = [P_{e,d}(z) / P_d]^{-\lambda} C_d \quad ; \quad C_{e,d}(z) = (\alpha)^{-1} [H_{e,d}(z)]^\alpha$$

Unilateral Invoicing Choice

- The exporter choose the preset price and invoicing shares to maximize expected profits. Invoicing reflects coalescing around aggregate shares η and hedging:

$$\beta_{e,d}^d = \Omega \eta_d^d + (1 - \Omega) \rho(m_{e,d}, s_{e,d}) \quad ; \quad m_{e,d} = w_e + (1 - \alpha)(\alpha)^{-1} c_d$$

Ω is large when demand is elastic and costs are convex.

- Aggregate invoicing shares reflect market shares. $\omega_{e,d}$ is the share of country e in market d . Domestic firms invoice in domestic currency.

$$\eta_d^v = \sum_{e \neq d} \beta_{e,d}^v \omega_{e,d} \quad ; \quad \eta_d^d = 1 - \sum_{e \neq d} \omega_{e,d} + \sum_{e \neq d} \beta_{e,d}^d \omega_{e,d}$$

Testable implications

- Assess the impact of various factors on individual invoicing by firms and aggregate invoicing shares.
 - Main implications (parallel earlier literature):
 - Some currency dominates industries with strong coalescing motive.
 - Higher market share of an exporter reduces use of currency d by all exporters, especially if coalescing is strong.
 - Imported inputs by e from a country v shifts invoicing from currency e to v for all exporters. Inputs from the destination shifts invoicing towards currency d .
 - FX stabilization vis-à-vis d shifts invoicing away from currency d .
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Bargaining View of Invoicing

- Step 1: exporter e and customer i in country d bargain over invoicing shares. Step 2: exporters unilaterally sets her preset price (nests the unilateral invoicing model).

- Exporter's surplus from a successful bargain ($\rho_e > 1$):

$$SF_{e,d}^{k(i)} = (1 - \rho_e)^{-1} E \left\{ \left[\Pi_{e,d}^{k(i)} + \sum_{j \neq i} \Pi_{e,d}^{k(j)} \right]^{1-\rho_e} - \left[\sum_{j \neq i} \Pi_{e,d}^{k(j)} \right]^{1-\rho_e} \right\}$$

- Customer's surplus ($\rho_d > 1$, \bar{C}_d^i reflects customer size):

$$SC_{e,d}^{k(i)} = (1 - \rho_d)^{-1} E \left\{ [C_d^i(z) / \bar{C}_d^i]^{1-\rho_d} - [\tau_d^i]^{1-\rho_d} \right\}$$

- Customer benefits from reduced exchange rate exposure, but this leads exporter to set a higher price.

Splitting the Surplus

- The invoicing shares maximize the joint surplus, with δ representing the exporter's bargaining power:

$$N_{e,d}^{k(i)} = [SF_{e,d}^{k(i)}]^\delta [SC_{e,d}^{k(i)}]^{1-\delta}$$

- Unilateral invoicing corresponds to $\delta = 1$. Assess the marginal impact of a higher share of currency d on the joint surplus at the unilateral allocation.
 - Difference between risk aversions ρ_d and ρ_e . Exchange rate exposure: higher share of currency d stabilizes relative price in that currency, benefiting the customer. Risk is passed onto the exporter who raises the price.
- Focus on a higher use of currency d under bargaining.

Role of Customer Size

- Differentiate the first-order condition for invoicing share with respect to size and invoicing share:

$$d\bar{c}_d^i [\partial SC_{e,d}^{k(i)} / \partial d\beta_{e,d}^{d,i}] A = d\beta_{e,d}^{d,i} \quad ; \quad A > 0$$

\bar{c}_d^i : steady-state share of customer i in total demand.

- More invoicing in destination currency for large sales.
 - Failure to reach an agreement leaves the exporter with limited revenue, and a high marginal value. Requires concave utility ($\rho_e = 0 \Rightarrow A = 0$).
- More relevant if exporter's bargaining power is large.
 - If customer directly weighs on bargaining, her surplus is close to be maximized. Size then adds little.

A New Detailed Dataset

- Data on Canadian imports from Canadian Customs / Statistics Canada.
 - Covers **all** imports from Feb. 2002 to Feb. 2009.
 - **44.5 million** observations.
 - Country of origin, invoicing currency, industry (up to HS10), contract amounts.
 - Limit our coverage to 47 countries that account for 95.9% of Canadian imports by count (97.1 per value).
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Main Industries in Canadian Imports

Broad Industry Group	Percent Share in Transaction Value						Percent of Total
	United States	Eurozone	East and SE Asia	China	Other Americas	Other	
Animal Products	62.3	5.5	8.3	7.9	4.2	11.8	0.8
Vegetable Products	69.6	5.5	3.7	2.8	6.2	12.2	1.9
Foodstuffs	58.6	17.7	4.0	1.9	4.9	12.8	3.0
Mineral Products	26.9	4.6	0.3	0.4	1.3	66.5	10.9
Chemicals	59.0	19.3	1.3	2.0	1.2	17.2	7.8
Plastics/Rubbers	76.9	5.1	5.4	6.0	0.4	6.1	4.7
Leather/Furs/Hides	14.4	15.9	5.3	53.2	3.0	8.2	0.4
Wood Products	79.4	7.2	2.3	6.0	1.6	3.5	3.4
Textiles	32.2	6.7	11.4	33.2	0.9	15.6	2.7
Footwear/Headgear	4.9	11.0	11.9	64.8	3.9	3.6	0.5
Stone/Glass	55.5	8.7	2.7	8.0	11.3	13.8	2.2
Metals	64.5	7.6	4.9	9.4	3.7	9.8	6.8
Machinery/Electrical	54.5	7.9	9.0	11.1	0.3	17.2	25.7
Transportation	68.9	9.1	4.2	0.8	0.9	16.0	21.0
Miscellaneous	47.3	9.7	4.6	22.2	0.2	15.9	6.2
Service	59.6	24.0	0.7	0.9	0.1	14.7	2.0
Total	56.6	9.2	5.0	7.5	1.5	20.2	

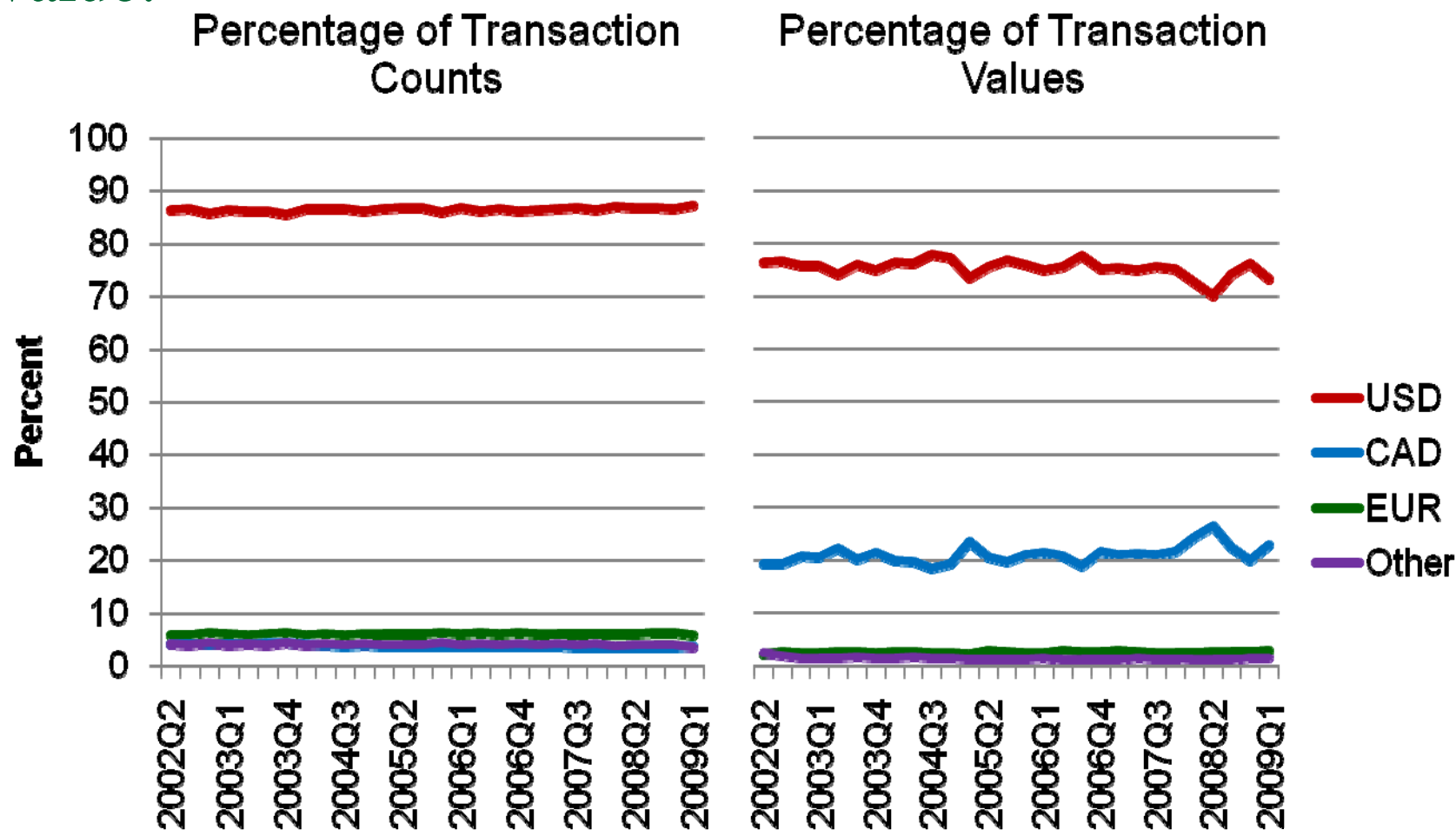
Dominant Role of the U.S. in Canadian Imports

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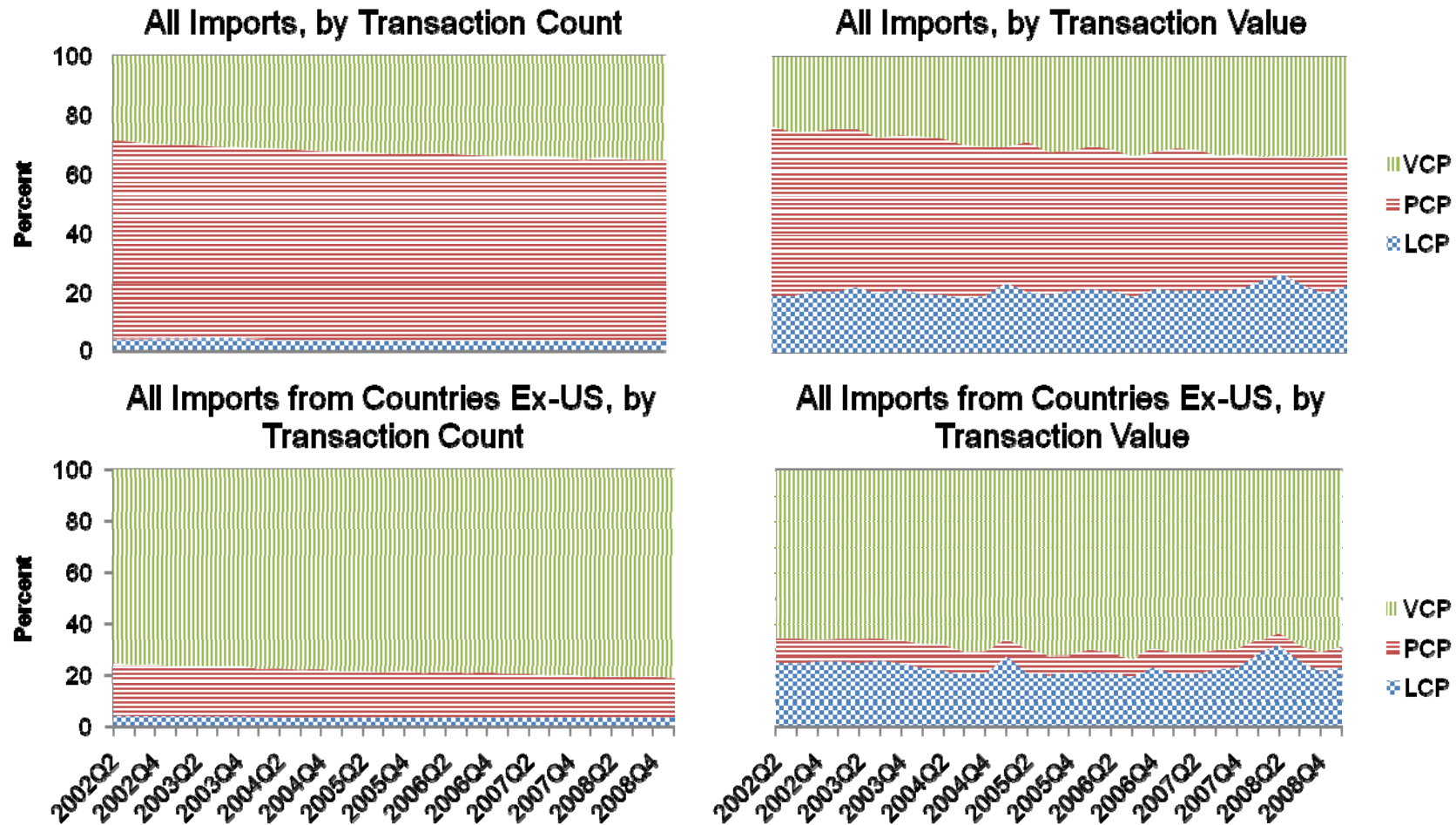
Eurozone next, then substantial role of Asia

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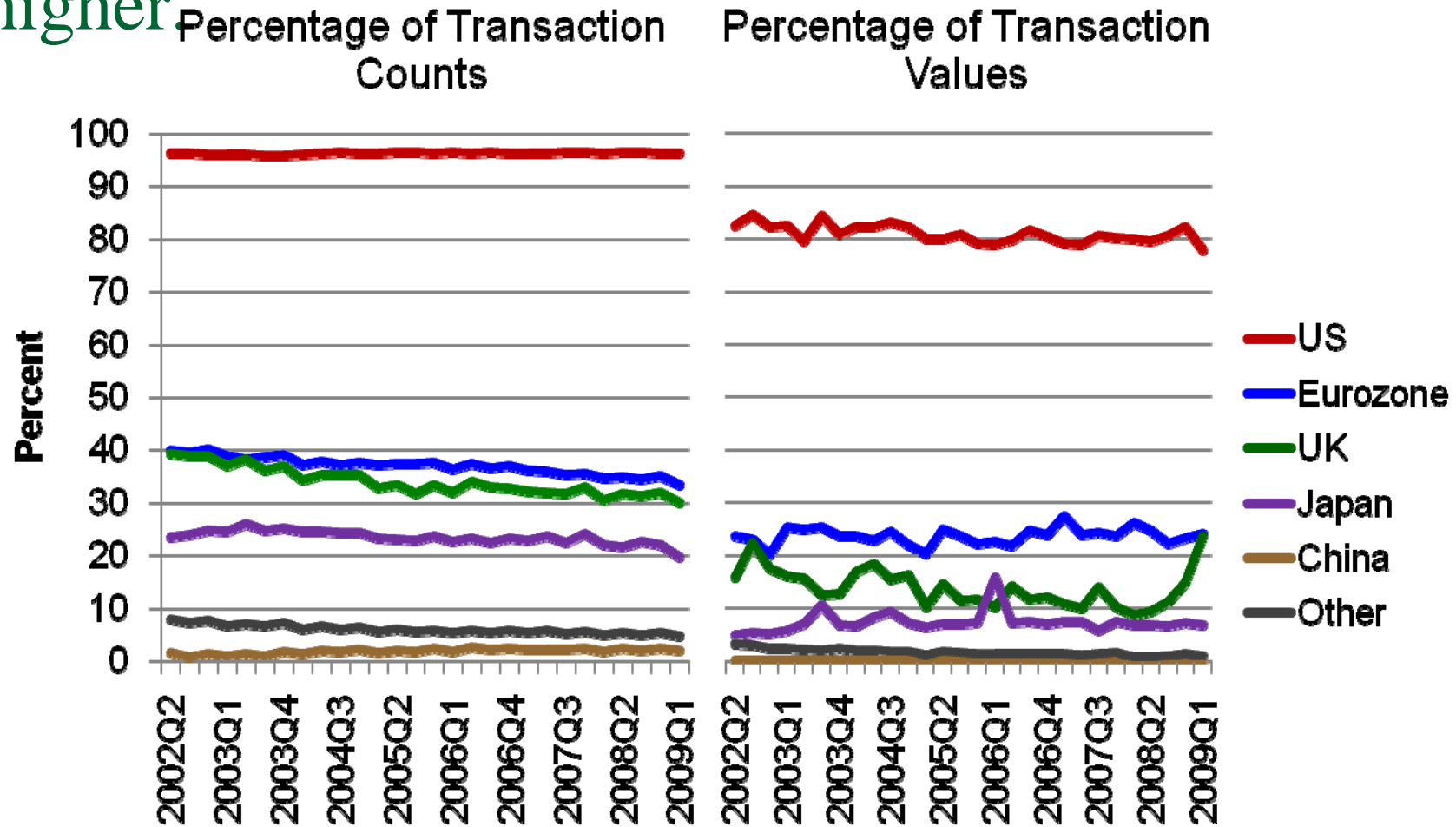
Currency Use in Invoicing Canadian Imports: broadly stable over time. Dollar role higher by count than value.



By count, PCP dominates. This is driven by U.S. activity. VCP dominates for non-US exporters. By value, invoicing shows a larger role of LCP.



In empirics, useful to distinguish between actions of US and other exporters. For US, PCP much higher



Count versus value distinctions reflect a larger use of CAD in large shipments across industries.

Broad Industry Category	Including the United States				Excluding the United States			
	Median Transaction Size, CAD		LCP Share by Count		Median Transaction Size, CAD		LCP Share by Count	
	Low 95th Percentile	Upper 5th Percentile	Low 95th Percentile	Upper 5th Percentile	Low 95th Percentile	Upper 5th Percentile	Low 95th Percentile	Upper 5th Percentile
Animal Products	7,378	366,215	3.3	8.7	3,861	457,343	5.7	16.2
Vegetable Products	3,508	320,042	3.7	5.2	2,335	221,396	5.7	9.3
Foodstuffs	6,720	329,681	4.4	19.4	2,733	326,451	6.0	24.5
Mineral Products	4,174	1,173,402	2.9	7.1	764	27,059,727	5.2	7.0
Chemicals	2,221	260,242	4.5	13.8	1,462	262,860	6.6	19.3
Plastics/Rubbers	3,287	312,689	3.0	8.9	1,289	187,073	3.3	13.9
Leather/Furs/Hides	816	141,768	3.3	9.3	1,309	284,232	3.4	10.3
Wood Products	1,502	209,611	3.2	12.6	539	150,689	4.1	13.5
Textiles	924	151,503	3.7	8.8	1,030	180,142	4.0	10.7
Footwear/Headgear	520	233,843	4.5	7.8	1,014	375,026	4.7	7.7
Stone/Glass	1,668	188,994	3.5	7.0	1,307	183,740	4.0	8.7
Metals	1,788	243,673	3.2	7.9	925	211,080	3.7	13.2
Machinery/Electrical	4,005	509,480	2.9	8.5	2,861	560,843	3.3	10.9
Transportation	13,655	2,523,291	2.5	10.2	6,071	1,921,510	2.7	13.4
Miscellaneous	2,133	267,970	3.4	10.3	1,937	277,942	3.8	13.2
Service	2,521	557,624	5.4	15.1	1,929	545,826	6.4	20.6

Econometric Analysis

- Logit regression of invoicing dummy (PCP, LCP, VCP).
 - Three broad samples reported
 - Invoicing of all Canadian import transactions
 - Invoicing of imports from US;
 - Invoicing of imports from everyone else.
 - Construct tests to cover the different highlighted motives for invoice currency choice.
 - No shortage of observations for hypothesis testing!
-

Motives and Variables

- Coalescing motive or herding in a common currency:
 - Rauch Index classification applied at HS4 level. It should be stronger for “**reference-priced**” goods and “**walrasian**” goods with a centralized market.
 - **Dollarshare**: one quarter lagged U.S. dollar share of invoicing by HS4 code, range 0 to 1
 - Exchange rate regimes:
 - **Dollarpeg/Europeg**: dummy variables, classification from Reinhart and Rogoff’s “Exchange Rate Arrangements Entering the 21st Century: Which Anchor Will Hold?”
-

Variables

- Hedging against profit volatility
 - Exporter and time-varying dummy for optimal hedging currency, based on rolling regressions of each exporter's PPI and Canadian demand on exporter bilateral exchange rates.
 - Compare USD, Euro and CAD (**HUSD/ HEUR/ HCAD**)
 - ERvolatility:
 - **Ercoefvar** is coefficient of variation of each exporter/CAD period-average exchange rate over rolling five-year period
 - Bargaining power of customers
 - **Importshare**: country's share of imports by quarter and HS4 code
 - **Top5ind**: dummy variable equal to 1 if the transaction value is in the 95th or higher percentile by HS4 code
-

Coalescing or herding motive supported: Heterogeneous goods use the dominant currency to a greater degree.

Tables of expected signs of effects. **C** indicates statistically significant and consistent empirical result. **I** indicates significant and inconsistent empirical result

Hypothesis	Corresponding Variable	Regression Coefficients			Regression Coefficients		
		Non-US Exports to Canada			US Exports To Canada		
		LCP	PCP	VCP	LCP	PCP	VCP
Coalescing or herding in a common currency	Ref	- I	- C	+ C	- I	+ C	- C
	Walras	- I	- C	+ C	- C	+ C	- C
	Ref	- I	- I	+ I	- I	+ I	- C
	Walras	- I	- I	+ I	- I	+ I	- C
	Ref * Dollarshare	- C	- C	+ C	- C	+ C	- C
	Walras*Dollarshare	- C	- C	+ C	- C	+ C	- C

Bargaining between exporters and consumers strongly supported: Exporters with higher shares in industry have less VCP and more PCP.

When transactions are large, the balance of pricing power is tilted toward customers and LCP.

Hypothesis	Corresponding Variable	Regression Coefficients Non-US Exports to Canada			Regression Coefficients US Exports To Canada		
		LCP	PCP	VCP	LCP	PCP	VCP
		Bargaining power of exporters and importing customers	Importshare	+ C	+ C	- C	- C
	Top5ind	+ C	- C	- C	+ C	- C	- C
	Importshare *	+ C	- C	+ C	+ C	- C	- C
	Top5ind						

Exchange rate regimes are associated with a clear pattern of nominal rigidities:

Dollar peggers use vehicle currency pricing more frequently, PCP and LCP less.

Euro area countries have more PCP and less VCP.

Hypothesis	Corresponding Variable	Regression Coefficients Non-US Exports to Canada			Regression Coefficients US Exports To Canada		
		LCP	PCP	VCP	LCP	PCP	VCP
Direct role of exchange rate arrangements	Dollarpeg	- C	- C	+ C			
	Europeg	- I	+ C	- C			

Hedging Motive:

More limited success -- a mix of consistent, inconsistent, or insignificant results. Data issues or conceptual?

Exchange rate volatility: Devereux, Engel and Storgaard (2004) supported (lower volatility currency,

Hypothesis	Corresponding Variable	Regression Coefficients Non-US Exports to Canada			Regression Coefficients US Exports To Canada		
		LCP	PCP	VCP	LCP	PCP	VCP
Hedging against profit volatility	HCAD	+ C	-	-	+	-	-
	HEUR	- I	+ I	- I	- C	-	+
	HUSD	-	- C	+ C	-	+	-
	HCAD * Ref/Walras	-	+	+	-	+	+
	HEUR * Ref/Walras	+ (I/C)	- (I/C)	+ I	+ I	+ C	- C
	HUSD * Ref/Walras	+	+ I	-	+	-	+
	ERvolatility	+	- C	+ C	+ C	- C	+ C

Conclusion

We address two limitations of the literature of international trade invoicing.

- 1. In terms of theory, we develop a bargaining model of invoicing, a setting that has empirical support.
 - Points to a higher use of LCP, especially towards large customers, even when the exporter has a lot of bargaining power.
 - 2. We analyze new highly detailed invoicing data.
 - Empirics provide support for coalescing and (somewhat) for hedging motives.
 - Strong support for implications of the bargaining model.
 - Exchange rate regimes influence nominal rigidities.
 - Next step: refine empirical tests even further, with comparisons of explanatory power of motives.
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Appendix slides

US presence is especially large in some Sectors

Broad Industry Group	Percent Share in Transaction Value						Percent of Total
	United States	Eurozone	East and SE Asia	China	Other Americas	Other	
Animal Products	62.3	5.5	8.3	7.9	4.2	11.8	0.8
Vegetable Products	69.6	5.5	3.7	2.8	6.2	12.2	1.9
Foodstuffs	58.6	17.7	4.0	1.9	4.9	12.8	3.0
Mineral Products	26.9	4.6	0.3	0.4	1.3	66.5	10.9
Chemicals	59.0	19.3	1.3	2.0	1.2	17.2	7.8
Plastics/Rubbers	76.9	5.1	5.4	6.0	0.4	6.1	4.7
Leather/Furs/Hides	14.4	15.9	5.3	53.2	3.0	8.2	0.4
Wood Products	79.4	7.2	2.3	6.0	1.6	3.5	3.4
Textiles	32.2	6.7	11.4	33.2	0.9	15.6	2.7
Footwear/Headgear	4.9	11.0	11.9	64.8	3.9	3.6	0.5
Stone/Glass	55.5	8.7	2.7	8.0	11.3	13.8	2.2
Metals	64.5	7.6	4.9	9.4	3.7	9.8	6.8
Machinery/Electrical	54.5	7.9	9.0	11.1	0.3	17.2	25.7
Transportation	68.9	9.1	4.2	0.8	0.9	16.0	21.0
Miscellaneous	47.3	9.7	4.6	22.2	0.2	15.9	6.2
Service	59.6	24.0	0.7	0.9	0.1	14.7	2.0
Total	56.6	9.2	5.0	7.5	1.5	20.2	

Import Origin and Industry per Count

Table 1. Regional Exporter Presence in Canadian Imports by Broad Industry Group, by Count

Broad Industry Category	Percent Share in Import Transaction Counts						Percent of Total
	United States	Eurozone	East and SE Asia	China	Other Americas	All Other Countries	
Animal Products	68.2	5.0	9.9	4.6	3.0	9.3	1.0
Vegetable Products	60.6	7.9	7.5	5.9	3.8	14.3	3.1
Foodstuffs	61.7	11.8	7.8	3.5	1.6	13.5	3.2
Mineral Products	84.0	4.6	1.5	3.2	0.7	6.1	1.5
Chemicals	70.3	11.5	2.8	3.3	0.4	11.6	9.8
Plastics/Rubbers	63.7	11.2	7.8	3.3	0.9	13.2	7.0
Leather/Furs/Hides	44.2	14.3	13.1	9.3	1.9	17.2	1.0
Wood Products	66.3	9.8	8.2	4.7	1.0	9.9	7.2
Textiles	42.8	13.6	14.6	9.2	1.4	18.4	9.3
Footwear/Headgear	39.7	12.9	18.2	15.1	1.9	12.1	1.2
Stone/Glass	52.9	13.3	9.7	6.8	1.7	15.7	4.6
Metals	61.7	11.4	7.3	4.6	0.8	14.2	13.2
Machinery/Electrical	56.3	13.4	8.8	3.5	0.9	17.1	23.2
Transportation	65.4	10.3	5.9	3.2	0.8	14.3	2.8
Miscellaneous	54.5	11.6	10.7	6.5	0.5	16.2	10.9
Service	67.2	8.9	7.1	2.9	0.7	13.1	0.8
Total	58.9	11.8	8.6	5.0	1.0	14.7	

Table 5 Baseline Regression

	All Canadian Import Transactions			All Canadian Imports, excluding US			All Canadian Imports, from US		
	LCP	PCP	VCP	LCP	PCP	VCP	LCP	PCP	VCP
Ref	0.27	-0.09	-0.07	0.49	-0.23	0.02	0.05	0.08	-1.15
	[0.00]	[0.00]	[0.00]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]	[0.04]
Walras	0.02	0.09	-0.08	0.23	-0.18	0.07	-0.19	0.36	-2.21
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.10]
Dollarpeg	-0.13	1.54	-1.02	-0.12	-1.36	0.96			
	[0.02]	[0.07]	[0.06]	[0.01]	[0.04]	[0.02]			
Europepeg	0.10	1.49	-1.30	0.10	1.42	-1.26			
	[0.01]	[0.06]	[0.06]	[0.01]	[0.02]	[0.02]			
Importshare	-0.57	6.24	-8.33	-5.68	0.65	0.89	-0.61	0.61	-0.53
	[0.02]	[0.07]	[0.12]	[0.10]	[0.04]	[0.04]	[0.03]	[0.03]	[0.03]
Top5ind	1.34	-1.24	0.63	1.67	-0.32	-0.55	1.24	-1.07	-1.84
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.05]
ERcoefvar	0.33	5.37	-4.26	-0.14	-7.23	5.03	-1.19	-8.40	20.13
	[0.29]	[2.05]	[1.87]	[0.30]	[1.90]	[1.32]	[29.59]	[20.64]	[30.63]
HUSD	0.05	-0.24	0.25	0.07	-0.23	0.18			
	[0.02]	[0.06]	[0.08]	[0.02]	[0.04]	[0.03]			
HEUR	0.05	-0.30	0.25	0.07	-0.16	0.11	-0.05	0.25	-0.07
	[0.02]	[0.20]	[0.21]	[0.02]	[0.06]	[0.05]	[0.37]	[0.26]	[0.39]
HCAD	0.01	-0.17	0.18	0.06	-0.01	0.00	0.07	-0.13	0.06
	[0.03]	[0.17]	[0.17]	[0.02]	[0.03]	[0.02]	[0.73]	[0.51]	[0.76]
AIC	12,563,956	27,373,110	24,454,140	5,787,297	13,428,808	15,670,579	6,713,172	7,579,768	1,554,428
Observations	40,642,260	40,642,260	40,642,260	16,538,291	16,538,291	16,538,291	24,103,969	24,103,969	24,103,969
Dependent=1	1,506,593	26,084,860	13,050,807	735,226	2,879,709	12,923,356	771,367	23,205,151	127,451

Note: All regressions include time fixed effects. Regressions follow a Binary Logit Model, with maximum likelihood estimate of coefficients provide and [.] reporting standard errors. Indicated in bold are significant coefficients at the 5 percent probability level.

Econometric Analysis

Table 5	Imports from U.S.			From non-U.S.			From HK & China		
	LCP	PCP	VCP	LCP	PCP	VCP	LCP	PCP	VCP
Ref	0.05	0.08	-1.15	0.49	-0.23	0.02	0.58	-0.18	-0.19
Walras	-0.19	0.36	-2.21	0.23	-0.18	0.07	0.53	0.12	-0.32
USDpeg				-0.12	-1.36	0.96			
Europeg				0.10	1.42	-1.26			
ImportShare	-0.61	0.61	-0.53	-5.68	0.65	0.89	-2.08	-0.50	1.22
Top5	1.24	-1.07	-1.84	1.67	-0.32	-0.55	1.22	-2.86	-0.12
Ercoefvar	-1.19	-8.40	20.13	-0.14	-7.23	5.03	40.3	93.3	-75.8
HedgeUSD				0.07	-0.23	0.18			
HedgeEuro	-0.05	0.25	-0.07	0.07	-0.16	0.11	0.61	2.15	-1.63
HedgeCAD	0.07	-0.13	0.06	0.06	-0.01	0.00	0.31	1.15	-0.86
# obs (thsds)		24'104			16'538			2'404	
Dep=1	772	23'205	128	735	2'880	12'923	68	99	2'237

Table 6 Canadian Imports and Coalescing Motive

	All Canadian Import Transactions			All Canadian Imports, excluding US			All Canadian Imports, from US		
	LCP	PCP	VCP	LCP	PCP	VCP	LCP	PCP	VCP
Ref	1.31	0.21	-0.86	1.25	0.81	-1.11	1.38	-1.35	1.31
	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.01]	[0.02]	[0.07]
Walras	0.69	0.11	-0.34	0.43	1.01	-0.98	1.07	-1.01	1.15
	[0.03]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.04]	[0.05]	[0.22]
Dollarpeg	-0.15	1.57	-1.05	-0.11	-1.33	0.94			
	[0.02]	[0.07]	[0.06]	[0.01]	[0.04]	[0.02]			
Europeg	0.09	1.48	-1.29	0.10	1.43	-1.26			
	[0.01]	[0.06]	[0.07]	[0.01]	[0.02]	[0.02]			
Importshare	-0.53	6.21	-8.27	-5.76	0.55	0.98	-0.55	0.55	-0.47
	[0.02]	[0.07]	[0.12]	[0.10]	[0.03]	[0.04]	[0.03]	[0.03]	[0.03]
Top5ind	1.34	-1.25	0.64	1.67	-0.32	-0.55	1.26	-1.09	-1.86
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.05]
ERcoefvar	0.23	5.85	-4.73	-0.27	-6.80	4.84	13.43	-7.16	-14.08
	[0.31]	[2.25]	[2.06]	[0.32]	[1.96]	[1.39]			[30.85]
HUSD	0.03	-0.25	0.27	0.07	-0.23	0.18			
	[0.02]	[0.07]	[0.08]	[0.02]	[0.04]	[0.03]			
HEUR	0.04	-0.35	0.31	0.07	-0.15	0.10	-0.73	0.17	1.68
	[0.02]	[0.20]	[0.21]	[0.02]	[0.07]	[0.05]	[0.09]	[0.07]	[0.39]
HCAD	0.00	-0.26	0.26	0.05	-0.01	0.01	-0.48	0.05	1.33
	[0.03]	[0.17]	[0.17]	[0.02]	[0.03]	[0.02]			[0.09]
Ref *	-1.28	-0.37	0.96	-0.95	-1.31	1.41	-1.61	1.73	-3.12
Dollarshare	[0.01]	[0.02]	[0.02]	[0.02]	[0.03]	[0.02]	[0.02]	[0.02]	[0.13]
Walras *	-0.77	-0.02	0.30	-0.25	-1.47	1.28	-1.40	1.52	-3.97
Dollarshare	[0.03]	[0.04]	[0.04]	[0.03]	[0.02]	[0.02]	[0.04]	[0.05]	[0.20]
AIC	12,084,732	26,453,543	23,673,806	5,577,185	12,936,509	15,096,980	6,445,729	7,288,484	1,509,919
Observations	39,244,109	39,244,109	39,244,109	16,013,317	16,013,317	16,013,317	23,230,792	23,230,792	23,230,792
Dependent=1	1,450,312	25,136,185	12,657,612	708,199	2,771,962	12,533,156	742,113	22,364,223	124,456

Note: All regressions include time fixed effects. Regressions follow a Binary Logit Model, with maximum likelihood estimate of coefficients provide and [.]reporting standard errors. Indicated in bold are significant coefficients at the 5 percent probability level.

Table 7 Canadian Imports and Hedging Motive

	All Canadian Import Transactions			All Canadian Imports, excluding US			All Canadian Imports, from US		
	LCP	PCP	VCP	LCP	PCP	VCP	LCP	PCP	VCP
Ref	0.24	-0.13	-0.03	0.54	-0.17	0.02	0.09	0.04	-1.11
	[0.02]	[0.03]	[0.03]	[0.02]	[0.01]	[0.01]	[0.01]	[0.01]	[0.08]
Walras	-0.06	0.18	-0.14	0.16	-0.14	0.09	-0.19	0.35	-1.81
	[0.02]	[0.03]	[0.03]	[0.03]	[0.02]	[0.02]	[0.01]	[0.01]	[0.12]
Dollarpeg	-0.14	1.54	-1.03	-0.12	-1.36	0.96			
	[0.02]	[0.07]	[0.06]	[0.01]	[0.04]	[0.02]			
Europeg	0.10	1.49	-1.30	0.10	1.42	-1.26			
	[0.01]	[0.06]	[0.06]	[0.01]	[0.02]	[0.02]			
Importshare	-0.56	6.23	-8.32	-5.67	0.65	0.88	-0.61	0.61	-0.53
	[0.02]	[0.07]	[0.12]	[0.09]	[0.03]	[0.04]	[0.03]	[0.03]	[0.03]
Top5ind	1.34	-1.24	0.63	1.67	-0.32	-0.55	1.24	-1.07	-1.84
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.05]
ERcoefvar	0.36	5.36	-4.26	-0.14	-7.23	5.03	1.39	-8.37	19.99
	[0.29]	[2.05]	[1.87]	[0.30]	[1.90]	[1.32]		[20.62]	[30.65]
HUSD	-0.01	-0.22	0.24	0.08	-0.22	0.18			
	[0.02]	[0.07]	[0.08]	[0.02]	[0.04]	[0.03]			
HEUR	0.05	-0.31	0.27	0.08	-0.16	0.12	-0.08	0.23	-0.06
	[0.03]	[0.21]	[0.22]	[0.02]	[0.06]	[0.05]		[1.53]	[0.39]
HCAD	0.01	-0.18	0.18	0.06	0.00	0.00	0.14	-0.14	0.06
	[0.03]	[0.17]	[0.18]	[0.02]	[0.03]	[0.02]		[0.25]	[0.76]
HUSD * Ref	0.26	-0.12	0.08	-0.04	-0.08	0.04			
	[0.03]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]			
HUSD * Walras	0.25	-0.40	0.27	0.02	-0.05	0.01			
	[0.03]	[0.04]	[0.04]	[0.04]	[0.02]	[0.01]			
HEUR * Ref	-0.05	0.13	-0.17	-0.09	0.03	-0.12	-0.05	0.05	-0.09
	[0.03]	[0.04]	[0.04]	[0.02]	[0.02]	[0.01]	[0.01]	[0.01]	[0.09]
HEUR * Walras	0.01	-0.04	0.01	0.10	-0.08	-0.07	-0.01	0.02	-0.24
	[0.03]	[0.04]	[0.05]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.19]
HCAD * Ref	0.01	0.05	-0.05	-0.04	-0.08	0.03	-0.05	0.04	-0.03
	[0.03]	[0.04]	[0.04]	[0.02]	[0.02]	[0.01]	[0.01]	[0.01]	[0.09]
HCAD * Walras	0.09	-0.09	0.04	0.10	-0.03	-0.04	0.01	0.00	-1.27
	[0.02]	[0.04]	[0.04]	[0.03]	[0.03]	[0.02]	[0.01]	[0.02]	[0.18]
AIC	12,561,998	27,369,123	24,450,703	5,787,206	13,428,365	15,669,708	6,713,126	7,579,717	1,554,312
Observations	40,642,260	40,642,260	40,642,260	16,538,291	16,538,291	16,538,291	24,103,969	24,103,969	24,103,969
Dependent=1	1,506,593	26,084,860	13,050,807	735,226	2,879,709	12,923,356	771,367	23,205,151	127,451

Note: All regressions include time fixed effects. Regressions follow a Binary Logit Model, with maximum likelihood estimate of coefficients and [.] reporting standard errors.

	All Canadian Import Transactions			All Canadian Imports, excluding US			All Canadian Imports, from US		
	LCP	PCP	VCP	LCP	PCP	VCP	LCP	PCP	VCP
Ref	0.27	-0.09	-0.07	0.50	-0.23	0.02	0.05	0.08	-1.15
	[0.00]	[0.00]	[0.00]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]	[0.04]
Walras	0.01	0.08	-0.07	0.23	-0.18	0.07	-0.19	0.35	-2.21
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.10]
Dollarpeg	-0.14	1.51	-0.99	-0.11	-1.36	0.96			
	[0.02]	[0.07]	[0.06]	[0.01]	[0.04]	[0.02]			
Europepeg	0.10	1.49	-1.31	0.10	1.42	-1.26			
	[0.01]	[0.06]	[0.06]	[0.01]	[0.02]	[0.02]			
Importshare	-0.51	6.39	-8.72	-7.61	0.91	0.53	-0.64	0.64	-0.53
	[0.02]	[0.07]	[0.12]	[0.13]	[0.03]	[0.04]	[0.03]	[0.03]	[0.03]
Top5ind	1.47	-0.69	-0.05	1.54	-0.17	-0.67	1.03	-0.83	-1.15
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.11]
ERcoefvar	0.32	5.33	-4.18	-0.18	-7.23	5.03	3.26	-8.77	19.27
	[0.30]	[2.05]	[1.87]	[0.29]	[1.90]	[1.32]		[20.64]	[30.64]
HUSD	0.03	-0.24	0.25	0.07	-0.23	0.18			
	[0.02]	[0.07]	[0.08]	[0.02]	[0.04]	[0.03]			
HEUR	0.05	-0.29	0.25	0.07	-0.16	0.10	-0.11	0.24	-0.06
	[0.02]	[0.20]	[0.21]	[0.02]	[0.07]	[0.05]		[0.26]	[0.39]
HCAD	0.01	-0.17	0.17	0.05	-0.01	0.00	0.18	-0.15	0.04
	[0.03]	[0.17]	[0.17]	[0.02]	[0.03]	[0.02]		[0.51]	[0.76]
Top5ind * Importshare	-0.39	-1.53	3.28	3.64	-2.55	1.94	0.35	-0.41	-1.21
	[0.01]	[0.03]	[0.04]	[0.11]	[0.07]	[0.05]	[0.03]	[0.03]	[0.19]
AIC	12,561,566	27,337,067	24,344,189	5,783,582	13,424,779	15,666,035	6,712,847	7,579,307	1,554,383
Observations	40,642,260	40,642,260	40,642,260	16,538,291	16,538,291	16,538,291	24,103,969	24,103,969	24,103,969
Dependent=1	1,506,593	26,084,860	13,050,807	735,226	2,879,709	12,923,356	771,367	23,205,151	127,451

Note: All regressions include time fixed effects. Regressions follow a Binary Logit Model, with maximum likelihood estimate of coefficients provide and [.] reporting standard errors. Indicated in bold are significant coefficients at the 5 percent probability level.

Optimal pricing

- In terms of a quadratic expansion:

$$\begin{aligned} & [\alpha + \lambda(1 - \alpha)](\alpha)^{-1} p_{e,d}^{k(i)}(z) \\ &= 0.5E[mc_{e,d}^{k(i)}]^2 - 0.5E[mr_{e,d}^{k(i)}]^2 + E[disc_{e,d}^{k(i)}(mr_{e,d}^{k(i)} - mc_{e,d}^{k(i)})] \end{aligned}$$

where:

$$mr_{e,d}^{k(i)} = -(\lambda - 1)[\beta_{e,d}^{d,i}s_{e,d} + \beta_{e,d}^{v,i}s_{e,v}] + \lambda[s_{e,d} + p_d] + c_d$$

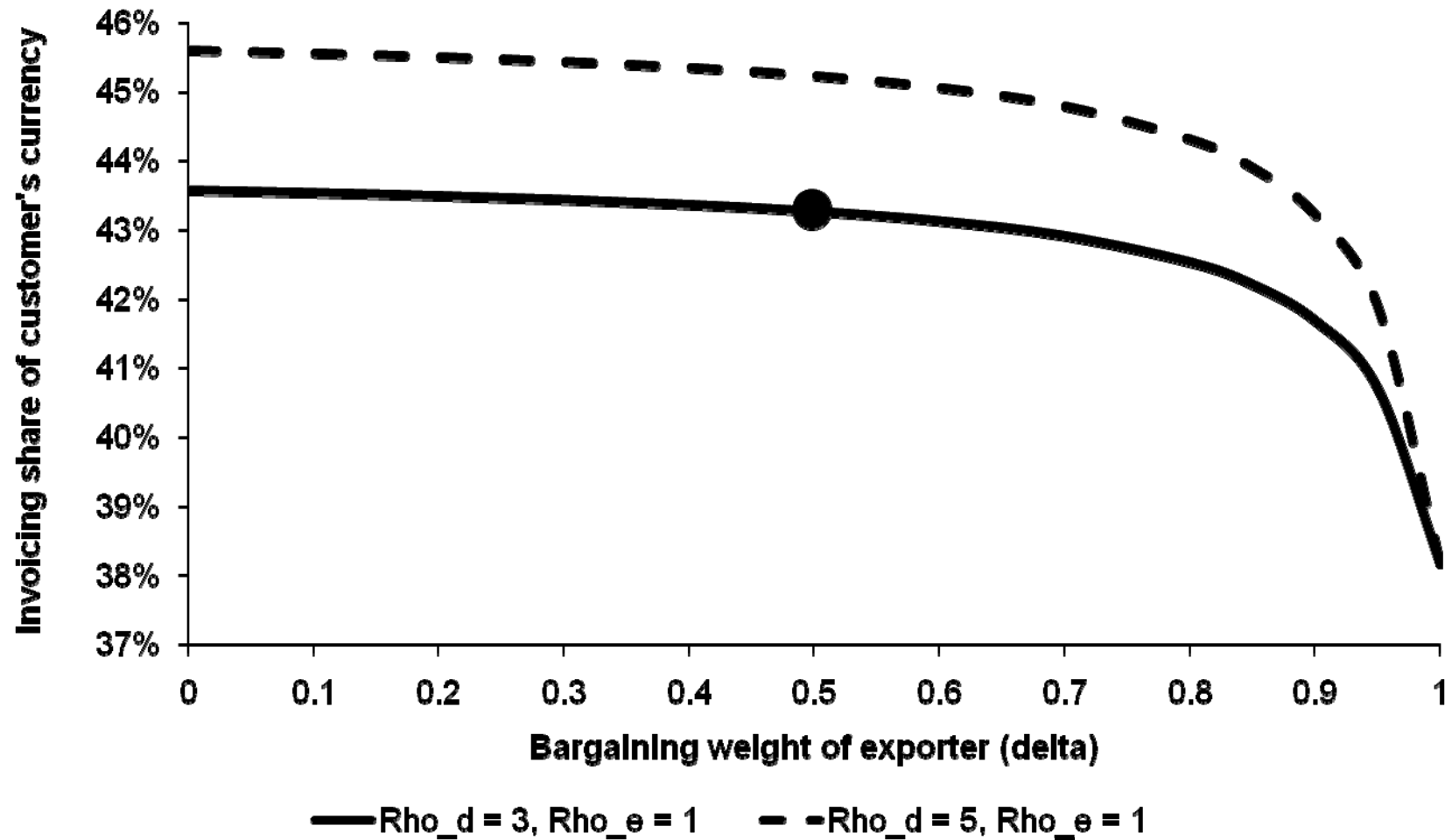
$$mc_{e,d}^{k(i)} = w_e + \frac{\lambda}{\alpha}[s_{e,d} + p_d] + \frac{1}{\alpha}c_d - \frac{\lambda}{\alpha}[\beta_{e,d}^{d,i}s_{e,d} + \beta_{e,d}^{v,i}s_{e,v}]$$

$$disc_{e,d}^{k(i)} = -\rho_e \left[\frac{1}{\alpha + \lambda(1 - \alpha)} [\lambda[s_{e,d} + p_d] + c_d] - \frac{\alpha(\lambda - 1)}{\alpha + \lambda(1 - \alpha)} w_e \right]$$

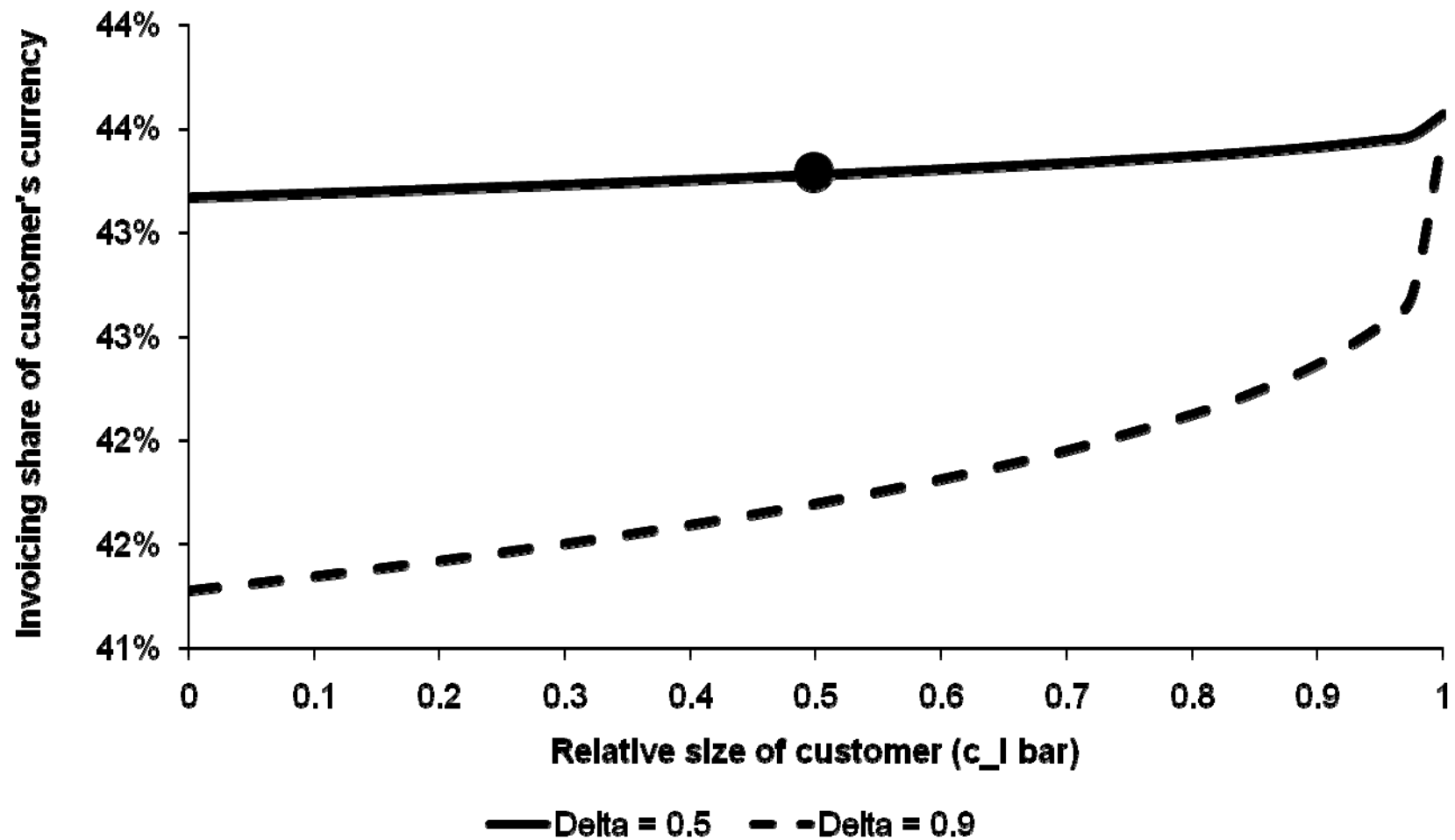
Illustration

- Consider that ρ_d exceeds ρ_e by enough so the demand stabilization benefits outweighs the costs through a higher preset price.
- Bargaining then calls for a higher use of currency d .
- Focus on exchange rate risk by assuming constant wages and aggregate demand.
 - ▣ Set $\alpha = 0.65$, $\lambda = 6$; $\eta_d^d = 0.5$, $\eta_d^e = 0$
 - ▣ Set $\delta = 0.5$, $\tau_d^i = 0.8$, $\bar{c}_d^i = 0.5$ (share to all customer's steady state consumption), $\rho_d = 3$ and $\rho_e = 1$
- The share of currency d is then 43%, compared to 38% under unilateral invoicing.
 - ▣ Most of the impact occurs when the exporter's bargaining weight is high.

Impact of bargaining weight on invoicing share of customer's currency



Impact of customer size on share of customer's currency



Impact of customer size on share of customer's currency

