

Multi-product firms, markup adjustment and import competition

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Motivation - Why focus on product markups, multi-product firms and import competition?

- Big increase in import penetration in developed countries (> 45% for Denmark) from 1999 - 2012
- Important to understand empirically how important is the pro-competitive effect of trade across sectors
- The pro-competitive effect of trade is one of the main channels through which gains from trade occur
- Multi-product firms do not charge the same markup across all their products

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The main results of the paper

- **What do we do:** [▶ Literature](#)
 - Explore how multi-product firms in the manufacturing sector react to import competition at the most disaggregated level
 - Investigate the pro-competitive effects of increased import competition along the product ladder
- **What do we discover:**
 - On average markups drop by 11-18% following a 10% point increase in import competition
 - These effects are **heterogeneous**: products closer to the core competency of the firm suffer a greater markup reduction than peripherals

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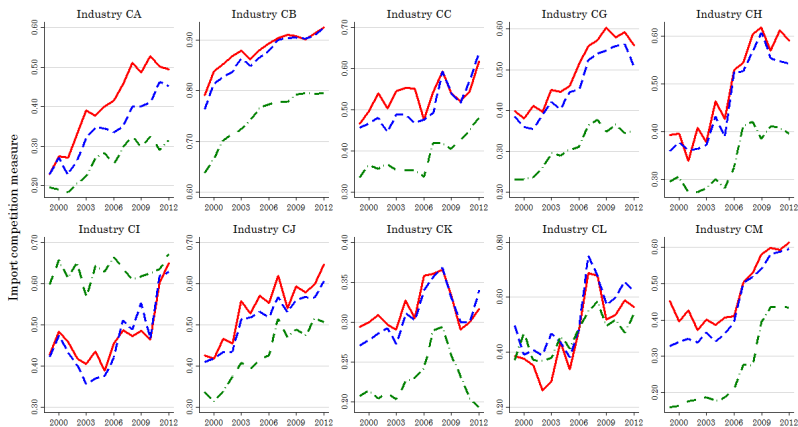
Substantial heterogeneity in import competition across products

Table: Import competition measure by NACE industry

NACE 2-letter manufacturing industry	Mean	Standard deviation	P25	Median	P75
CA - Food products, beverages and tobacco products	0.457	0.353	0.111	0.397	0.816
CB - Textiles, apparel, leather and related products	0.765	0.271	0.653	0.879	0.972
CC - Wood and paper products, and printing	0.541	0.312	0.252	0.541	0.847
CG - Rubber and plastics products, and other non-metallic mineral products	0.495	0.311	0.210	0.490	0.767
CH - Basic metals and fabricated metal products, ex. machinery and equipment	0.513	0.329	0.216	0.490	0.826
CI - Computer, electronic and optical products	0.514	0.280	0.302	0.461	0.762
CJ - Electrical equipment	0.544	0.287	0.316	0.542	0.789
CK - Machinery and equipment n.e.c.	0.391	0.301	0.131	0.317	0.611
CL - Transport equipment	0.469	0.320	0.191	0.445	0.739
CM - Other, repair and installation of machinery and equipment	0.482	0.302	0.212	0.469	0.725

Import competition has increased across all sectors

Figure: Import penetration ratio by NACE industry in Danish manufacturing



Source: Statistics Denmark, UHDI and VARS

Brief discussion

- **Question 1:** Doesn't it suffice to keep the analysis of markups at the firm level?
- **Answer 1:** More than 45% of the firms are multi-product and individual markups are affected differently

Table: Single vs. Multi-product firms in the Danish sample

	Count share in %							
	1999	2001	2003	2005	2007	2009	2011	2012
Single product firms	51.5	54.4	55.1	54.8	55.0	58.0	56.1	55.8
Multi-product firms	48.5	45.6	44.9	45.2	45.0	42.0	43.9	44.2

	Total product sales share in %							
	1999	2001	2003	2005	2007	2009	2011	2012
Single product firms	34.2	33.5	32.1	36.2	37.9	38.6	35.8	36.9
Multi-product firms	65.8	66.5	67.9	63.8	62.1	61.4	64.2	63.1

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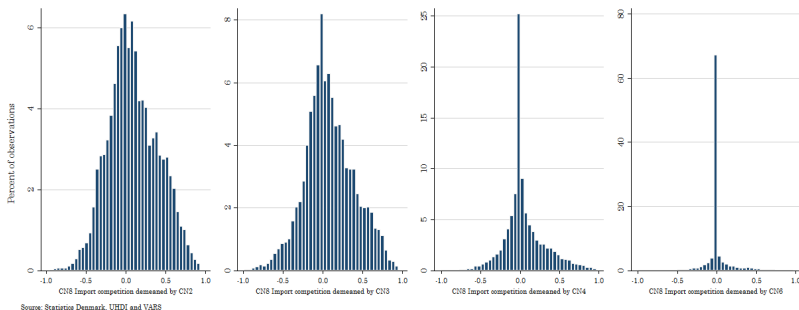
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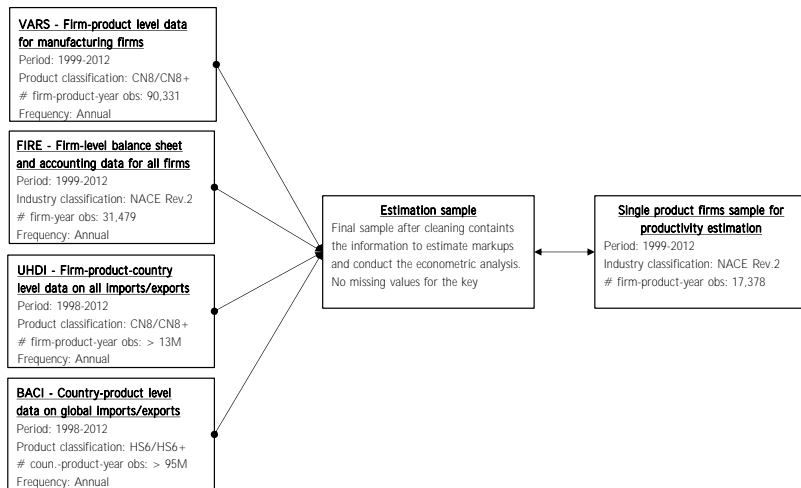
Brief discussion

- **Question 2:** Import competition has so far been analyzed at the industry or firm level. Why go to the product level?
- **Answer 2:** Across narrowly defined varieties there is substantial heterogeneity in import competition

Figure: Import competition heterogeneity across CN product categories



Danish firm- and product-level data



Brief look at the average year in the sample

Table: Sample characteristics for the average year in the Danish manufacturing sector (1999-2012)

NACE 2-letter manufacturing product industry	Output share out of total	# of firms	# of single- product firms	# of unique CN products
CA - Food products, beverages and tobacco products	33.3%	263	76	1,055
CB - Textiles, apparel, leather and related products	3.1%	97	30	590
CC - Wood and paper products, and printing	4.8%	201	110	91
CE - Chemicals and chemical products	5.9%	88	26	406
CG - Rubber and plastics products, and other non-metallic mineral products	8.2%	232	118	201
CH - Basic metals and fabricated metal products, ex. machinery and equipment	8.6%	500	298	357
CI - Computer, electronic and optical products	4.8%	90	62	127
CJ - Electrical equipment	4.5%	131	91	134
CK - Machinery and equipment n.e.c.	14.8%	291	196	269
CL - Transport equipment	2.3%	55	43	65
CM - Other, repair and installation of machinery and equipment	9.8%	302	192	122
	100%	2,249	1,241	3,417

How to obtain markup estimates?

- The paper closely follows [De Loecker et al. \(2016\)](#) on the markup estimation algorithm
- The approach is based on production function estimation and assumes that:
 1. Firms are cost-minimizing
 2. Productivity is firm-specific and Hicks-neutral:
$$Q_{ijt} = Q_{jt}(K_{ijt}, L_{ijt}^V, M_{ijt}^V, \dots)\Omega_{it}$$
 3. At least one freely adjustable input (materials) in the production function

Expression for markups

- The markup for product j , produced by firm i at time t is:

$$\mu_{ijt} = \underbrace{\zeta_{ijt}^v \left(\frac{P_{ijt} Q_{ijt}}{W_{ijt}^v V_{ijt}^v} \right)}_{(\alpha_{ijt}^v)^{-1}}, \quad (1)$$

ζ_{ijt}^v : output elasticity w.r.t the variable input (materials) and $(\alpha_{ijt}^v)^{-1}$ is the ratio of material expenditures to total sales

- Problem:** ζ_{ijt}^v needs to be estimated, α_{ijt}^v unobserved in the data e.g. $\tilde{\rho}_{ijt} TE_{it}^v = W_{ijt}^v X_{ijt}^v$

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Estimation of markups

- Exploit the relationship: $W_{ijt}^v X_{ijt}^v = \tilde{\rho}_{ijt} TE_{it}^v$ and taking logs:

$$x_{ijt} = \rho_{ijt} + \tilde{x}_{it} - w_{ijt}^x \quad (2)$$

- The production function in logs:

$q_{ijt} = f_j(\mathbf{v}_{ijt}, \mathbf{k}_{ijt}; \beta) + \omega_{it} + \epsilon_{ijt}$ combined with (2):

$$q_{ijt} = f_j(\tilde{\mathbf{x}}_{it}; \beta) + A(\rho_{ijt}, \tilde{\mathbf{x}}_{it}; \beta) + B(\mathbf{w}_{ijt}, \rho_{ijt}, \tilde{\mathbf{x}}_{it}; \beta) + \omega_{it} + \epsilon_{ijt}$$

- **Problem:** ρ_{ijt} and \mathbf{w}_{ijt} are unobserved
- **Solution:** Use single-product firms and use a control function for $\mathbf{w}_{ijt} = w_t(p_{it}, \mathbf{ms}_{it}, \mathbf{pr_dum}_i, \mathbf{exp}_{it}, \mathbf{imp}_{it})$

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Estimation of markups

- Estimates of β obtained in 2 stages as in Akerberg et al. (2015):
- Recall: $q_{ijt} = f_j(\tilde{\mathbf{x}}_{it}; \beta) + B(\mathbf{w}_{ijt}, \rho_{ijt}, \tilde{\mathbf{x}}_{it}; \beta) + \omega_{it} + \epsilon_{ijt}$
- Invert for productivity: $\omega_{it} = g_t(\tilde{\mathbf{x}}_{it}, \tilde{m}_{it}, \mathbf{u}_{it}) \Rightarrow$ Predicted output: $q_{it} = \phi_t(\cdot) + \epsilon_{it}$, with
 $\phi_t(\cdot) = f(\tilde{\mathbf{x}}_{it}; \beta) + B(\mathbf{w}_{it}, \tilde{\mathbf{x}}_{it}; \beta) + g_t(\tilde{\mathbf{x}}_{it}, \mathbf{u}_{it})$
- Law of motion for productivity: $\omega_{it}(\beta, \delta) =$
 $h_t(\omega_{i,t-1}(\beta, \delta), \exp_{i,t-1}, \text{imp}_{i,t-1}, IC_{i,t-1}, Pr_{it}, S_{it}) + \xi_{it}$

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Allocation shares and markup estimates

- The shares are backed out numerically by solving a system of equations in $J + 1$ unknowns: $\rho_{ijt}, \dots, \rho_{iJt}$ and ω_{it}
- In the translog case $\hat{\zeta}_{ijt}^M = \zeta_t \left(\hat{\beta}, \tilde{\mathbf{x}}_{it}, \hat{\rho}_{ijt}, \hat{w}_{ijt} \right)$
 - Theoretical expression: $\mu_{ijt} = \zeta_{ijt}^v \left(\frac{P_{ijt} Q_{ijt}}{W_{ijt}^v V_{ijt}^v} \right)$
 - Empirical expression: $\hat{\mu}_{ijt} = \hat{\zeta}_{ijt}^M \left(\frac{P_{ijt} Q_{ijt}}{\exp(\hat{\rho}_{ijt}) TE_{it}^M} \right)$
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How to capture import competition?

- *IC* measure accounting for own imports of firms varying at the *product-firm level*:

$$IC_{ijt} = \frac{M_{jt} - M_{ijt}}{M_{jt} - M_{ijt} + Y_{jt}^{DK}}, j \in \{CN8, CN6\}$$

- An alternative measure varying only at the *product level*:

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- Both measures are very highly correlated (0.97) \Rightarrow The alternative *IC* is used only as a robustness measure

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Regression model

- Explore the variation in markup dynamics (within firm-products) due to import competition:

$$\ln(\mu_{ijt}) = \beta_1 IC_{ij,t-1} + \mathbf{X}'_{ij,t-1} \boldsymbol{\delta} + \tau_k + \tau_t + \epsilon_{ijt} \quad (3)$$

- Import competition effects across the product ladder:

$$\ln(\mu_{ijt}) = \beta_1 IC_{ij,t-1} + \beta_2 Rank_{ij,t-1} \times IC_{ij,t-1} + \mathbf{X}'_{ij,t-1} \boldsymbol{\delta} + \tau_k + \tau_t + \epsilon_{ijt}, \quad (4)$$

where in (3) and (4) $k \in \{i, j, ij\}$

- Main interest in the β_1 and β_2 coefficients and hypotheses suggest: $\beta_1 < 0$, $\beta_2 > 0$
- Firm- and product-level controls: firm productivity, marginal costs, number of employees, portfolio size and product rank

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Endogeneity and Instrument

- Potential endogeneity due to unobserved supply/demand shocks that could affect both markups and import intensity
- **Instrument: World Export Supply (WES)** of the top 5 exporters at the HS6/CN6 level, excluding neighboring countries of DK:

$$IV_WES_{jt} = \log \left(\sum_{c \in E'} WES_{jct} \right)$$

- Idea: Higher exports of Denmark's trading partners to other non-neighboring countries are correlated with exports to Denmark
- The instrument purges the effect of unobserved supply and demand shocks that simultaneously affect import exposure and product-level markups

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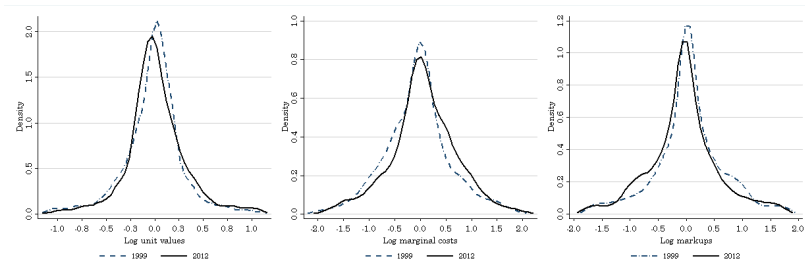
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How have markups, prices and marginal costs evolved across time?

Figure: Evolution of prices, marginal costs and markups, 1999-2012



Markups, product ladder and import competition

► Results: MP, MC, P Variation across firms

► Results: MP, MC, P Variation within firms

	OLS						IV			
	(1) Markup	(2) Markup	(3) Markup	(4) Markup	(5) Markup	(6) Markup	(7) Markup	(8) Markup	(9) Markup	(10) Markup
Import competition (CN8) _{ij,t-1}	-0.953*** (0.125)	-0.713*** (0.085)	-0.453*** (0.086)	-0.308*** (0.062)	-0.149* (0.076)	-0.099 (0.061)	-1.793*** (0.504)	-1.340*** (0.402)	-1.149*** (0.386)	-1.228*** (0.343)
Product rank x Import competition (CN8) _{ij,t-1}	0.064*** (0.018)	0.044*** (0.013)	0.045*** (0.011)	0.036*** (0.007)	0.028*** (0.008)	0.022*** (0.006)	0.063* (0.037)	0.051* (0.029)	0.067** (0.031)	0.067** (0.031)
Product rank _{ij,t-1}	-0.161*** (0.037)	-0.091*** (0.027)	-0.110*** (0.016)	-0.071*** (0.014)	-0.061*** (0.015)	-0.031*** (0.010)	-0.081*** (0.027)	-0.047** (0.021)	-0.060*** (0.022)	-0.060*** (0.022)
Marginal cost _{ij,t-1}		-0.439*** (0.026)		-0.468*** (0.012)		-0.265*** (0.013)		-0.269*** (0.012)	-0.291*** (0.024)	-0.292*** (0.024)
Log # employees _{i,t-1}		0.127*** (0.035)		-0.001 (0.013)		0.246*** (0.031)		0.191*** (0.033)	0.198*** (0.036)	0.194*** (0.034)
# of products _{i,t-1}		0.013** (0.007)		0.011*** (0.004)		0.008*** (0.003)		0.008*** (0.003)	0.008** (0.003)	0.008** (0.003)
Single product firm _{i,t-1}		0.307*** (0.068)		0.144*** (0.028)		0.111* (0.057)		0.101* (0.054)	0.056 (0.055)	0.055 (0.055)
Constant	0.553*** (0.141)	-1.309*** (0.160)	-0.025 (0.239)	-1.342*** (0.169)	-0.200*** (0.070)	-1.939*** (0.146)				
R ²	0.45	0.58	0.56	0.72	0.87	0.88	0.08	0.10	0.10	0.10
Firm fixed effects	Yes	Yes	No	No	No	No	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Sector fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Product-firm fixed effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
F-stat. (first stage)							85.60	86.60	49.52	9.20
Under-identification stat.							138.87	137.68	125.06	7.32
Under-identification p-value							0.000	0.000	0.000	0.026
Endogenous variables							2	2	3	3
Exogenous instruments							2	2	3	4
Observations	62,385	61,479	62,385	61,479	62,385	61,479	56,342	55,592	44,939	44,939

Standard errors in parentheses

Standard errors clustered at the firm-level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Marginal cost $_{ij,t-1}$		-0.439*** (0.026)		-0.468*** (0.012)		-0.265*** (0.013)		-0.269*** (0.012)	-0.291*** (0.024)	-0.292*** (0.024)
Log # employees $_{i,t-1}$		0.127*** (0.035)		-0.001 (0.013)		0.246*** (0.031)		0.191*** (0.033)	0.198*** (0.036)	0.194*** (0.034)
# of products $_{i,t-1}$		0.013** (0.007)		0.011*** (0.004)		0.008*** (0.003)		0.008*** (0.003)	0.008** (0.003)	0.008** (0.003)
Single product firm $_{i,t-1}$		0.307*** (0.068)		0.144*** (0.028)		0.111* (0.057)		0.101* (0.054)	0.056 (0.055)	0.055 (0.055)
Constant	0.553*** (0.141)	-1.309*** (0.160)	-0.025 (0.239)	-1.342*** (0.169)	-0.200*** (0.070)	-1.939*** (0.146)				
R^2	0.45	0.58	0.56	0.72	0.87	0.88	0.08	0.10	0.10	0.10
Firm fixed effects	Yes	Yes	No	No	No	No	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Sector fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Product-firm fixed effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
F-stat. (first stage)							85.60	86.60	49.52	9.20
Under-identification stat.							138.87	137.68	125.06	7.32
Under-identification p-value							0.000	0.000	0.000	0.026
Endogenous variables							2	2	3	3
Exogenous instruments							2	2	3	4
Observations	62,385	61,479	62,385	61,479	62,385	61,479	56,342	55,592	44,939	44,939

Standard errors in parentheses

Standard errors clustered at the firm-level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Markups, product ladder and import competition

► Results: MP, MC, P Variation across firms

► Results: MP, MC, P Variation within firms

	OLS						IV			
	(1) Markup	(2) Markup	(3) Markup	(4) Markup	(5) Markup	(6) Markup	(7) Markup	(8) Markup	(9) Markup	(10) Markup
Import competition $(CN8)_{ij,t-1}$	-0.953*** (0.125)	-0.713*** (0.085)	-0.453*** (0.086)	-0.308*** (0.062)	-0.149* (0.076)	-0.099 (0.061)	-1.793*** (0.504)	-1.340*** (0.402)	-1.149*** (0.386)	-1.228*** (0.343)
Product rank x Import competition $(CN8)_{ij,t-1}$	0.064*** (0.018)	0.044*** (0.013)	0.045*** (0.011)	0.036*** (0.007)	0.028*** (0.008)	0.022*** (0.006)	0.063* (0.037)	0.051* (0.029)	0.067** (0.031)	0.067** (0.031)
Product rank $_{ij,t-1}$	-0.161*** (0.037)	-0.091*** (0.027)	-0.110*** (0.016)	-0.071*** (0.014)	-0.061*** (0.015)	-0.031*** (0.010)	-0.081*** (0.027)	-0.047** (0.021)	-0.060*** (0.022)	-0.060*** (0.022)
Marginal cost $_{ij,t-1}$		-0.439*** (0.026)		-0.468*** (0.012)		-0.265*** (0.013)		-0.269*** (0.012)	-0.291*** (0.024)	-0.292*** (0.024)
Log # employees $_{i,t-1}$		0.127*** (0.035)		-0.001 (0.013)		0.246*** (0.031)		0.191*** (0.033)	0.198*** (0.036)	0.194*** (0.034)
# of products $_{i,t-1}$		0.013** (0.007)		0.011*** (0.004)		0.008*** (0.003)		0.008*** (0.003)	0.008** (0.003)	0.008** (0.003)
Single product firm $_{i,t-1}$		0.307*** (0.068)		0.144*** (0.028)		0.111* (0.057)		0.101* (0.054)	0.056 (0.055)	0.055 (0.055)
Constant	0.553*** (0.141)	-1.309*** (0.160)	-0.025 (0.239)	-1.342*** (0.169)	-0.200*** (0.070)	-1.939*** (0.146)				
R^2	0.45	0.58	0.56	0.72	0.87	0.88	0.08	0.10	0.10	0.10
Firm fixed effects	Yes	Yes	No	No	No	No	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Sector fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Product-firm fixed effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
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Markups, product ladder and import competition

► Results: MP, MC, P Variation across firms

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	OLS						IV			
	(1) Markup	(2) Markup	(3) Markup	(4) Markup	(5) Markup	(6) Markup	(7) Markup	(8) Markup	(9) Markup	(10) Markup
Import competition $(CN8)_{ij,t-1}$	-0.953*** (0.125)	-0.713*** (0.085)	-0.453*** (0.086)	-0.308*** (0.062)	-0.149* (0.076)	-0.099 (0.061)	-1.793*** (0.504)	-1.340*** (0.402)	-1.149*** (0.386)	-1.228*** (0.343)
Product rank x Import competition $(CN8)_{ij,t-1}$	0.064*** (0.018)	0.044*** (0.013)	0.045*** (0.011)	0.036*** (0.007)	0.028*** (0.008)	0.022*** (0.006)	0.063* (0.037)	0.051* (0.029)	0.067** (0.031)	0.067** (0.031)
Product rank $_{ij,t-1}$	-0.161*** (0.037)	-0.091*** (0.027)	-0.110*** (0.016)	-0.071*** (0.014)	-0.061*** (0.015)	-0.031*** (0.010)	-0.081*** (0.027)	-0.047** (0.021)	-0.060*** (0.022)	-0.060*** (0.022)
Marginal cost $_{ij,t-1}$		-0.439*** (0.026)		-0.468*** (0.012)		-0.265*** (0.013)		-0.269*** (0.012)	-0.291*** (0.024)	-0.292*** (0.024)
Log # employees $_{i,t-1}$		0.127*** (0.035)		-0.001 (0.013)		0.246*** (0.031)		0.191*** (0.033)	0.198*** (0.036)	0.194*** (0.034)
# of products $_{i,t-1}$		0.013** (0.007)		0.011*** (0.004)		0.008*** (0.003)		0.008*** (0.003)	0.008** (0.003)	0.008** (0.003)
Single product firm $_{i,t-1}$		0.307*** (0.068)		0.144*** (0.028)		0.111* (0.057)		0.101* (0.054)	0.056 (0.055)	0.055 (0.055)
Constant	0.553*** (0.141)	-1.309*** (0.160)	-0.025 (0.239)	-1.342*** (0.169)	-0.200*** (0.070)	-1.939*** (0.146)				
R^2	0.45	0.58	0.56	0.72	0.87	0.88	0.08	0.10	0.10	0.10
Firm fixed effects	Yes	Yes	No	No	No	No	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Sector fixed effects	No	No	Yes	Yes	No	No	No	No	No	No
Product-firm fixed effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
F-stat. (first stage)							85.60	86.60	49.52	9.20
Under-identification stat.							138.87	137.68	125.06	7.32
Under-identification p-value							0.000	0.000	0.000	0.026
Endogenous variables							2	2	3	3
Exogenous instruments							2	2	3	4
Observations	62,385	61,479	62,385	61,479	62,385	61,479	56,342	55,592	44,939	44,939

Standard errors in parentheses

Standard errors clustered at the firm-level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Summary of findings

- Markups drop, on average, by 11-18% following a 10% point increase in import competition
 - These effects are magnified for products closer to the core competency of the firm than peripherals
- Policy implication: Globalization has highly heterogeneous effects across products within firms \Rightarrow Important margin of firm adjustment when faced with tougher market conditions

Summary of findings

- Markups drop, on average, by 11-18% following a 10% point increase in import competition
 - These effects are magnified for products closer to the core competency of the firm than peripherals
- Policy implication: Globalization has highly heterogeneous effects across products within firms \Rightarrow Important margin of firm adjustment when faced with tougher market conditions

Prices, markups, marginal costs and import competition (Variation within products across firms)

	Markup (1)	Markup (2)	Markup (3)	Markup (4)	MC (1)	MC (2)	MC (3)	MC (4)	Price (1)	Price (2)	Price (3)	Price (4)
Import competition (CN8) _{ijt-1}	-0.440*** (0.086)	-0.205*** (0.056)	-0.238*** (0.057)	-0.217*** (0.056)	0.515*** (0.093)	0.448*** (0.096)	0.461*** (0.098)	0.420*** (0.097)	-0.057 (0.047)	-0.181*** (0.046)	-0.212*** (0.047)	-0.201*** (0.047)
Marginal cost _{ijt-1}		-0.531*** (0.010)	-0.529*** (0.010)	-0.524*** (0.010)						0.308*** (0.011)	0.310*** (0.011)	0.313*** (0.011)
Log # employees _{it-1}			-0.059*** (0.011)	-0.023* (0.013)			0.023 (0.023)	-0.081** (0.031)			-0.054*** (0.012)	-0.035*** (0.013)
Number of products _{it-1}				-0.007*** (0.001)				0.018*** (0.004)				-0.004*** (0.001)
Firm productivity _{it-1}						-0.313*** (0.021)	-0.309*** (0.020)	-0.316*** (0.020)				
Constant	-0.285*** (0.038)	-1.271*** (0.036)	-1.010*** (0.060)	-1.074*** (0.064)	-1.858*** (0.044)	-1.195*** (0.070)	-1.312*** (0.128)	-1.085*** (0.146)	-2.112*** (0.027)	-1.524*** (0.034)	-1.282*** (0.062)	-1.317*** (0.064)
R ²	0.48	0.70	0.70	0.70	0.72	0.70	0.70	0.70	0.90	0.93	0.93	0.93
Adjusted R ²	0.45	0.69	0.69	0.69	0.71	0.68	0.68	0.68	0.90	0.92	0.92	0.92
Number of clusters	4,016	4,009	4,009	4,009	3,953	1,915	1,915	1,915	4,016	4,009	4,009	4,009
Product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62385	61479	61479	61479	62256	48848	48848	48848	62385	61479	61479	61479

Standard errors in parentheses

Standard errors clustered at the firm level. All specifications are estimated using OLS. The product level is at 8-digit CN.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Prices, markups, marginal costs and import competition (Variation within products across firms)

	Markup (1)	Markup (2)	Markup (3)	Markup (4)	MC (1)	MC (2)	MC (3)	MC (4)	Price (1)	Price (2)	Price (3)	Price (4)
Import competition (CN8) _{ijt-1}	-0.440*** (0.086)	-0.205*** (0.056)	-0.238*** (0.057)	-0.217*** (0.056)	0.515*** (0.093)	0.448*** (0.096)	0.461*** (0.098)	0.420*** (0.097)	-0.057 (0.047)	-0.181*** (0.046)	-0.212*** (0.047)	-0.201*** (0.047)
Marginal cost _{ijt-1}		-0.531*** (0.010)	-0.529*** (0.010)	-0.524*** (0.010)						0.308*** (0.011)	0.310*** (0.011)	0.313*** (0.011)
Log # employees _{it-1}			-0.059*** (0.011)	-0.023* (0.013)			0.023 (0.023)	-0.081** (0.031)			-0.054*** (0.012)	-0.035*** (0.013)
Number of products _{it-1}				-0.007*** (0.001)				0.018*** (0.004)				-0.004*** (0.001)
Firm productivity _{it-1}						-0.313*** (0.021)	-0.309*** (0.020)	-0.316*** (0.020)				
Constant	-0.285*** (0.038)	-1.271*** (0.036)	-1.010*** (0.060)	-1.074*** (0.064)	-1.858*** (0.044)	-1.195*** (0.070)	-1.312*** (0.128)	-1.085*** (0.146)	-2.112*** (0.027)	-1.524*** (0.034)	-1.282*** (0.062)	-1.317*** (0.064)
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Adjusted R ²	0.45	0.69	0.69	0.69	0.71	0.68	0.68	0.68	0.90	0.92	0.92	0.92
Number of clusters	4,016	4,009	4,009	4,009	3,953	1,915	1,915	1,915	4,016	4,009	4,009	4,009
Product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62385	61479	61479	61479	62256	48848	48848	48848	62385	61479	61479	61479

Standard errors in parentheses

Standard errors clustered at the firm level. All specifications are estimated using OLS. The product level is at 8-digit CN.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Prices, markups, marginal costs and import competition (Variation within products across firms)

	Markup (1)	Markup (2)	Markup (3)	Markup (4)	MC (1)	MC (2)	MC (3)	MC (4)	Price (1)	Price (2)	Price (3)	Price (4)
Import competition (CN8) _{ijt-1}	-0.440*** (0.086)	-0.205*** (0.056)	-0.238*** (0.057)	-0.217*** (0.056)	0.515*** (0.093)	0.448*** (0.096)	0.461*** (0.096)	0.420*** (0.097)	-0.057 (0.047)	-0.181*** (0.046)	-0.212*** (0.047)	-0.201*** (0.047)
Marginal cost _{ijt-1}		-0.531*** (0.010)	-0.529*** (0.010)	-0.524*** (0.010)						0.308*** (0.011)	0.310*** (0.011)	0.313*** (0.011)
Log # employees _{it-1}			-0.059*** (0.011)	-0.023* (0.013)			0.023 (0.023)	-0.081** (0.031)			-0.054*** (0.012)	-0.035*** (0.013)
Number of products _{it-1}				-0.007*** (0.001)				0.018*** (0.004)				-0.004*** (0.001)
Firm productivity _{it-1}						-0.313*** (0.021)	-0.309*** (0.020)	-0.316*** (0.020)				
Constant	-0.285*** (0.038)	-1.271*** (0.036)	-1.010*** (0.060)	-1.074*** (0.064)	-1.858*** (0.044)	-1.195*** (0.070)	-1.312*** (0.128)	-1.085*** (0.146)	-2.112*** (0.027)	-1.524*** (0.034)	-1.282*** (0.062)	-1.317*** (0.064)
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Adjusted R ²	0.45	0.69	0.69	0.69	0.71	0.68	0.68	0.68	0.90	0.92	0.92	0.92
Number of clusters	4,016	4,009	4,009	4,009	3,953	1,915	1,915	1,915	4,016	4,009	4,009	4,009
Product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62385	61479	61479	61479	62256	48848	48848	48848	62385	61479	61479	61479

Standard errors in parentheses

Standard errors clustered at the firm level. All specifications are estimated using OLS. The product level is at 8-digit CN.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Prices, markups, marginal costs and import competition (Variation within products across firms)

	Markup (1)	Markup (2)	Markup (3)	Markup (4)	MC (1)	MC (2)	MC (3)	MC (4)	Price (1)	Price (2)	Price (3)	Price (4)
Import competition (CN8) _{ijt-1}	-0.440*** (0.086)	-0.205*** (0.056)	-0.238*** (0.057)	-0.217*** (0.056)	0.515*** (0.093)	0.448*** (0.096)	0.461*** (0.098)	0.420*** (0.097)	-0.057 (0.047)	-0.181*** (0.046)	-0.212*** (0.047)	-0.201*** (0.047)
Marginal cost _{ijt-1}		-0.531*** (0.010)	-0.529*** (0.010)	-0.524*** (0.010)						0.308*** (0.011)	0.310*** (0.011)	0.313*** (0.011)
Log # employees _{it-1}			-0.059*** (0.011)	-0.023* (0.013)			0.023 (0.023)	-0.081** (0.031)			-0.054*** (0.012)	-0.035*** (0.013)
Number of products _{it-1}				-0.007*** (0.001)				0.018*** (0.004)				-0.004*** (0.001)
Firm productivity _{it-1}						-0.313*** (0.021)	-0.309*** (0.020)	-0.316*** (0.020)				
Constant	-0.285*** (0.038)	-1.271*** (0.036)	-1.010*** (0.060)	-1.074*** (0.064)	-1.858*** (0.044)	-1.195*** (0.070)	-1.312*** (0.128)	-1.085*** (0.146)	-2.112*** (0.027)	-1.524*** (0.034)	-1.282*** (0.062)	-1.317*** (0.064)
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Number of clusters	4,016	4,009	4,009	4,009	3,953	1,915	1,915	1,915	4,016	4,009	4,009	4,009
Product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62385	61479	61479	61479	62256	48848	48848	48848	62385	61479	61479	61479

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* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Prices, markups, marginal costs and import competition (Variation within products across firms)

	Markup (1)	Markup (2)	Markup (3)	Markup (4)	MC (1)	MC (2)	MC (3)	MC (4)	Price (1)	Price (2)	Price (3)	Price (4)
Import competition (CN8) _{ijt-1}	-0.440*** (0.086)	-0.205*** (0.056)	-0.238*** (0.057)	-0.217*** (0.056)	0.515*** (0.093)	0.448*** (0.096)	0.461*** (0.098)	0.420*** (0.097)	-0.057 (0.047)	-0.181*** (0.046)	-0.212*** (0.047)	-0.201*** (0.047)
Marginal cost _{ijt-1}		-0.531*** (0.010)	-0.529*** (0.010)	-0.524*** (0.010)						0.308*** (0.011)	0.310*** (0.011)	0.313*** (0.011)
Log # employees _{it-1}			-0.059*** (0.011)	-0.023* (0.013)			0.023 (0.023)	-0.081** (0.031)			-0.054*** (0.012)	-0.035*** (0.013)
Number of products _{it-1}				-0.007*** (0.001)				0.018*** (0.004)				-0.004*** (0.001)
Firm productivity _{it-1}						-0.313*** (0.021)	-0.309*** (0.020)	-0.316*** (0.020)				
Constant	-0.285*** (0.038)	-1.271*** (0.036)	-1.010*** (0.060)	-1.074*** (0.064)	-1.858*** (0.044)	-1.195*** (0.070)	-1.312*** (0.128)	-1.085*** (0.146)	-2.112*** (0.027)	-1.524*** (0.034)	-1.282*** (0.062)	-1.317*** (0.064)
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Adjusted R ²	0.45	0.69	0.69	0.69	0.71	0.68	0.68	0.68	0.90	0.92	0.92	0.92
Number of clusters	4,016	4,009	4,009	4,009	3,953	1,915	1,915	1,915	4,016	4,009	4,009	4,009
Product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62385	61479	61479	61479	62256	48848	48848	48848	62385	61479	61479	61479

Standard errors in parentheses

Standard errors clustered at the firm level. All specifications are estimated using OLS. The product level is at 8-digit CN.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Prices, markups, marginal costs and import competition (Variation within firms across products)

	Markup (1)	Markup (2)	Markup (3)	MC (1)	MC (2)	MC (3)	Price (1)	Price (2)	Price (3)
Import competition (CN8) _{ij,t-1}	-0.604*** (0.074)	-0.459*** (0.074)	-0.313*** (0.065)	0.900*** (0.115)	0.202 (0.124)	0.291** (0.119)	-0.474*** (0.074)	-0.408*** (0.075)	-0.247*** (0.064)
Marginal cost _{ij,t-1}	-0.541*** (0.016)	-0.501*** (0.017)	-0.540*** (0.015)				0.301*** (0.017)	0.327*** (0.018)	0.280*** (0.015)
# of product sellers _{it,t-1}		-0.008*** (0.001)	-0.004*** (0.001)		-0.015*** (0.002)	-0.010*** (0.001)		-0.010*** (0.001)	-0.006*** (0.001)
NOT core product _{ij,t-1}		-0.941*** (0.051)	-0.848*** (0.047)		1.665*** (0.057)	1.687*** (0.055)		-0.746*** (0.055)	-0.642*** (0.049)
Number of products _{it,t-1}			-0.006*** (0.002)			0.018*** (0.003)			-0.000 (0.002)
BEC Intermediate good _j			-2.129*** (0.156)			-1.944*** (0.194)			-2.491*** (0.178)
BEC Consumption good _j			-0.953*** (0.152)			-1.663*** (0.191)			-1.223*** (0.166)
Firm productivity _{it,t-1}				-0.115*** (0.026)	-0.149*** (0.026)	-0.146*** (0.025)			
Constant	-1.167*** (0.055)	-0.436*** (0.077)	0.652*** (0.135)	-1.754*** (0.099)	-2.468*** (0.112)	-1.335*** (0.181)	-1.423*** (0.055)	-0.754*** (0.082)	0.488*** (0.151)
R ²	0.55	0.58	0.61	0.61	0.66	0.67	0.88	0.89	0.90
adj. R ²	0.52	0.55	0.58	0.60	0.64	0.66	0.87	0.88	0.89
Number of clusters	4,009	4,009	4,007	1,915	1,915	1,915	4,009	4,009	4,007
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	61479	61479	61460	48848	48848	48846	61479	61479	61460

Standard errors in parentheses

Standard errors clustered at the firm level. All specifications are estimated using OLS. The reference group for type of product is capital good according to the BEC classification.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Related literature

- **Markup estimation methods:**
 - De Loecker et al. (2016, ECTA), De Loecker and Warzynski (2012, AER), Hall (1986, BPEA), Hall (1988, JPE)
- **Literature on competition and trade:**
 - Bloom et al. (2016, ReStud), Autor et al. (2013, AER), Zhu and Mion (2013, JIE), Dhyne et al. (2016), Meinen (2016, EL), Dhingra (2012, AER), Ashournia et al. (2014), De Loecker (2011, ECTA), Utar (2014, AEJ), Lu and Yu (2015, AEJ), Liu and Rosell (2013, JIE), Martin and Mejean (2014, JIE), Caselli et al. (2014)
- **Theoretical literature on multi-product firms and trade:**
 - Mayer et al. (2014, AER), Eckel and Neary (2010, REStud)