Import Churning and Export Performance of Multi-product Firms

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- Preliminary results
- Data
- Descriptive statistics
- Net- and gross-churning
- Re-export (Pass–on-trade)
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Motivation

Evidence on *multi-product firms*

- ▶ Entering new export markets affects the reallocation of resources across multiple product firms and has been shown to be important drivers of firm performance (Bernard, Redding & Schott, 2011),

- ▶ Bernard, Redding & Schott (2010) find that one-half of US firms alter their mix of five-digit SIC products every five years and suggest that product switching contributes to a reallocation of resources within firms toward their most efficient use,

- ▶ Iacovone & Javorcik (2010) show intense product churning within firms for Mexican exporters, while true export discoveries are rare.

Motivation (2)

- In a number of recent papers, imports is shown to have a bigger effect on firm performance than exports (Altomonte & Bekes, 2009; Wagner, 2010; Damijan & Kostevc, 2010a,b),

- Access to cheaper, better and more intermediate inputs through imports is seen as an important determinant of firm level productivity (Amiti & Konings, 2007),

- By providing access to new products or new varieties of existing (intermediate) products, static and dynamic gains of trade can be realized by raising firm productivity and innovation in India (Goldberg et al, 2010),

- For French firms, Bas & Strauss-Kahn (2011) show that increased number of imported inputs varieties impacts on firm's TFP and export scope, while the price effect is very limited.

Aims

- *Churning* (adding and dropping) of imported inputs may play a major role in the export story
- We make use of Slovenian multi-product firm transaction-level trade data for 1994 - 2008
  - with detailed information on firm import and export flows at the CN-8 product level
  - broken down by product type (intermediate, capital, final product)
- We analyze the impact of diversification of imported products on (1) firm's export scope and (2) productivity growth,
  - whereby we disentangle the effects of net- and gross- import products churning,
  - we account for phenomenon of re-exported products

Preliminary results

- Huge product churning both in imports and exports,
- Substantial simultaneous trade in identical goods (POT),
- Price effects have limited effects:
  - changes in import prices have larger effect than tariff cuts,
- Variety effects are substantial:
  - enhance the export scope, and
  - impact at firm's productivity growth,
  - gross-churning of imported goods seems to have a bigger effect,
- POT has less favorable effects on firms' long-run performance than regular trade.

Data

- Transaction-level imports & exports data for Slovenia at CN-8 product-level,
  - manufacturing firms only
  - period 1994 - 2008
  - broken down by product type (intermediate, capital, final)
  - information on destination and origin country
  - values in EUR, deflated to 1994 using Nace-2 PPI indices
  - corrected for changes in CN-8 over time
- Matched with firm balance sheets (AJPES)
  - deflated to 1994 using Nace-2 PPI and CPI (capital)
  - dropping firms with zero output or zero employees
- Matched with data on firm's multinational status
  - purely domestic owned, foreign affiliate, having affiliates abroad

Summary statistics for exporters and importers in 2008

Importers					
Number of products imported	Number of firms	Freq. (%)	Average number of employees	Average value of imports per firm	Freq. (%)
0	747	16.8	9.2	0	0.00
1	559	12.6	8.7	13,507	0.20
2	291	6.5	13.4	24,769	0.19
3	194	4.4	15.1	59,850	0.30
4	129	2.9	17.5	109,790	0.37
5	115	2.6	16.8	108,073	0.32
6-10	355	8.0	19.3	166,403	1.53
11-20	414	9.3	36.1	249,393	2.67
21-50	725	16.3	51.2	603,553	11.33
>50	917	20.6	201.3	3,500,629	83.10
Total	4,446	100.0	59.9	868,856	100.00

Exporters					
Number of products exported	Number of firms	Freq. (%)	Average number of employees	Average value of exports	Freq. (%)
0	1122	25.2	15.8	0	0.00
1	565	12.7	13.6	48,348	0.58
2	357	8.0	17.2	71,679	0.54
3	260	5.9	18.5	124,780	0.69
4	173	3.9	21.9	263,908	0.97
5	138	3.1	23.3	232,854	0.68
6-10	398	9.0	39.8	387,860	3.28
11-20	429	9.7	47.4	667,734	6.09
21-50	486	10.9	85.4	1,265,407	13.07
>50	516	11.6	279.9	6,759,066	74.10
Total	4,444	100.0	59.7	1,059,098	100.00

Concentration of imports, exports and employment in 2008 (Lorenz)

Figure 1:
Concentration of imports exports and employment in 2008
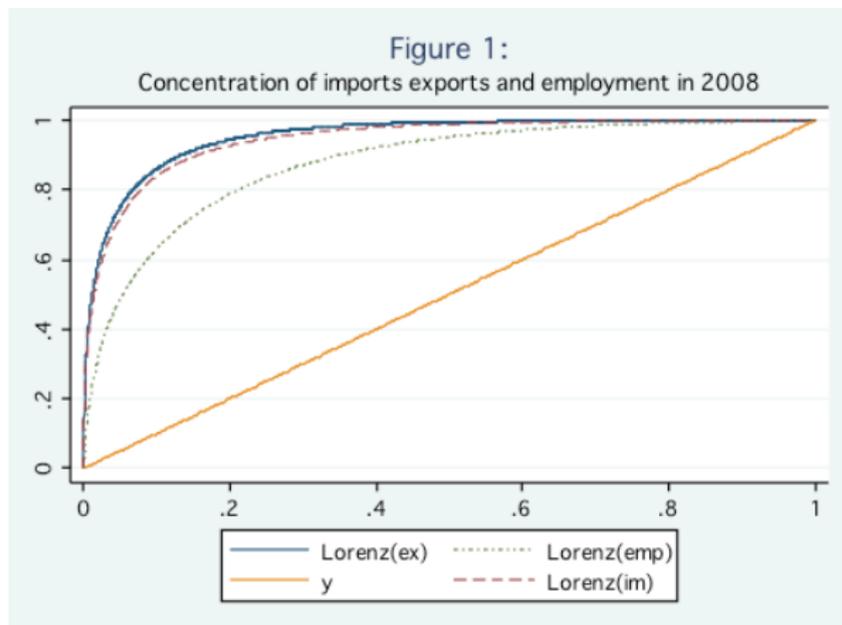
Extensive margins, per-firm average 1995-2008

	All Goods	Capital goods	Intermediate goods	Final goods
	No. of foreign markets per firm			
Exporters	7.2	1.5	3.7	2.0
Importers	6.9	1.6	3.8	1.6
	No. of traded product-markets per firm			
Exporters	29.5	4.3	17.5	7.7
Importers	39.2	5.6	27.5	6.1
	Share in total value of trade			
Exporters	100.0	13.8	50.5	35.6
Importers	100.0	17.0	71.9	11.2

Product churning

Net churning

$$NC = 2 \cdot \frac{|n_{it} - n_{it-1}|}{n_{it} + n_{it-1}}$$

Gross churning

$$GC = 2 \cdot \frac{n_{it}^{a} + n_{it}^{d}}{n_{it} + n_{it-1}}$$

Measures of churning defined in the range:

- net churning [0, 2],
- gross churning [0, 2]

Statistics on churning, per-firm average 1995-2008

Net churning

Size class	Exports			Imports		
	Capital goods	Intermed. goods	Final goods	Capital goods	Intermed. goods	Final goods
emp < 10	0.46	0.50	0.44	0.50	0.50	0.50
9 < emp < 50	0.48	0.50	0.50	0.52	0.44	0.46
49 < emp < 250	0.50	0.42	0.46	0.52	0.34	0.46
emp > 249	0.54	0.34	0.40	0.42	0.24	0.34
Total	0.50	0.46	0.46	0.50	0.44	0.46

Gross churning

Size class	Capital goods	Intermed. goods	Final goods	Capital goods	Intermed. goods	Final goods
emp < 10	1.48	1.36	1.36	1.48	1.34	1.32
9 < emp < 50	1.54	1.36	1.40	1.50	1.36	1.40
49 < emp < 250	1.54	1.32	1.42	1.50	1.34	1.40
emp > 249	1.50	1.26	1.38	1.54	1.34	1.36
Total	1.52	1.34	1.40	1.50	1.34	1.38

- ▶ on net, 1/4 of exp./imp. goods is being replaced every year
- ▶ 3/4 of of exp./imp. goods are being involved in adding / dropping

Re-exported goods (Pass-on-trade)

- Substantial churning of products within the same product type
- How much of trade is within the same product?

$$POT = \left\{ \begin{array}{c} x_{it}^c > 0, x_{it-n}^c = 0 \\ m_{it}^c > 0 \text{ or } m_{it-1}^c > 0 \end{array} \right. , \quad c = CN8$$

- POT: simultaneous trade within the same CN-8 category:
  - products exported in t not being exported in $t-1$, but being imported in t and/or $t-1$
- Can be trade with the same country of origin / destination

POT by level of aggregation

Shares (average 1995-2008)

	CN-8	CN-5	CN-3
in firm's # OVERALL exported goods	0.25	0.31	0.42
in firm's # ADDED exported goods	0.42	0.55	0.89

▶ POT is substantial also at the most disaggregated level

Share of POT by number of exported goods

(average 1995-2008)

Number of products exported	N	# OVERALL exported goods	# ADDED exported goods	total #goods from same country
1	565	0.20	0.26	0.11
2	357	0.20	0.31	0.10
3	260	0.20	0.33	0.11
4	173	0.21	0.36	0.11
5	138	0.22	0.35	0.11
6-10	398	0.24	0.41	0.12
11-20	429	0.26	0.48	0.14
21-50	486	0.26	0.49	0.15
>50	516	0.26	0.51	0.15

- ▶ Extent of POT is largest with the most diversified exporters,
- ▶ ...but is substantial for the least diversified exporters as well
- ▶ 1/4 to 1/2 of all newly added goods is POT

Share of POT by multinational status of firms

(average 1995-2008)

Ownership type	N	OVERALL # exported goods	# added exported goods
Domestic only	67,882	0.21	0.37
Foreign affiliate (inward FDI)	4,740	0.36	0.63
Has affiliates abroad (outward FDI)	3,274	0.25	0.48

- ▶ POT is largest for affiliates of MNCs
- ▶ ...and for local firms having affiliates abroad

Share of POT by type of country

(average 1995-2008)

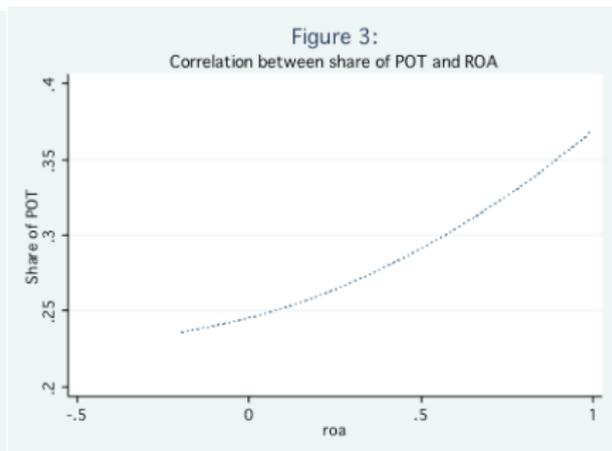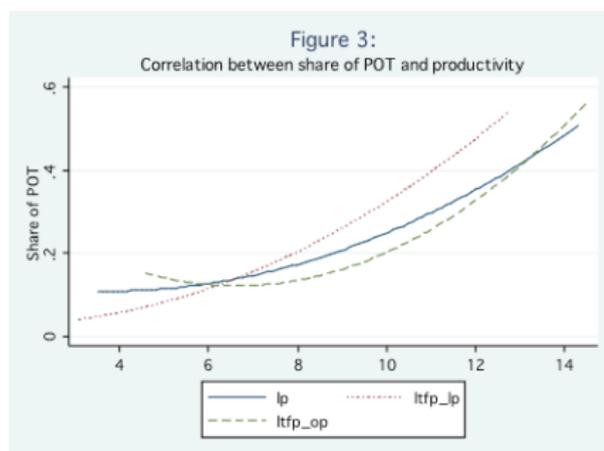|	All countries	Same country	with IFDI country	with OFDI country
in total value of exports	0.26	0.15	0.013	0.015
in #total exp.goods	0.25	0.14	0.012	0.014
in #added exp.goods	0.42	0.25	0.020	0.027

- ▶ Extent of POT is small for country with direct FDI
- ▶ This suggest that POT is only marginally related to intra-firm trade within the network

POT also substantial for new exporters

t	#All exp. goods	#POT goods	Share of POT goods	
			All	Added
0	4.73	1.02	0.22	
1	8.66	2.00	0.23	0.34
2	10.33	2.75	0.27	0.43
3	11.38	3.35	0.29	0.43
4	12.69	3.52	0.28	0.43
5	14.57	4.24	0.29	0.45
6	16.94	4.99	0.29	0.49
7	17.40	5.89	0.34	0.51
8	19.63	7.49	0.38	0.59
9	22.06	8.83	0.40	0.65
10	21.79	8.46	0.39	0.67

▶ In the first year, more than a $1/5$ of goods exported is just re-exports

▶ Furthermore, share of POT among new exporters (in the first year) that export only 1 good: 30%

Extent of POT is correlated with TFP and ROA

Figure 3:
Correlation between share of POT and productivity

Figure 3:
Correlation between share of POT and ROA

- **Pure intermediary - price arbitrage** (expanding the exp. product set once paying the fixed entry cost)
  - however, POT substantial also for new exporters in the first year
- **Intermediary in the multinational network** (a firm with operations in many countries supplying its affiliates)
  - true, but POT also substantial for pure domestic owned firms
- **Rebranding** (simple manipulation of imported goods and then re-exporting rebranded goods)
  - seems most plausible

- ▶ We analyze the impact of churning in imported inputs on:
    - ▶ firm's export scope and productivity growth,
    - ▶ disentangle the effects of net- and gross- import product churning,
- ▶ Account for POT,
- ▶ Baseline estimations with fixed effects with ind-year demeaning,
- ▶ Robustness checks with different measures of TFP (OP, LP, VA/emp residual),
- ▶ Robustness checks with Blundell-Bond system GMM estimations.

Mechanisms

Theoretical framework (Damijan and Kostevc, 2010):

- ▶ heterogeneous firms in terms of productivity assigned exogenously,
- ▶ choice between investing in low or high technology,
- ▶ imported capital and intermediate inputs needed for technology upgrading,
- ▶ imports lower firms' price index reducing the marginal cost, resulting in:
  - ▶ higher productivity,
  - ▶ larger share of expenditures for R&D
- ▶ implying new product innovations
  - ▶ increasing the export scope

Empirical framework

Cobb-Douglas with intermediate inputs:

$$A_{it} = \frac{y_{it}}{L^\alpha K^\beta \sum \overline{M}_{it}^{\gamma_j}} = \omega \sum \left(n_{it} \cdot p_{it} \cdot \overline{m}_{it} \right)^{\frac{\gamma_j}{1-\sigma_j}}$$

- Firm's TFP is hence a function of
    - firm's unobserved heterogeneity shock,
    - the firm-specific import price index, and
    - firm-specific variety set of imported inputs

Potential for price and variety effects

Changes in import tariffs and unit values (1994 - 2008)

	Tariff rates[1]		Unit Values[2]	
	Mean	Median	Mean	Median
All products	-0.073	-0.033	-0.357	-0.418
Capital	-0.056	-0.023	0.151	0.130
Intermediate	-0.060	-0.033	-0.418	-0.449
Final	-0.091	-0.054	-0.297	-0.389

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Variety index (1994 - 2008, 1994=100)

	Imports		Exports	
	CN-8	CN-5	CN-8	CN-5
All products	130	122	221	203
Capital	79	74	145	135
Intermediate	137	130	253	130
Final	213	200	229	214

Simple check of the potential for price effects

Impact of changes in imp. tariffs and UV's on $\triangle x_{it}^s$

$$\triangle x_{ijt}^s = \alpha + \alpha_i + \alpha_j + \alpha_t + \beta_1 \triangle \tau_{ijt}^s + (\beta_2 \triangle P_{ijt}^s) + \epsilon_{it}$$

where:

- s is a product type (1-capital, 2-intermediate, 3-consumer)
- τ_{it}^s - firm's i individ. trade-weighted import tariff rate by type s
- P_{it}^s - firm's i individ. trade-weighted import unit value by type s
- firm-, industry- and time-effects

Results

	Import tariff			Unit value		
	#Pooled products (1)	#Added products (2)	#POT products (3)	# Pooled products (4)	#Added products (5)	#POT products (6)
Output tariff / UV applied to:						
All products	-0.052	-0.036	-0.039	-0.187	-0.233***	-0.237**
	[-0.55]	[-0.54]	[-0.64]	[-1.57]	[-2.64]	[-2.42]
Capital	-0.032***	-0.023***	-0.010***	-0.271	-0.415	-0.423*
	[-15.70]	[-12.80]	[-8.71]	[-1.05]	[-1.54]	[-1.84]
Intermediate	-0.053***	-0.036***	-0.024***	-0.158***	-0.174***	-0.154***
	[-10.98]	[-10.01]	[-10.04]	[-6.06]	[-6.96]	[-6.90]
Final	0.014	0.010	-0.005	0.216	-0.045	0.142
	[1.34]	[0.76]	[-1.31]	[1.30]	[-0.17]	[1.55]
Observations	40,050	40,050	40,050	40,050	40,050	40,050

▶ very small price effects:

   ▶ tariffs: a 7.3 pct $\downarrow$ in tariffs results in 0.4% $\uparrow$ in $\#x$ (=-0.52×7.3%),

      ▶ i.e. a 30% $\uparrow$ in $\#x$ implies that tariffs $\downarrow$ affected a 1.2% $\uparrow$ in $\#x$.

   ▶ UV: a 36 pct $\downarrow$ in UVs results in 6.7% $\uparrow$ in $\#x$ (=-0.187×36%),

      ▶ i.e. a 30% $\uparrow$ in $\#x$ implies that UVs $\downarrow$ affected a 22% $\uparrow$ in $\#x$.

▶ This implies that 77% in actual $\uparrow$ of $\#x$ has to be accounted for by other factors

Net churning

Empirical model for **net churning**

$$\triangle tfp_{it} = \alpha + \beta_1 \triangle \tau_{it}^s + \beta_2 \triangle P_{it}^s + \beta_3 \triangle m_{it}^s + \delta \mathbf{X}_{it}^j + ... + \epsilon_{it}$$

$$\triangle m_{it}^s = \ln(\#m_{it}^s) - \ln(\#m_{it-1}^s),$$

where:

- $\triangle tfp = \triangle$Olley-Pakes TFP with x, m, $ifdi$, $ofdi$ controls
- s is a product type (1-capital, 2-intermediate, 3-consumer)
- τ_{it}^s - firm's i individ. trade-weighted import tariff rate by type s
- P_{it}^s - firm's i individ. trade-weighted import unit value by type s
- X is a set of control variables (size, #markets, ifdi, ofdi, ind-year)

Estimated using FE estimator with robust s.e.

Results for net churning in imports

	Including POT products				Excluding POT products			
	ΔTFP (OP)	Δ# exp. capital	Δ# exp. intermed.	Δ# exp. final	ΔTFP (OP)	Δ# exp. capital	Δ# exp. intermed.	Δ# exp. final
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔImport tariff	0.010	-0.026**	-0.027**	-0.013	0.011	-0.030***	-0.020*	-0.002
	[0.85]	[-2.02]	[-2.19]	[-0.84]	[1.31]	[-3.03]	[-1.77]	[-0.24]
ΔImport unit value	-0.013*	-0.018	-0.189	-0.244	-0.014*	-0.096***	-0.035	0.006
	[-1.73]	[-0.24]	[-1.19]	[-0.83]	[-1.85]	[-3.67]	[-0.81]	[0.53]
Δ# imp. capital	0.002***	0.044***	0.026***	0.020***	0.014**	0.031***	0.005	0.004
	[3.49]	[5.83]	[3.61]	[2.83]	[2.40]	[4.15]	[0.55]	[0.54]
Δ#imp. Intermed.	0.002**	0.012	0.041***	0.030**	0.037***	0.018**	0.055***	0.026***
	[2.01]	[1.07]	[2.79]	[2.08]	[4.93]	[2.47]	[5.22]	[3.59]
Δ# imp. final	0.001	-0.000	0.016**	-0.001	-0.003	-0.009	-0.006	0.007
	[1.08]	[-0.01]	[2.20]	[-0.16]	[-0.54]	[-1.25]	[-0.64]	[0.91]
Observations	28,453	11,917	19,342	12,926	28,453	11,917	19,342	12,926
R-squared	0.011	0.002	0.002	0.001	0.013	0.004	0.004	0.002

▶ $\triangle$tfp unaffected by ↓ import tariffs, but $\triangle\#x^c$ & $\triangle\#x^i$ are,

▶ $\triangle m_{it}^s$ positively affects both $\triangle$tfp and $\triangle\#$exp. goods,

▶ when excluding POT goods, results for TFP increase substantially,

    ▶ but not for the export scope

Gross churning more important

- net changes in # imported inputs have a systematic impact on firms' TFP growth and year-to-year changes in firms' export scope,
- however, these net effects may well underestate the whole churning effects,
- e.g., 2% net growth in # imported goods, can be result of:
  - adding 2% and dropping 0% imported inputs, or
  - adding 10% and dropping 8% imported inputs.
- This implies that one should take into account the gross churning in #products
  - as firms more heavily engaged in churning may better optimize their input mix towards their most valuable inputs.

Gross churning

- Empirical model for **gross churning**

$$\triangle tfp_{it} = \alpha + \beta_1 \triangle \tau_{it}^s + \beta_2 \triangle P_{it}^s + \beta_3 \triangle m_{it}^s + \delta \mathbf{X}_{it}^j + ... + \epsilon_{it}$$

$$\triangle m_{it}^s = \frac{\#add_{it}^s + \#drop_{it}^s}{\#m_{it-1}^s},$$

- where:
    - $\triangle m$ - gross change in #total import products by type s,
    - $\triangle mc$ - gross change in #import goods - #POT goods,
    - s is a product type (1-capital, 2-intermediate, 3-consumer)
    - $\mathbf{X}$ is a set of control variables (size, TFP, ifdi, ofdi, ind-year)
- Estimated using FE estimator with robust s.e.

Results for gross churning in imports

	Including POT products				Excluding POT products			
	TFP (OP)	Δ# exp. capital	Δ# exp. intermed.	Δ# exp. final	TFP (OP)	Δ# exp. capital	Δ# exp. intermed.	Δ# exp. final
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔImport tariff	0.091	-0.113	-0.070	-0.072	0.091	-0.137*	-0.063	0.006
	[0.81]	[-1.51]	[-1.08]	[-0.66]	[0.81]	[-1.89]	[-0.82]	[0.04]
ΔImport unit value	-0.013*	0.005***	-0.009*	-0.004***	-0.013*	-0.002	-0.006***	-0.005
	[-1.69]	[2.88]	[-1.70]	[-3.10]	[-1.68]	[-1.52]	[-3.57]	[-1.24]
Δ# imp. capital	0.022***	0.056***	0.013**	0.008	0.021***	0.067***	0.009	0.002
	[4.03]	[5.65]	[2.40]	[1.05]	[3.86]	[5.46]	[1.59]	[0.24]
Δ#imp. Intermed.	0.013	0.067***	0.120***	0.084***	0.017*	0.053***	0.138***	0.081***
	[1.29]	[3.77]	[10.43]	[5.08]	[1.76]	[2.91]	[11.20]	[4.65]
Δ# imp. final	0.006	0.009	0.012**	0.044***	0.007	0.002	-0.001	0.032***
	[1.01]	[1.09]	[2.13]	[4.77]	[1.11]	[0.24]	[-0.12]	[3.07]
Observations	28,453	11,917	19,342	12,926	28,453	11,917	19,342	12,926
R-squared	0.011	0.010	0.015	0.010	0.012	0.009	0.017	0.007

▶ $\triangle$tfp and $\triangle\#x$ unaffected by $\downarrow$ import tariffs, but by $\downarrow UV$,

▶ impact of $\triangle\#m^{cap}$ on $\triangle$tfp increases by factor 10,

▶ impact of $\triangle\#m^{int}$ on $\triangle\#x$ increases by factor 2 - 3.

▶ POT and non-POT estimates very similar

Robustness check

- Potential source of bias in estimated models due to potential simultaneity between TFP and # imported inputs,
  - in anticipation of positive exogeneous demand shock firms may decide to increase # imported inputs,
  - which potentially affects also the measures of tariffs and unit values, which are calculated using the individual firm's trade weights.
- To acount for the bias, we estimate the model also using the Blundell–Bond system GMM estimator.

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- Results qualitatively remain fairly similar to FE estimates.

Summary

- Huge product churning both in imports and exports,
- Substantial simultaneous trade in identical goods (POT),
- Price effects have limited effects:
    - changes in import prices have larger effect than tariff cuts,
- Variety effects are substantial:
    - enhance the export scope, and
    - impact at firm's productivity growth,
    - gross-churning of imported goods seems to have a bigger effect,
- POT has less favorable effects on firms' long-run performance than regular trade.
- This suggests knowledge spillovers and technology upgrading through the imports channel,
    - within-firm reallocation in inputs and final goods.

Corrections in CN-8 codes (exports)

	Uncorr. CN-8	Corr. CN-8 for merged and splitted items (where possible)	Corr. CN-8 as in (2), with CN-6 replacements for multiple changes	CN-8 aggregated to CN-6
	(1)	(2)	(3)	(4)
	New exporters			
#Products	5.07	5.03	4.98	4.59
#Product-Markets	8.71	8.65	8.54	7.97
	Continuing exporters			
#Products	17.35	17.16	16.88	15.01
#Product-Markets	41.02	40.67	40.08	36.59