"Improved access to foreign markets raises plant-level productivity... for some plants"

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Agenda

Introduction

- General theme of the literature: relation between productivity, export and investment
- Melitz (2003): exposure to trade will induce only the more productive firms to enter the export market $\Rightarrow$ Melitz cut-off
  - However, many small and less-productive plants export
  - Empirics show that new exporters have faster productivity growth than non-exporters $\Rightarrow$ explanation needed
- Simple model of exporting and investing in productivity
  - Heterogeneity in initial productivity
  - Heterogeneity in the productivity gains from investing
- Identify increase in labour productivity, technology adoption and innovation for Canadian plants that were induced to export to the US as a result of US tariff cuts, as well as for so called "old exporters"

A model of selection into investing and exporting

Difference between exporting and not exporting:

$$\pi_0(E) = \phi_0[A + E\tau^{-\sigma}A^*] - EF^E \tag{1}$$

This gives us the Melitz cut-off $F^E/\tau^{-\sigma}A^*$.

Difference between investing and not investing:

$$\pi_1(E) = \phi_1[A + E\tau^{-\sigma}A^*] - EF^E - F^I \tag{2}$$

Difference between profits from exporting and investing versus neither exporting nor investing:

$$\begin{aligned} \pi_1(1) - \pi_0(0) &= [\phi_0\tau^{-\sigma}A^* - F^E] \\ &+ [(\phi_1 - \phi_0)A - F^I] + [(\phi_1 - \phi_0)\tau^{-\sigma}A^*] \end{aligned} \tag{3}$$

The optimal choices of exporting and investing

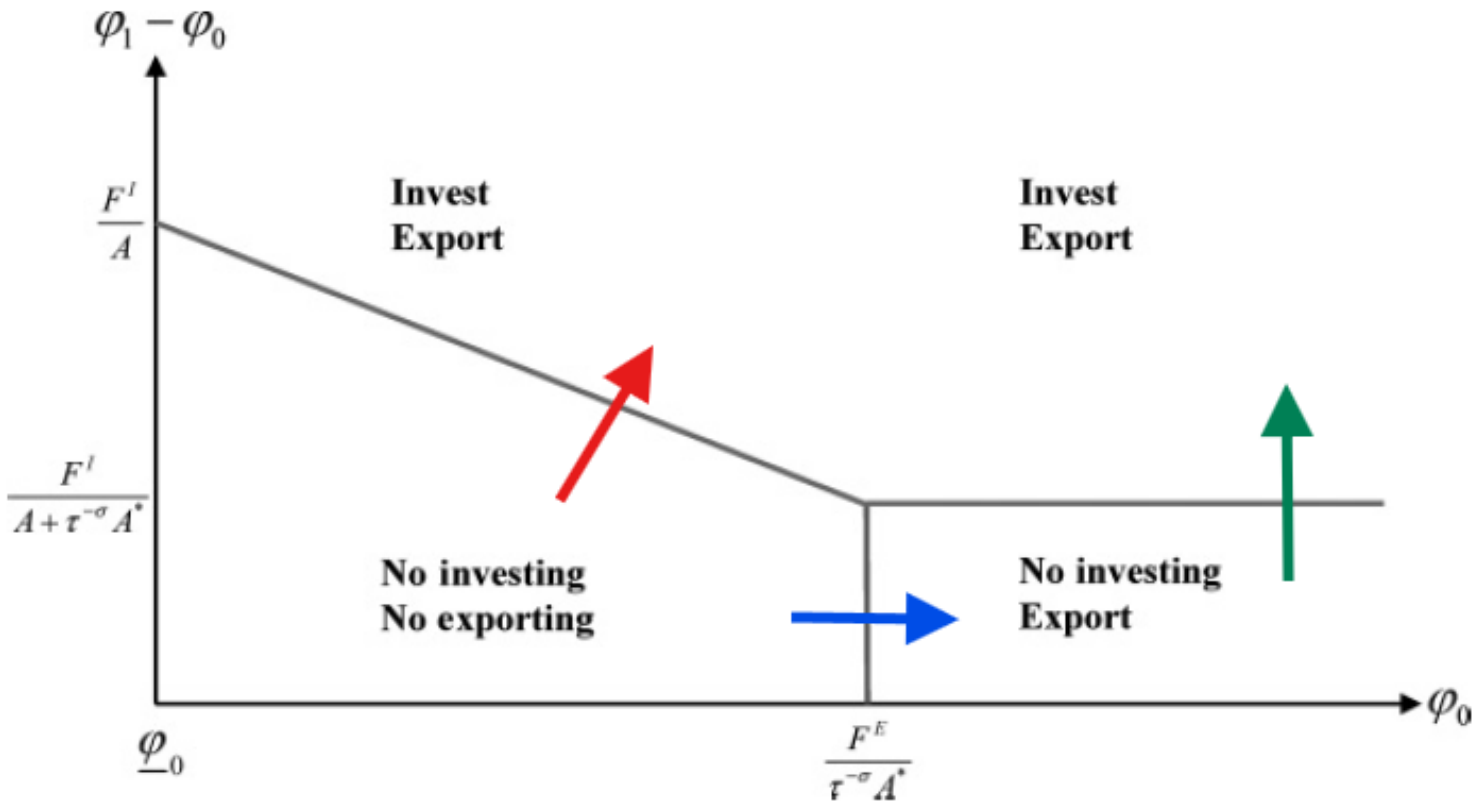


FIGURE I
The Optimal Choices of Exporting and Investing

Improvement in access to the foreign market due to a fall in the foreign tariff τ

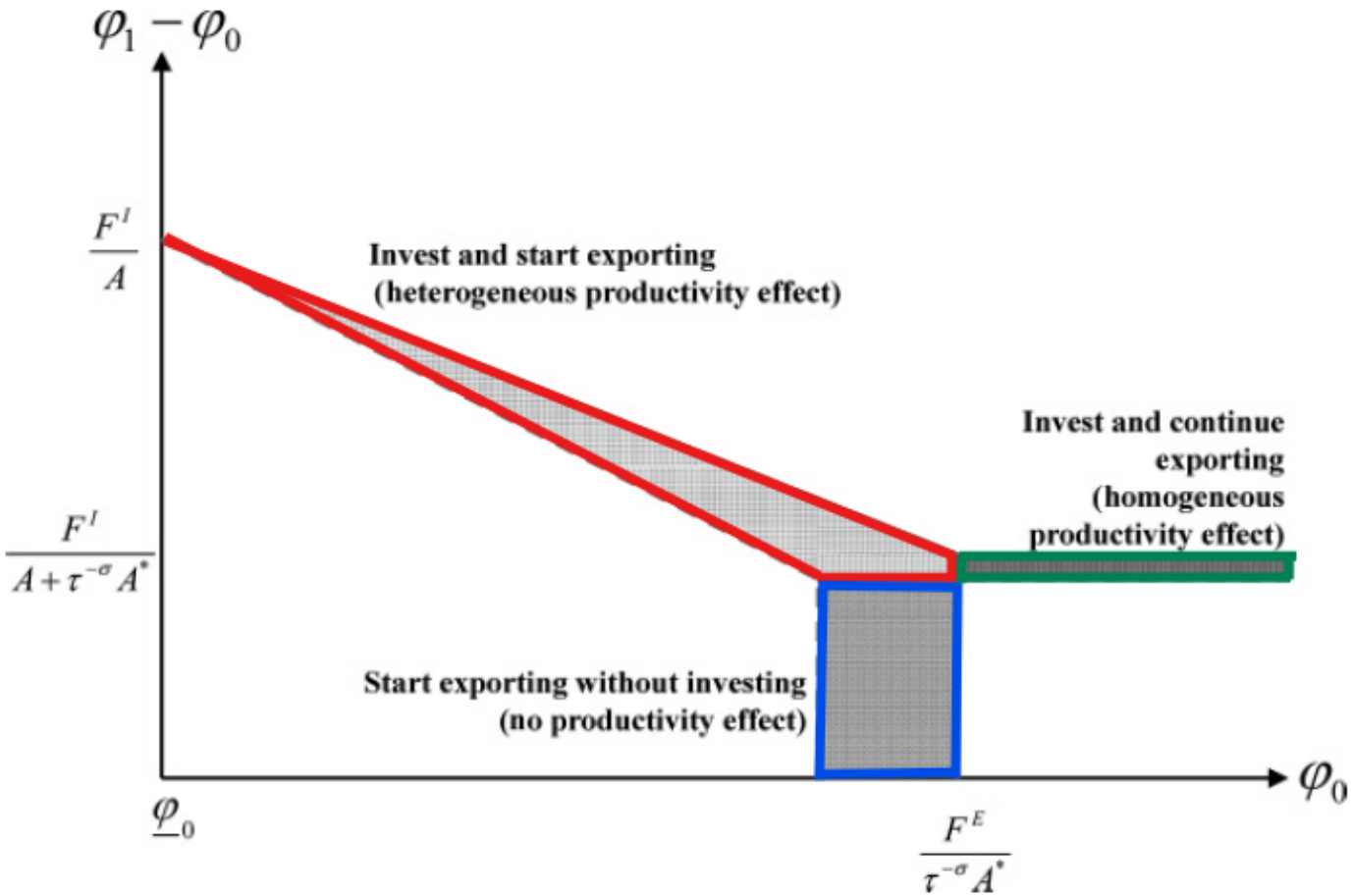


FIGURE II
Switching Behavior Induced by Improved Foreign Market Access

A brief history of the Canada-US Free Trade Agreement

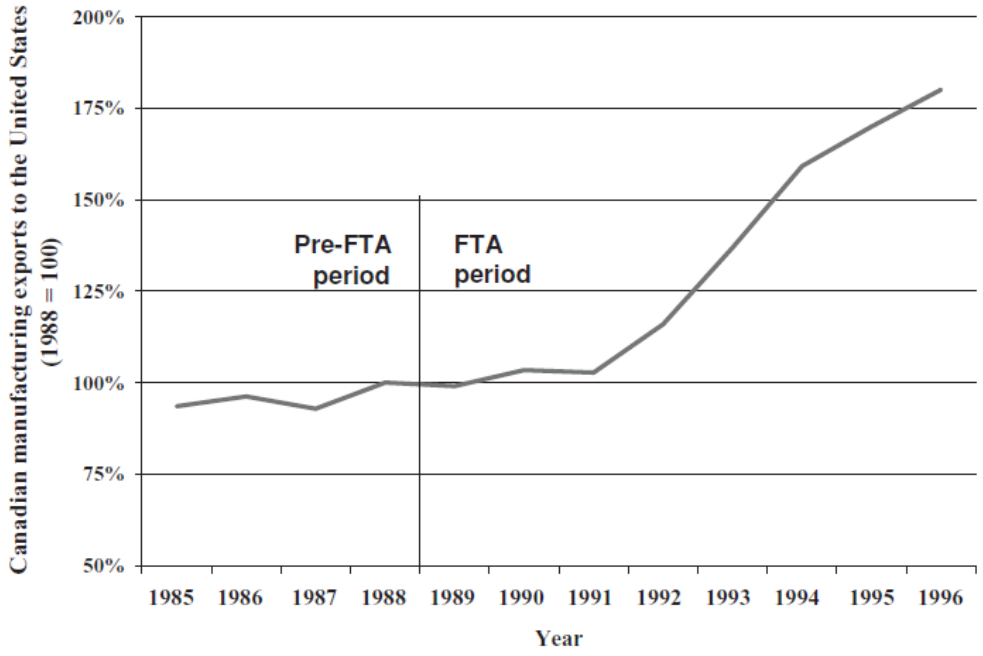


FIGURE III
Canadian Manufacturing Exports to the United States

- Into effect in 1989, all tariffs eliminated by 1998
- 1989-1991: severe recession

Description of the plant-specific tariff variable

- Tariff changes as an instrument for exporting behaviour
- Construction of the plant-specific tariff variable
  - Compute change in tariff τ_j for HS8 commodity j over the period 1988-1996 and aggregate up to HS6 level using import weights
  - Resulting HS6 tariff changes are matched to HS6 plant-level commodity data $\Rightarrow$ simple average tariff change across products produced by a specific plant, denoted as $\Delta\tau$
- Transform the tariff instrument into a set of mutually orthogonal binary variables $\Delta\tau_q$ based on quartiles q $(q = 1, ..., 4)$
  - All industries are represented in all quartiles: *1 2 3* **1 2** *4* **3 4** $\Rightarrow$ *1* **1** *2* **2** *3* **3** *4* **4**

Two subsamples of plants

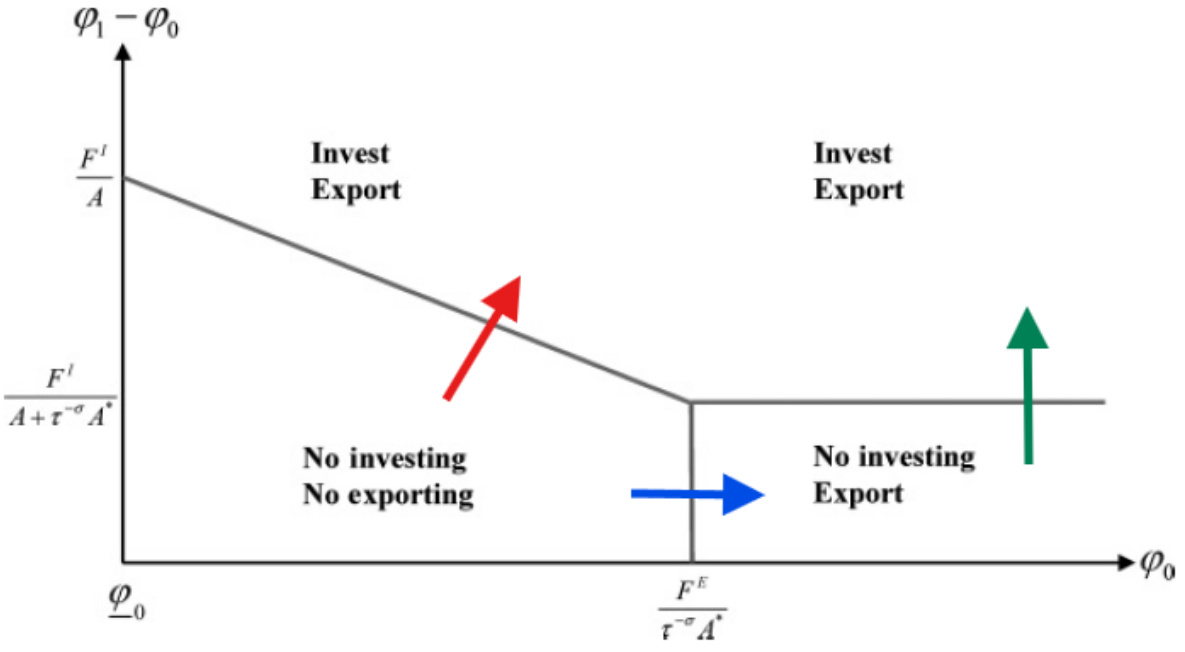


FIGURE I
The Optimal Choices of Exporting and Investing

- 1984 non-exporters (5,233 plants): left of the Melitz cut-off (red arrow)
- Old exporters (1,607 plants): right of the Melitz cut-off (green arrow)

Labour productivity responses

- Using 1984 non-exporters sample: looking for empirical validation red arrow effect, namely the presence of positive, heterogeneous labour productivity responses to improved US market access
  - Heterogeneous: productivity gains $\phi_1 - \phi_0$
    $\Rightarrow$ new exporters with low initial productivity have higher productivity gains
    $\Rightarrow$ new exporters have faster productivity growth than old exporters

- Dependent variable is average annual log change in labour productivity: $\Delta\phi \equiv \ln(LP_{1996}/LP_{1988})/8$
  - LP_t = value added per worker in year t

Definition of the bins based on within-industry quartiles

Employment quartiles in 1988	Labor productivity quartiles in 1988: 1	2	3	4
1	**0.061**	**0.052**	**0.050**	**0.041**
2	**0.045**	**0.039**	**0.030**	0.023
3	**0.057**	**0.033**	**0.021**	0.013
4	0.022	0.015	0.008	0.005

FIGURE IV

Labor Productivity Growth, 1988–1996: New Exporters Less Nonexporters by Productivity and Size

OLS and IV regressions to prove heterogeneous labour productivity responses

- OLS regression / Second stage regression in IV:

$$\Delta\phi = \beta T + \gamma X + \epsilon \tag{4}$$

  - T = ln EXP_{1996} for new exporters, 0 for non-exporters
  - X = control variables (log employment in 1984, log labour productivity in 1984 and average annual log change in labour productivity during 1984-1988)
- First stage regression in IV:

$$T = \sum_{i=2}^{4} \delta_i \Delta\tau_i + \gamma X + \eta \tag{5}$$

  - $\Delta\tau_q$ indicates quartile for tariffs

Results of OLS and IV regression

TABLE III

LABOR PRODUCTIVITY GROWTH, 1988–1996: STANDARD IV ESTIMATION

Bin	Treatment: $T = \ln(EXP_{1996})$		Labor productivity		Labor prod. growth 1984–1988		Employment size		Tariff cut instruments $\Delta\tau_2$		$\Delta\tau_3$		$\Delta\tau_4$		Alternative bins $T = \ln(EXP_{1996})$	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(2′)	(3′)
OLS, dependent variable: Productivity growth																
All	0.0022	(13.01)	−0.04	(−22.58)	−0.28	(−35.47)	0.01	(5.55)								
1	0.0042	(8.12)	−0.05	(−7.46)	−0.25	(−10.27)	0.01	(2.04)							0.0040	(8.94)
2	0.0041	(9.64)	−0.05	(−9.40)	−0.33	(−15.74)	0.00	(−0.58)							0.0036	(9.45)
3	0.0027	(6.67)	−0.05	(−10.44)	−0.32	(−18.03)	0.00	(1.39)							0.0023	(6.73)
4	0.0013	(3.48)	−0.04	(−8.45)	−0.25	(−12.45)	0.01	(3.36)							0.0008	(2.42)
5	0.0008	(2.79)	−0.03	(−7.19)	−0.20	(−9.16)	0.01	(3.64)							0.0002	(0.43)
Second-stage IV, dependent variable: Productivity growth																
All	0.010	(15.92)	−0.05	(−25.33)	−0.31	(−37.77)	−0.01	(−6.01)								
1	0.017	(9.87)	−0.05	(−7.88)	−0.24	(−10.06)	0.00	(−0.70)							0.016	(10.11)
2	0.015	(10.30)	−0.06	(−10.52)	−0.32	(−15.35)	−0.02	(−4.98)							0.014	(10.07)
3	0.012	(7.72)	−0.05	(−10.45)	−0.30	(−16.99)	−0.01	(−3.43)							0.010	(7.68)
4	0.008	(4.57)	−0.03	(−7.14)	−0.24	(−11.90)	0.00	(−0.19)							0.006	(4.00)
5	0.003	(2.44)	−0.03	(−7.25)	−0.20	(−9.28)	0.01	(2.79)							0.001	(0.85)
First-Stage IV, dependent variable: $T = 0, \ln(EXP_{1996})$																
All			1.68	(20.48)	2.50	(4.03)	0.78	(5.03)	3.1	(12.04)	4.4	(18.82)	3.1	(13.01)		
1			0.13	(0.35)	−0.50	(−0.34)	0.50	(2.61)	1.8	(4.21)	3.1	(7.64)	2.9	(7.33)		
2			0.75	(1.80)	−0.70	(−0.46)	1.36	(5.99)	3.4	(6.10)	4.1	(8.33)	2.9	(5.92)		
3			−0.04	(−0.13)	−1.39	(−1.12)	1.63	(7.94)	3.4	(6.02)	4.1	(8.19)	3.2	(6.47)		
4			−0.45	(−1.14)	−0.37	(−0.21)	1.36	(6.13)	2.2	(3.37)	4.0	(6.54)	2.5	(4.05)		
5			0.33	(0.76)	1.75	(0.79)	0.64	(2.86)	3.2	(4.93)	4.6	(7.37)	2.4	(3.67)		

Impact on labour productivity of the change in exporting induced by the US tariff cuts

TABLE IV
SPECIFICATION TESTS AND COEFFICIENT MAGNITUDES

	Coefficient magnitudes			Hausman test		Over-id test		First stage F-tests			
	ΔT	$\beta \times \Delta T \times 8$	Emp. wgt.					3 tariffs		All variables	
Bin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	1.43	0.196	0.06	34.62	.00	3.56	.03	25.50	.00	18.28	.00
2	2.20	0.264	0.10	34.43	.00	1.53	.22	29.10	.00	32.68	.00
3	2.71	0.267	0.18	25.36	.00	0.05	.95	26.20	.00	43.88	.00
4	2.25	0.146	0.25	11.22	.02	1.40	.25	14.35	.00	22.88	.00
5	2.77	0.071	0.40	3.26	.52	2.47	.09	18.89	.00	18.46	.00
Total		0.153									

- ΔT = change in exporting induced by the US tariff cuts
- Labour productivity rose on average by 0.153 log points for treated firms
- Treated firms are 23% of manufacturing employment in 1996 $\Rightarrow$ improved market access raised productivity by 0.035 log points ($= 0.153 \times 0.23$) or 3.5%

Robustness check: unobserved heterogeneous responses

- Divide the three covariates into quartiles, include instrument-covariate interactions in the second stage and estimate separately by bin
- θ_{SIC} = four-digit SIC industry fixed effects
- First stage regression:

$$\Delta\varphi = \beta T + \sum_{k=1}^{3}\sum_{q=2}^{4}\gamma_{kq}X_{kq} + \theta_{SIC} + \varepsilon \tag{6}$$

- Second stage regression:

$$\begin{aligned} T = &\sum_{q=2}^{4}\delta_q\Delta\tau_q + \sum_{k=1}^{3}\sum_{q=2}^{4}\gamma'_{kq}X_{kq} \\ &+ \sum_{k=1}^{3}\sum_{q,q'=2}^{4}\lambda_{kqq'}X_{kq}\Delta\tau_{q'} + \theta'_{SIC} + \eta \end{aligned} \tag{7}$$

Angrist–Imbens Results

TABLE V
LABOR PRODUCTIVITY GROWTH 1988–1996, ANGRIST–IMBENS IV ESTIMATOR

	IV						OLS			Alternative bins	
	β	t	ΔT	$\beta \times \Delta T \times 8$	Overidentification		β	t	R^2	β	t
Bin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(1′)	(2′)
A. Baseline: Five bins based on productivity and size; $T = 0, \ln(\text{EXP}_{1996})$											
1	0.012	(7.34)	1.58	0.147	1.20	(.22)	0.0041	(7.32)	.19	0.013	(9.65)
2	0.010	(7.77)	2.85	0.237	1.53	(.04)	0.0041	(8.29)	.20	0.012	(9.45)
3	0.009	(6.21)	3.46	0.241	1.28	(.15)	0.0031	(6.71)	.25	0.009	(8.18)
4	0.005	(2.54)	2.02	0.085	0.80	(.77)	0.0011	(2.76)	.20	0.002	(1.19)
5	0.002	(1.01)	1.51	0.022	1.13	(.29)	0.0007	(1.97)	.16	0.002	(1.65)
Total				0.107							
B. Five bins based on productivity and size; binary treatment ($T = 0, 1$)											
1	0.154	(7.34)	0.12	0.149	1.18	(.24)	0.0519	(6.99)	.18	0.183	(9.76)
2	0.140	(7.71)	0.21	0.234	1.54	(.04)	0.0534	(7.86)	.20	0.159	(9.43)
3	0.117	(6.06)	0.24	0.228	1.32	(.12)	0.0388	(6.08)	.24	0.129	(8.14)
4	0.084	(2.93)	0.14	0.091	0.70	(.88)	0.0144	(2.46)	.20	0.021	(1.21)
5	0.021	(0.88)	0.11	0.018	1.15	(.27)	0.0081	(1.59)	.16	0.032	(1.47)
Total				0.105							

Panel A: coefficient heterogeneity remains, but baseline total treatment effect is smaller

Angrist–Imbens Results (continued)

TABLE V
CONTINUED

	IV						OLS			Alternative bins	
	β	t	ΔT	$\beta \times \Delta T \times 8$	Overidentification		β	t	R^2	β	t
Bin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(1′)	(2′)
C. Four bins based on productivity; $T = 0$, $\ln(\text{EXP}_{1996})$											
1	0.010	(8.27)	2.88	0.240	1.67	(.02)	0.0036	(7.86)	.20	0.011	(10.48)
2	0.009	(7.66)	3.34	0.251	1.71	(.01)	0.0028	(8.10)	.13	0.009	(9.13)
3	0.006	(4.65)	3.55	0.162	2.42	(.00)	0.0021	(6.22)	.13	0.005	(4.33)
4	0.005	(3.38)	1.58	0.067	1.58	(.03)	0.0016	(4.04)	.14	0.005	(3.88)
Total				0.168							
D. Baseline, but without the twenty-seven covariate–tariff interaction instruments											
1	0.015	(7.91)	1.50	0.183	1.20	(.31)	0.0041	(7.32)	.19	0.016	(9.71)
2	0.013	(8.72)	2.65	0.282	1.53	(.21)	0.0041	(8.29)	.20	0.014	(10.47)
3	0.012	(7.32)	3.42	0.317	1.28	(.28)	0.0031	(6.71)	.25	0.012	(9.08)
4	0.011	(2.95)	1.55	0.139	0.80	(.49)	0.0011	(2.76)	.20	0.007	(4.02)
5	0.004	(1.15)	1.47	0.042	1.13	(.34)	0.0007	(1.97)	.16	0.003	(1.82)
Total				0.150							

Panel D: removing the interaction terms gives better results for the total treatment effect

Robustness check: improved access to US intermediate inputs

- Effect of reduction of Canadian tariffs against intermediate inputs and capital equipment purchased by Canadian plants from the US
- $\Delta\tau^{input}$ = Canadian tariff cuts on intermediate inputs
  - Calculated in a similar fashion as before
  - Should have a similar effect as $\Delta\tau$
- $\Delta\tau^{input}$ as an additional regressor in the first and second stage of the Angrist-Imbens regressions (equation 6 and 7)
- Preferred alternative: exclude $\Delta\tau^{input}$ from the second stage

Results

TABLE VI
LABOR PRODUCTIVITY GROWTH, 1988–1996: CANADIAN TARIFF CUTS

	First stage				Second stage						Alternative second stage				Tests	
	$\Delta\tau^{Input}$		$\Delta\tau^{Output}$, $\Delta \ln M$		$T = \ln(EXP_{1996})$		$\Delta\tau^{Input}$		$\Delta\tau^{Output}$, $\Delta \ln M$		$T = \ln(EXP_{1996})$					
	Coeff.	t	Coeff.	t	β	t	Coeff.	t	Coeff.	t	β	t	ΔT	$\beta \times \Delta T \times 8$	Hausman	Overidentification
Bin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
					A. Baseline (from Table V)									A. Baseline (from Table V)		
1					0.012	(7.34)					0.012	(7.34)	1.58	0.147	20.6	1.20
2					0.010	(7.77)					0.010	(7.77)	2.85	0.237	20.9	1.53
3					0.009	(6.21)					0.009	(6.21)	3.46	0.241	15.6	1.28
4					0.005	(2.54)					0.005	(2.54)	2.02	0.085	3.7	0.80
5					0.002	(1.01)					0.002	(1.01)	1.51	0.022	0.4	1.13
Total														0.107		
					B. $\Delta\tau^{Input}$ in both stages									B. $\Delta\tau^{Input}$ as an instrument		
1	39.5	(7.09)			0.008	(3.22)	0.30	(2.03)			0.012	(8.82)	1.96	0.180	30.3	1.16
2	26.4	(4.28)			0.010	(5.65)	0.00	(−0.01)			0.010	(8.22)	3.24	0.267	23.3	1.50
3	36.5	(6.35)			0.007	(3.85)	0.12	(1.01)			0.008	(6.70)	4.04	0.262	17.8	1.28
4	22.9	(2.86)			0.004	(1.96)	0.15	(1.41)			0.006	(3.27)	2.71	0.132	6.2	0.76
5	1.9	(0.25)			0.002	(0.93)	0.05	(0.61)			0.002	(1.02)	1.59	0.023	0.4	1.10
Total														0.128		

Coefficients on $\Delta\tau^{input}$ are all positive and most are statistically significant, indicating that Canadian export decisions were correlated with access to US intermediate inputs

Results (continued)

TABLE VI
CONTINUED

	First stage				Second stage						Alternative second stage				Tests	
	$\Delta\tau^{Input}$		$\Delta\tau^{Output}$, $\Delta \ln M$		$T = \ln(EXP_{1996})$		$\Delta\tau^{Input}$		$\Delta\tau^{Output}$, $\Delta \ln M$		$T = \ln(EXP_{1996})$					
	Coeff.	t	Coeff.	t	β	t	Coeff.	t	Coeff.	t	β	t	ΔT	$\beta \times \Delta T \times 8$	Hausman	Overidentification
Bin	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	C. $\Delta\tau^{Input}$ and $\Delta\tau^{Output}$ in both stages										C. $\Delta\tau^{Input}$ and $\Delta\tau^{Output}$ as instruments					
1	43.3	(7.60)	−11.54	(−2.87)	0.007	(3.25)	0.22	(1.48)	0.15	(2.52)	0.011	(8.67)	1.93	0.172	29.0	1.21
2	27.2	(4.33)	−3.30	(−0.68)	0.009	(4.56)	−0.02	(−0.17)	0.18	(2.72)	0.010	(8.12)	3.21	0.259	22.6	1.56
3	37.2	(6.25)	−2.17	(−0.45)	0.006	(3.39)	0.07	(0.62)	0.15	(2.19)	0.008	(6.66)	4.01	0.257	17.5	1.29
4	23.0	(2.84)	−0.68	(−0.11)	0.004	(1.92)	0.15	(1.38)	0.01	(0.17)	0.006	(3.27)	2.70	0.132	6.3	0.73
5	−0.4	(−0.05)	3.80	(0.78)	0.001	(0.79)	0.02	(0.21)	0.05	(0.98)	0.002	(1.09)	1.71	0.026	0.5	1.07
Total														0.127		
	D. $\Delta\tau^{Input}$ and $\Delta \ln M$ in both stages										D. $\Delta\tau^{Input}$ and $\Delta \ln M$ as instruments					
1	39.7	(7.14)	−3.97	(−1.71)	0.008	(3.35)	0.29	(1.97)	−0.04	(−0.96)	0.012	(9.04)	1.59	0.148	31.6	1.13
2	26.5	(4.31)	−2.35	(−0.76)	0.010	(5.66)	0.00	(−0.01)	0.01	(0.21)	0.010	(8.22)	3.01	0.246	23.2	1.45
3	36.7	(6.36)	−1.15	(−0.42)	0.007	(3.79)	0.13	(1.07)	−0.03	(−0.72)	0.008	(6.72)	3.92	0.254	17.8	1.24
4	22.7	(2.82)	0.47	(0.12)	0.004	(1.93)	0.15	(1.37)	0.02	(0.42)	0.006	(3.28)	2.73	0.133	6.4	0.73
5	1.3	(0.17)	−2.64	(−0.75)	0.002	(0.95)	0.05	(0.70)	0.04	(1.13)	0.002	(0.92)	1.30	0.017	0.3	1.09
Total														0.121		

- Estimated total effect across all bins is larger, 0.127 log points as compared to 0.107 log points for the baseline specification
- Conclusion: additional gains to Canadian plants from improved access to US intermediate inputs

Robustness check: bilateral trade liberalization — effect of Canadian tariff cuts on final goods

- Fall in Canadian tariffs raises US exports to Canada
  $\Rightarrow$ domestic market size A shrinks
  - $\Delta\tau^{output}$ = Canadian tariff cuts on US final products
    - Calculated in a similar fashion as before
    - Should have an opposing effect as $\Delta\tau$
  - $\Delta\tau^{output}$ as an additional regressor in the first and second stage of the Angrist-Imbens regressions (equation 6 and 7)
  - Preferred alternative: exclude $\Delta\tau^{output}$ from the second stage
- Alternative: $\Delta \ln M$ as plant-level measure of import competition
  - Log change in HS6 Canadian imports from the US in 1988-1996 matched with HS6 commodities per Canadian plant
    $\Rightarrow$ calculate average change
- Conclusion: adding Canadian imports of final goods or Canadian tariff cuts on final goods to the analysis does not alter earlier conclusions

Starting to export and investing in productivity

- So far: correlation between labour productivity gains and starting to export for the low- and medium productivity plants as a result of improved access to US markets
- Now: link these labour productivity gains to active investments in productivity
- Survey of Innovation and Advanced Technologies (1993):
  - Surveyed plants include 512 plants that are in sample of 5,233 plants $\Rightarrow$ 2 bins: "low" and "high"
  - MIS (manufacturing information systems) adoption rates
  - Inspection and communications technologies
  - Engagement in product and process innovation

Results

TABLE VII
TECHNOLOGY ADOPTION AND PRODUCT INNOVATION

	Raw adoption and innovation rates				OLS		IV			
	New exporter	Nonexporter	New–Non Difference	New–Non %	β	t	β	t	Difference t	$\beta \Delta T$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Adoption of advanced manufacturing technologies, 1989–1993										
1. Manufacturing information systems										
Low bin	0.16	0.06	0.10	183	0.0077	(3.21)	0.018	(3.36)	(3.55)	0.07
High bin	0.16	0.17	−0.01	−5	−0.0008	(−0.18)	−0.018	(−1.92)		−0.06
2. Inspection and communications										
Low bin	0.18	0.10	0.07	72	0.0068	(2.55)	0.021	(3.61)	(3.17)	0.08
High bin	0.14	0.20	−0.06	−30	−0.0064	(−1.31)	−0.013	(−1.39)		−0.05
Engagement in innovative activities, 1989–1991										
3. Any product or process innovation										
Low bin	0.30	0.20	0.09	46	0.0073	(2.17)	0.021	(2.77)	(2.78)	0.08
High bin	0.53	0.57	−0.03	−6	−0.0011	(−0.18)	−0.018	(−1.50)		−0.06
4. Any product innovation										
Low bin	0.26	0.14	0.12	82	0.0083	(2.75)	0.019	(2.77)	(2.31)	0.07
High bin	0.43	0.47	−0.05	−10	−0.0022	(−0.34)	−0.011	(−0.90)		−0.04
Labor productivity growth, 1988–1996										
5. Labor productivity growth										
Low bin	0.030	0.005	0.024		0.0025	(3.92)	0.005	(3.37)	(2.50)	0.018
High bin	−0.005	−0.007	0.002		−0.0001	(−0.16)	−0.002	(−0.81)		−0.005

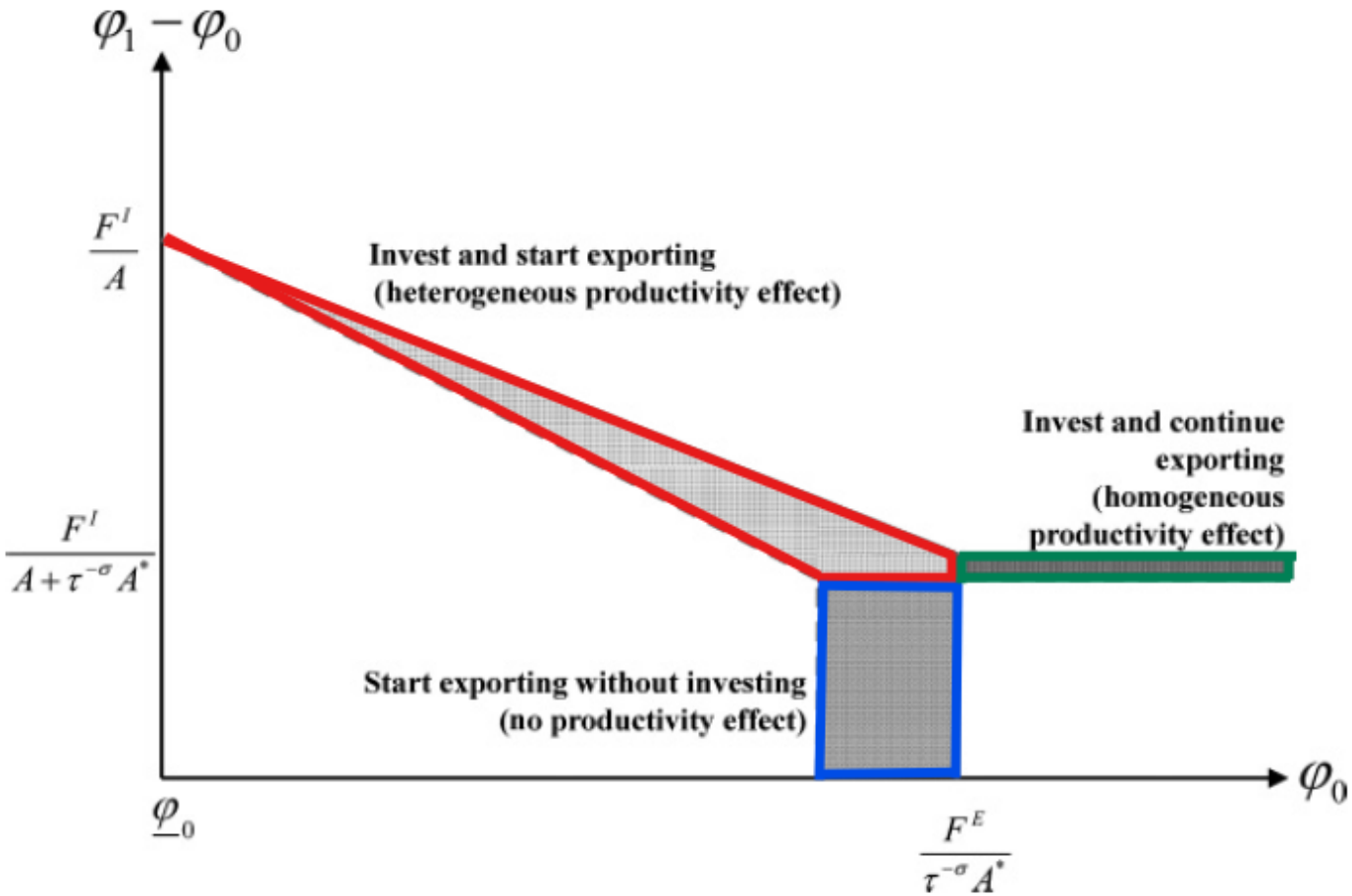
Having a positive correlation of exporting with labour productivity growth (i.e., small, less productive plants) $\Rightarrow$ positive correlation of exporting with both technology adoption and product innovation $\Rightarrow$ complementarity between exporting and investing

Problems with labour productivity: does it reflect TFP growth?

- What if there is no actual TFP growth?
  - Higher prices charged $\Rightarrow$ higher markups $\Rightarrow$ higher value added $\Rightarrow$ higher value added per labour input = higher labour productivity $\neq$ TFP growth
- Three arguments
  - Higher prices would imply loss of sales in domestic market $\Rightarrow$ did not happen, (heterogeneous) pattern of domestic sales mirrors (heterogeneous) pattern of labour productivity growth
  - Impact of MIS adoption on TFP should be reflected in inventory reductions $\Rightarrow$ inventories got reduced for lower bins
  - If TFP rose, it would reduce inputs per unit of output $\Rightarrow$ economically significant drops in input usage per unit of output for both intermediates and energy, but only for lower bins

Old exporters: what effect do we expect?

Recap: for old exporters we expect them to move along the green arrow. This implies that productivity gains are predicted to be independent of initial productivity ϕ_0.



Regressions for the old exporter sample (N = 1,607)

- Redefinition of the bins
- OLS estimates of treatment coefficient β show that labour productivity effect is the same for all three bins:
  - As predicted by the theory
  - Contrasting to the results for new exporters

TABLE X
LABOR PRODUCTIVITY GROWTH 1988–1996, OLD EXPORTERS SAMPLE: OLS

	Labor productivity growth differences		OLS			
	Mean (1)	t (2)	β (3)	t (4)	R^2 (5)	N (6)
All plants	0.018	(4.30)	0.060	(4.04)	.15	1,607
1. Productivity *and* employment below median	0.021	(2.22)	0.061	(1.70)	.11	351
2. Other	0.011	(1.87)	0.060	(2.84)	.15	802
3. Productivity *and* employment above median	0.023	(3.38)	0.059	(2.23)	.09	454

Impact on labour productivity growth of improved foreign market access for the old exporter sample

- $\beta \times \Delta T \times 8 = 0.067$ $(= 0.33 \times 0.026 \times 8)$
- These plants accounted for 21% of manufacturing employment in 1996 $\Rightarrow$ productivity rose by 0.014 log points $(= 0.067 \times 0.21)$ or 1.4%

TABLE XI
LABOR PRODUCTIVITY GROWTH 1988–1996, OLD EXPORTERS SAMPLE: IV

Second stage				First stage					
Treatment T				$\Delta\tau^{Input}$		$\Delta\tau^{Output}$, $\Delta \ln M$		Tests	
β (1)	t (2)	ΔT (3)	$\beta \times \Delta T \times 8$ (4)	Coeff. (5)	t (6)	Coeff. (7)	t (8)	Hausman (9)	Overidentification (10)
A. Baseline ($\Delta\tau^{Input}$, $\Delta\tau^{Output}$, and $\Delta \ln M$ omitted from both stages)									
0.33	(3.46)	0.026	0.067					6.80	0.72
B. $\Delta\tau^{Input}$ as an instrument									
0.27	(3.45)	0.040	0.088	0.53	(4.08)			6.64	0.77
C. $\Delta\tau^{Input}$ and $\Delta\tau^{Output}$ as instruments									
0.23	(2.92)	0.042	0.075	0.46	(3.42)	0.17	(1.80)	4.41	1.00
D. $\Delta\tau^{Input}$ and $\Delta \ln M$ as instruments									
0.29	(3.74)	0.044	0.102	0.49	(3.75)	0.06	(1.34)	7.90	0.78

Conclusions

- Labour productivity gains for Canadian manufacturing plants that were induced to export because of improved access to the US market
- Labour productivity gainers had high post-agreement adoption rates of advanced manufacturing technologies and levels of product innovation $\Rightarrow$ investment in productivity
- Labour productivity gainers increased their domestic sales relative to non-exporters $\Rightarrow$ underlying TFP gains
- New exporters: heterogeneous outcomes and "negative selection" in initial productivity $\Leftrightarrow$ old-exporter sample: no negative selection or heterogeneity
- FTA increased Canadian manufacturing productivity by between 13.2% and 14%

Discussion of the paper: strengths

- Gives a theoretical and empirical explanation for two observed facts as an extension to the Melitz model:
  $\Rightarrow$ new exporters with low initial productivity have higher productivity gains
  $\Rightarrow$ new exporters have faster productivity growth than old exporters
- Quantified the effect of the FTA on productivity in the Canadian manufacturing sector
- A lot of robustness checks
- Aware of the fact that increased labour productivity does not necessarily imply increased TFP

Discussion of the paper: weaknesses

- Blue rectangle/blue arrow effect is not really discussed, but is theoretically quite sizeable

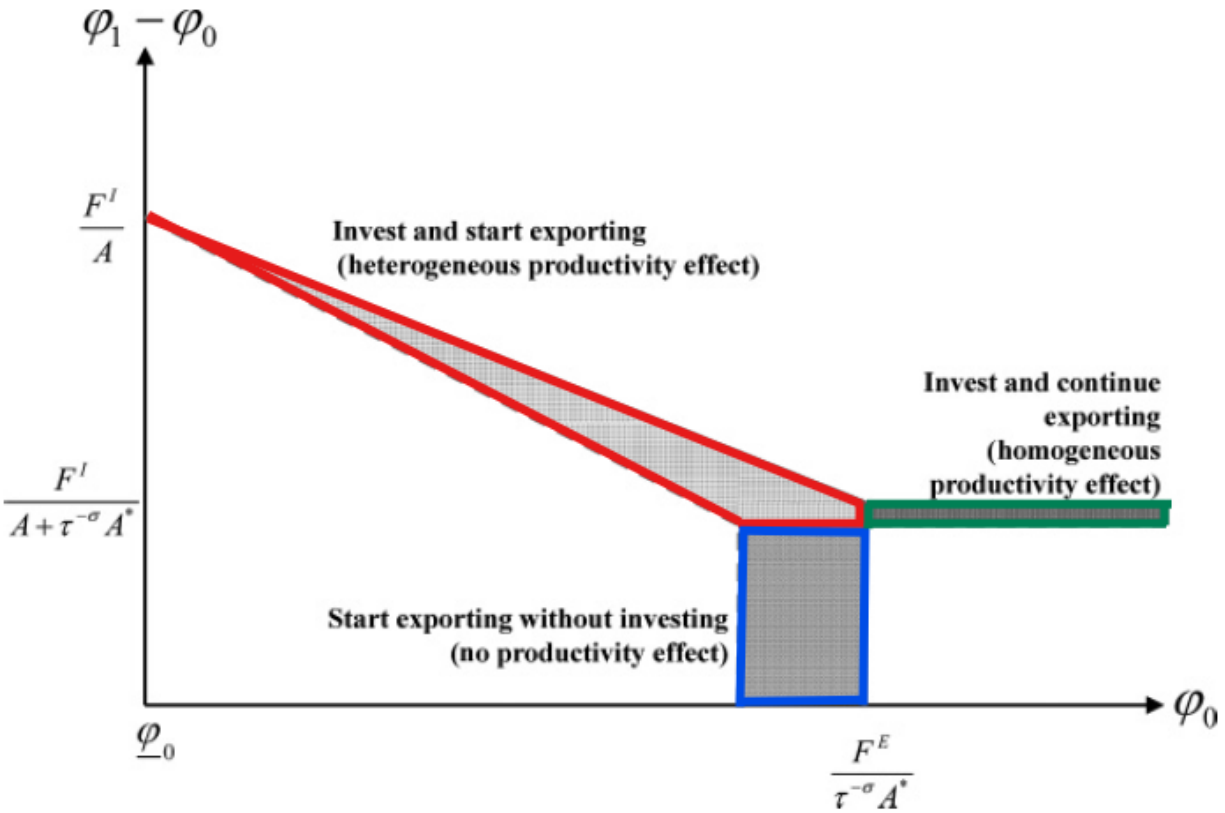


FIGURE II
Switching Behavior Induced by Improved Foreign Market Access

Discussion of the paper: weaknesses (continued)

- Section Exporting and investing in productivity: "Surveyed plants include 512 plants that are in sample of 5,233 plants" $\Rightarrow$ subsample size seems a bit small, paper draws conclusions from 10% of the whole sample
- Further research: see if the same effects can be seen for new and old US exporters to Canada