

Heterogeneous Responses to Competitive Shocks: Firm-level Evidence from Chile

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Introduction

- **Objective:** estimate short-term firms' margins of adjustment in response to a competitive shock;
- *Exogenous shock of competitiveness:* remarkable growth in chinese exports of manufactures during 1995-2006;
- **Motivation:** Scant evidence on firm performance and trade shocks in LA countries; China effect relatively unexplored in DC;
- **Identification:** differential growth rates in chinese import penetration (CIP) across manufacturing industries. Average China IP in Chile increased from 1.5% in 1995 to 10.1% in 2006;
- **Hypothesis:** increasing competition will affect firms differently depending on their characteristics (e.g. productivity, product quality, export status, size, etc.).

Background

- **Chile:**

- Reforms in the 1970s (e.g. trade liberalization);
- Labor code (reforms in 1991 and 2002);
- Economic recession during 1998-2001;
- Small open economy with a relatively flexible labor market.

- **China:**

- Reforms in the 1980s (e.g. import substitution and export promotion);
- Possible explanations for a remarkable growth: massive migration, infrastructure, access to foreign technology, intermediate inputs and capital goods, FDI, WTO;
- Exports to GDP ratio increased from 6% in 1980 to 37% in 2006;
- TFP growth during 1998-2007 was 8% per year on avg. (Brandt et al. 2008);
- China's supply shock potentially exogenous for Chilean firms.

Are China imports a competitive shock?

- China exports mainly final consumption goods;
- At very low international prices (even compared with other low wage countries);

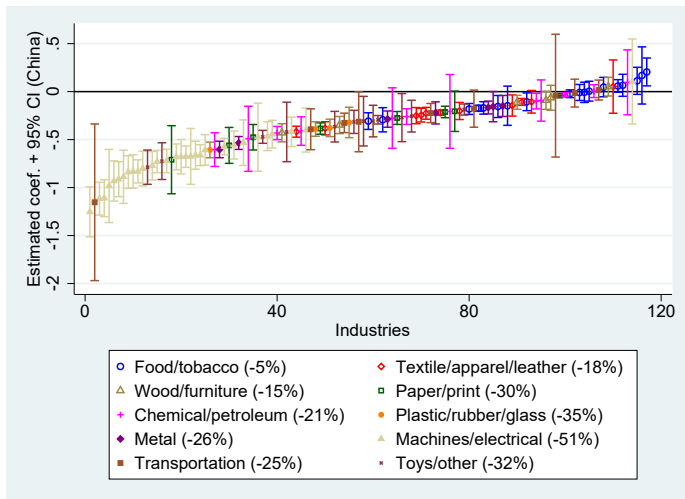
Chinese price competition

- Descriptive equation regression to measure price gap of “*Made in China*” products (COMTRADE data):

$$\log(P_{ijst}) = \beta \text{China}_{ijt} + \mu_{ijt} + \varepsilon_{ijst} \quad (1)$$

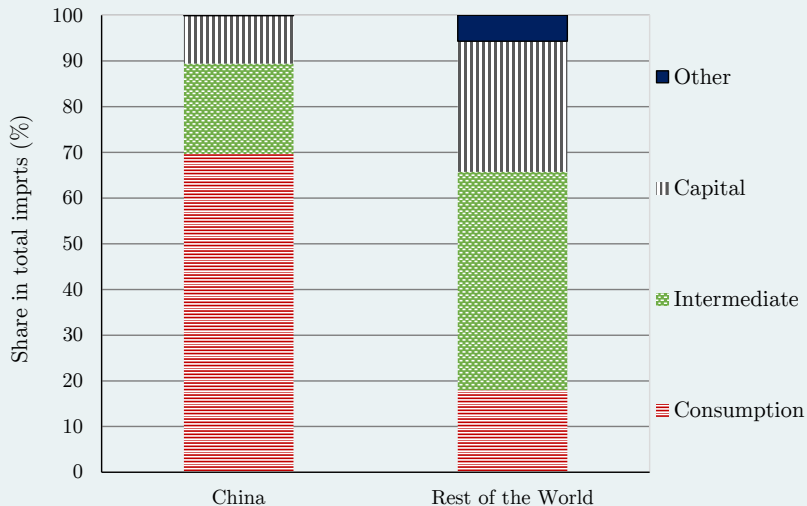
- β : Average price differences of the (same) products exported by China vs. Other low wage countries:
- i : importing country (top 50)
- j : product (6 digits HS)
- s : source country (exporter)
- $\text{China}_{ijt} = 1$ if product j imported from $s = \text{China}$; and $=0$ if imported from any other low wage country.

PRICE DIFFERENCES IN PRODUCTS EXPORTED BY CHINA VS. OTHER LOW WAGE COUNTRIES



Notes. Estimated coefficients of separate regressions by industry of log price of imported varieties on a China dummy (=1 if a product is imported from China and =0 if it is from any other low wage country) controlling for importing country-product-year fixed effects. In brackets we show the average estimated product price differences within broad sectors. Prices measured in constant U.S.\$ unit values. A variety is a product-exporting country combination. Products are defined at 6 digits of the Harmonized System international classification. Industries defined at 4 digits ISIC Rev. 3. Sample is restricted to top 50 importing countries in terms of total value of imports during the period 1995-2006. Low wage countries are defined as in Bernard, Jensen and Schott (2006). Robust standard errors clustered by products. Source. UN-COMTRADE.

COMPOSITION OF CHILEAN IMPORTS COMING FROM CHINA AND OTHER COUNTRIES



Notes. Average composition of imports across years during the period 1995-2006. To classify imported products we use the Broad Economic Categories classification. Source. COMTRADE-UN.

Why just China?

SHARE OF CHILEAN IMPORTS FROM CHINA AND LOW-WAGE COUNTRIES



Notes. Low wage countries are defined as in Bernard, Jensen and Schott (2006). This list includes countries with less than 5% GDP per capita relative to U.S. during 1972-2001. Source: UN-COMTRADE.

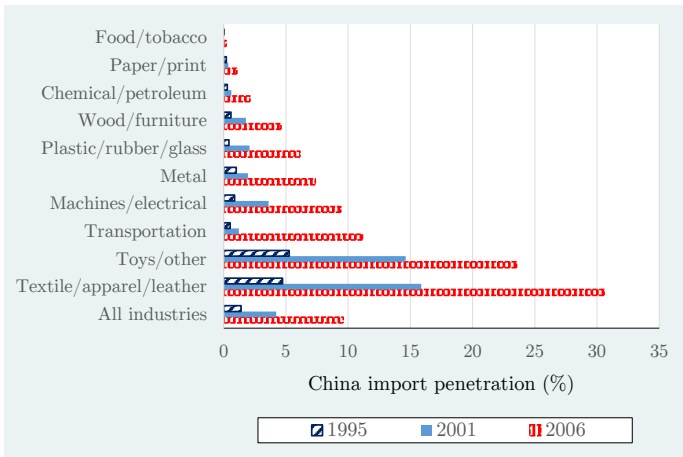
Related Literature

- **Low wage IP:** Bernard, Jensen & Schott (2006); Khandelwal (2010);
- **IP from China:** Autor, Dorn, Hanson & Song (2013 2014); Bloom et al. (2015); Acemoglu et al. (2016); Pierce & Schott (2016); Utar (2017);
- **Globalization/trade and ...:**
 - **Wages:** Goldberg & Pavcnik (2007); Amiti & Davis (2011); Hummels et al. (2014); Autor et al (2014);
 - **Productivity:** Pavcnik (2002); Bloom et al. (2015);
 - **Employment/reallocation:** Bernard et al. (2006); Menezes-Filho & Muendler (2011);
 - **Local labor markets:** Topalova (2010); Autor et al (2013); Dix-Carneiro & Kovak (2017);
 - **Welfare:** Porto (2006); Atkin et al. (2016).

Data

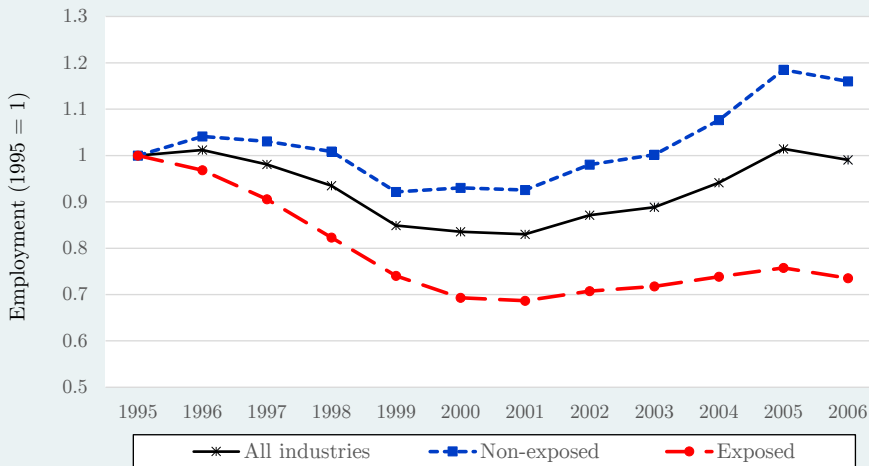
- **ENIA** from Chile's National Institute of Statistics (INE):
 - Firm-level panel data: universe manuf. firms (+10 emp.);
 - Information on sales, employment, capital, intermediate inputs, import/export condition, region, industry (ISIC), etc;
 - We can estimate total factor productivity (TFP);
- **COMTRADE** from United Nations (UN):
 - Product-level panel data (6 digits HS);
 - Origin, destination, quantity, values in USD and product codes;
 - Conversion HS-ISIC to construct: (1) Chinese import penetration (in Chile); y (2) IV: China's share in imports from other countries (both at industry-year level).
- Data cleaning: missing info., industries with less than 10 firms (robustness);
- Sample represents 2/3 of total employment and production in manufacturing.

EVOLUTION OF CHINESE IMPORT PENETRATION BY BROAD SECTORS



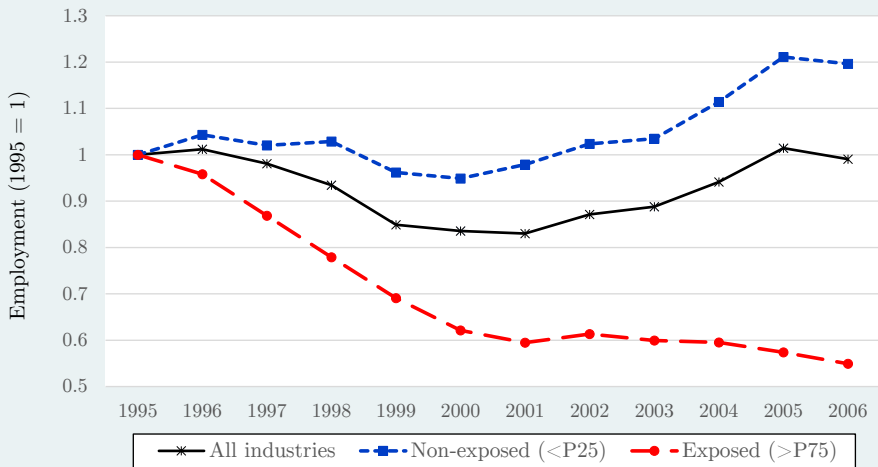
Notes. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. Manufacturing industries classified by ISIC Rev. 3 are grouped into 10 broad sectors. Each sector includes a set of similar manufacturing industries (number of industries within each sector are in brackets): Food/tobacco (14), Textile/apparel/leather (10), Wood/furniture (6), Paper/print (7), Chemical/petroleum (6), Plastic/rubber/glass (4), Metal (7), Machines/electrical (13), Transportation (3), Toys/other (8). Sources: INE-ENIA and UN-COMTRADE.

EVOLUTION OF MANUFACTURING EMPLOYMENT, 1995-2006



Notes. Exposed (non-exposed) industries are those above (below) percentile 50th of the average yearly growth rate in Chinese import penetration (CIP) over this period, which equals 0.2%. CIP measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. Industries defined at 4 digits ISIC Rev. 3. Sources. INE-ENIA and COMTRADE-UN.

EVOLUTION OF MANUFACTURING EMPLOYMENT, 1995-2006



Notes. Exposed (non-exposed) industries are those above (below) percentile 75th (25th) of the average yearly growth rate in Chinese import penetration (CIP) over this period, which equals 0.75% (0.02%). CIP is measured as the total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. Industries defined at 4 digits ISIC Rev. 3. Sources. INE-ENIA and UN-COMTRADE.

Empirical Strategy

- Main specification:

$$Y_{ijt} = \beta_0 + \beta_1 CIP_{jt} + \beta_2 OIP_{jt} + X'_{it}\beta + \alpha_i + \delta_t + \varepsilon_{ijt} \quad (2)$$

- Y_{ijt} (main outcomes):
 - Firm's total employment;
 - Firm's total sales of manuf. products;
 - Firm's probability of exiting the market;
- PIC_{jt} is endogenous because import demand shocks could be correlated with firm's demand shocks (e.g. economic crisis, input price shocks, etc.).

Empirical Strategy (IV)

- We instrument Chinese import penetration with China's import share in other countries to capture **China's supply shock** instead of Chile's demand shocks:

$$ChinaIP_{jt} = \frac{M_{jt}^{China}}{[Q_{jt} + M_{jt} - X_{jt}]} \quad (3)$$

- IV: average China's import share across high-income countries:

$$Sh_{jt}^{China} = \frac{1}{n} \sum_n \frac{M_{njt}^{China}}{M_{njt}^{World}} \quad (4)$$

- Simple average across $n = 8$ high-income countries: Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland (countries used by Autor et al. 2014 and Acemoglu et al. 2016);
- Robustness to use G7, OECD, Latin America or Mercosur.

Empirical Strategy (identifying assumption)

- Main specification:

$$Y_{ijt} = \beta_0 + \beta_1 CIP_{jt} + \beta_2 OIP_{jt} + X'_{it}\beta + \alpha_i + \delta_t + \varepsilon_{ijt}$$

- We estimate this equation by 2SLS, instrumenting CIP_{jt} with Sh_{jt}^{China} .
- **Identifying assumptions:**
 - (i) China export growth is exogenous (driven by TFP, infrastructure, migration, etc.);
 - (ii) Demand shocks affecting CIP are uncorrelated between high-income countries and Chile.

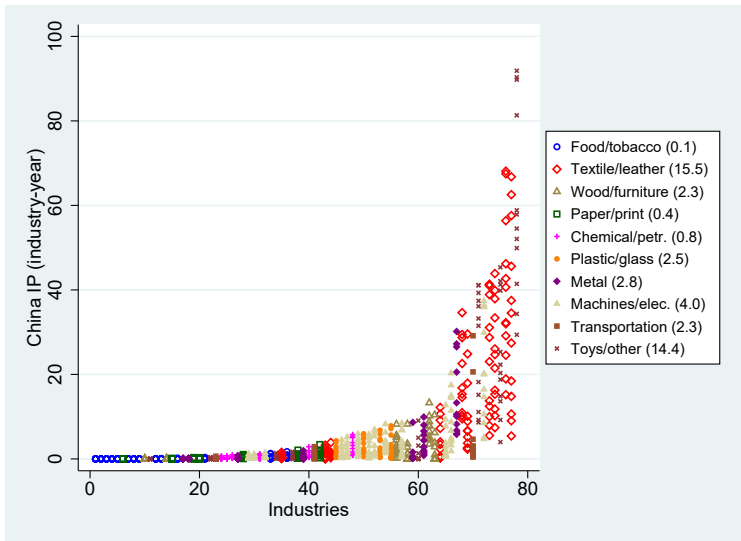
Empirical Strategy (heterogeneity)

- Interaction with firm's initial productivity TFP_{i0} :

$$Y_{ijt} = \beta_0 + \beta_1 CIP_{jt} + \beta_2 CIP_{jt} * TFP_{i0} + X'_{it}\beta + \alpha_i + \delta_t + \varepsilon_{it} \quad (5)$$

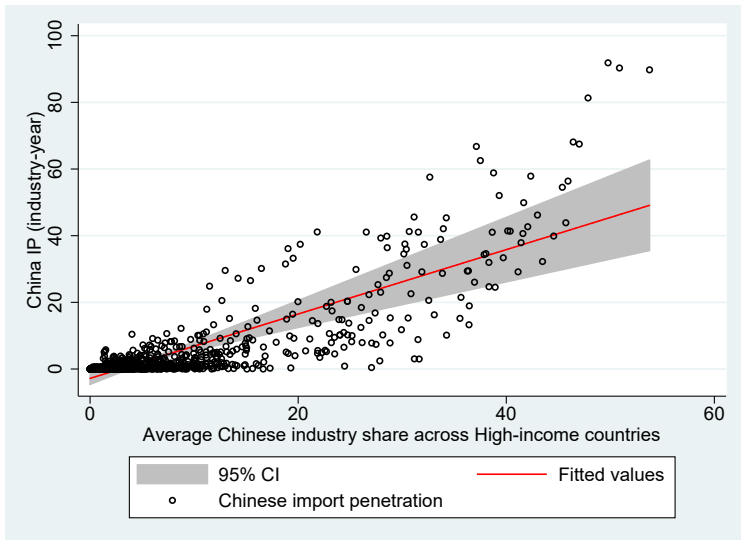
- We estimate eq. (4) by 2SLS, instrumenting CIP_{jt} and $CIP_{jt} * TFP_{i0}$ with Sh_{jt}^{China} and $Sh_{jt}^{China} * TFP_{i0}$;
- Some firms enter post 1995. Robustness to drop them;
- We estimate TFP following the method proposed by Akerberg, Caves y Frazer (*Econometrica* 2015). TFP

VARIATION (INDUSTRY-YEAR)



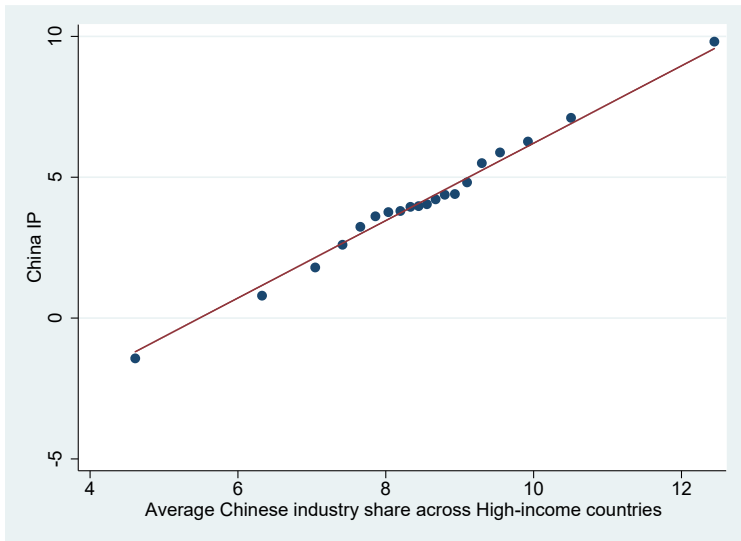
Notes. Each point represents chinese import penetration (IP) for one industry-year combination. Chinese IP is the value of imports from China divided by domestic absorption (production minus net exports). Industries are defined at 4 digits ISIC Rev. 3, grouped in 10 broad sectors and ordered from lowest to highest exposure. Each symbol represents a different sector. In parentheses we show the sector's average chinese IP across industries over time. Sources. ENIA-INE and COMTRADE-UN.

UNCONDITIONAL CORRELATION



Notes. Each point represents a year-industry combination. High-income countries used to construct the Average Chinese industry share are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland. This group of countries is the same used by Autor et al. (2013). The 95% confidence intervals are constructed from robust standard errors clustered by two digits sectors (ISIC Rev. 3). The slope of the linear prediction is .96 with a standard error of .13, and the regression has an R-squared of .70. Sources. ENIA-INE and COMTRADE-UN.

FIRST STAGE REGRESSION



Notes. First stage regression including as controls: IP from other countries, TFP, K/L ratio, importer/exporter condition, firm, region-year and sector-year fixed effects. Observations are grouped into 20 segments of the same size to facilitate graphic interpretation. Each point represents the (conditional) average of both variables within each segment, and the red line represents the linear prediction of Chinese IP on the instrument. Sources: ENIA-INE and COMTRADE-UN.

FIRST-STAGE REGRESSIONS

	Without interaction	With interaction	
	Dep. var: IP China	Dep. var: IP China	Dep. var: IP China*TFP
	(1)	(2)	(3)
China's import share in high-income countries	0.7875*** (0.1735)	0.7884*** (0.1742)	-0.0385 (0.0363)
China's import share in high-income countries*TFP ₀		-0.0225 (0.0508)	1.2081*** (0.2935)
R-squared	0.79	0.79	0.50
<i>N</i>	44,346	44,346	44,346
Firms	6,681	6,681	6,681
Weak id. F-Stat (CIP _{jt})	20.61	21.39	21.39
[<i>p</i> -value]	0.0000	0.0000	0.0000
Weak id. F-Stat (CIP _{jt} *TFP ₀)		18.52	18.52
[<i>p</i> -value]		0.0000	0.0000

Notes. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Robust standard errors clustered by industries. First Stage F-Statistics is the Sanderson-Windmeijer multivariate F test of excluded instruments. TFP measured following Akerberg, Caves and Frazer (2015). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

SUMMARY STATISTICS BY QUINTIL OF TFP

	Q1	Q2	Q3	Q4	Q5	All
Firms' exit rate (%)	10.47 (30.62)	7.71 (26.67)	6.99 (25.5)	6.85 (25.26)	5.47 (22.74)	7.50 (26.34)
Revenues	164 (253)	331 (502)	668 (1,095)	2,221 (7,039)	16,928 (76,324)	4,061 (34,881)
Employment	21.96 (29.9)	27.05 (30.65)	38.40 (38.41)	77.63 (137.12)	215.36 (273.73)	76.07 (156.94)
Average wage	1.78 (1.29)	2.05 (1.52)	2.38 (1.5)	3.10 (4.04)	4.23 (3.78)	2.71 (2.85)
K/L ratio	6.86 (42.42)	5.35 (14.11)	7.29 (43.58)	11.28 (28.47)	34.63 (168.85)	13.08 (82.22)
Share exporting (%)	5.79 (23.36)	7.53 (26.39)	16.10 (36.75)	28.98 (45.37)	50.50 (50.)	21.78 (41.27)
Share importing (%)	9.05 (28.69)	11.81 (32.27)	19.03 (39.25)	26.80 (44.29)	48.29 (49.97)	22.99 (42.08)
<i>N</i>	8,860	8,874	8,872	8,874	8,866	44,346

Notes. Standard deviations in parenthesis. TFP is calculated by the method proposed by Akerberg, Caves and Frazer (2015) and normalized by average year-sector TFP. Quintiles constructed within 2 digits ISIC Rev. 3 industries. Exit =0 in active years and =1 one year before a firm leaves the panel. Revenues, wages and K/L ratio measured in millions of chilean pesos of 1995. Exporting (importing) means exports (imports) >0. Average 1995 exchange rate: 396.8 pesos/U.S.\$1. Sources. INE-ENIA and UN-COMTRADE.

Preview of Results

- Firms in industries with growing chinese IP dismiss more workers, reduce their sales and are more likely to exit the market (in relation to comparable firms in other industries of the same sector);
- No effects on average wages (but: we can not distinguish composition) neither on TFP/lagged TFP;
- Heterogeneous effects: the three effects decrease for firms with higher initial TFP;
- Results are pretty robust to different specifications and tests.

ESTIMATES FOR EMPLOYMENT, 1995-2006

	OLS	2SLS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
China import pen.	-0.0071*** (0.0012)	-0.0091*** (0.0022)	-0.0091*** (0.0022)	-0.0104*** (0.0024)	-0.0101*** (0.0024)	-0.0084*** (0.0021)	-0.0089** (0.0042)
Other import pen.	-0.0005 (0.0006)	-0.0005 (0.0006)	-0.0002 (0.0007)	-0.0002 (0.0006)	-0.0001 (0.0006)	0.0002 (0.0005)	0.0001 (0.0004)
TFP			0.1333*** (0.0162)	0.0867*** (0.0156)	0.0837*** (0.0157)	0.0839*** (0.0155)	0.0852*** (0.0151)
Log(K/L ratio)				-0.0782*** (0.0101)	-0.0789*** (0.0102)	-0.0844*** (0.0107)	-0.0840*** (0.0107)
Importing					0.0449*** (0.0126)	0.0431*** (0.0123)	0.0416*** (0.0118)
Exporting					0.0865*** (0.0131)	0.0844*** (0.0136)	0.0857*** (0.0136)
<i>N</i>	44,346	44,346	44,346	44,346	44,346	44,346	44,346
Firms	6,681	6,681	6,681	6,681	6,681	6,681	6,681
Year FE	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Region x Year FE	-	-	-	-	-	YES	YES
Sector x Year FE	-	-	-	-	-	-	YES

Notes. Employment is the log of total workers. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Other import pen. measured as total value of non-China imports divided by domestic absorption. TFP measured following Akerberg, Caves and Frazer (2015). Importing (exporting) means exports (imports) >0. Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. *** p<0.01, ** p<0.05, * p<0.1.

ESTIMATES FOR REVENUE, 1995-2006

	OLS	2SLS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
China import pen.	-0.0094*** (0.0022)	-0.0115*** (0.0042)	-0.0113*** (0.0036)	-0.0097*** (0.0034)	-0.0093*** (0.0034)	-0.0087*** (0.0028)	-0.0187** (0.0083)
Other import pen.	-0.0023** (0.0010)	-0.0023** (0.0010)	-0.0001 (0.0009)	-0.0002 (0.0010)	-0.0002 (0.0010)	-0.0000 (0.0009)	0.0001 (0.0008)
TFP			0.9832*** (0.0242)	1.0404*** (0.0270)	1.0358*** (0.0271)	1.0350*** (0.0266)	1.0432*** (0.0260)
Log(K/L ratio)				0.0960*** (0.0058)	0.0950*** (0.0059)	0.0944*** (0.0059)	0.0969*** (0.0055)
Importing					0.0901*** (0.0107)	0.0890*** (0.0108)	0.0878*** (0.0107)
Exporting					0.1001*** (0.0150)	0.0968*** (0.0149)	0.0896*** (0.0149)
<i>N</i>	44,346	44,346	44,346	44,346	44,346	44,346	44,346
Firms	6,681	6,681	6,681	6,681	6,681	6,681	6,681
Year FE	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Region x Year FE	-	-	-	-	-	YES	YES
Sector x Year FE	-	-	-	-	-	-	YES

Notes. Revenue is the log of total sales of manufactured products deflated using a 4 digit industry deflator obtained from Chile's Institute of Statistics. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Other import pen. measured as total value of non-China imports divided by domestic absorption. TFP measured following Akerberg, Caves and Frazer (2015). Importing (exporting) means exports (imports) >0. Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. *** p<0.01, ** p<0.05, * p<0.1.

ESTIMATES FOR FIRM'S EXIT RATE, 1996-2005

	OLS	2SLS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
China import pen.	0.0029*** (0.0006)	0.0043*** (0.0009)	0.0043*** (0.0009)	0.0045*** (0.0009)	0.0044*** (0.0009)	0.0056*** (0.0010)	0.0065*** (0.0016)
Other import pen.	-0.0005*** (0.0001)	-0.0005*** (0.0001)	-0.0006*** (0.0002)	-0.0006*** (0.0002)	-0.0006*** (0.0002)	-0.0006*** (0.0002)	-0.0006*** (0.0002)
TFP			-0.0671*** (0.0077)	-0.0610*** (0.0077)	-0.0602*** (0.0076)	-0.0585*** (0.0075)	-0.0586*** (0.0073)
Log(K/L ratio)				0.0101*** (0.0034)	0.0103*** (0.0034)	0.0069** (0.0030)	0.0069** (0.0031)
Importing					-0.0175** (0.0072)	-0.0186*** (0.0071)	-0.0188*** (0.0070)
Exporting					-0.0206*** (0.0073)	-0.0212*** (0.0069)	-0.0233*** (0.0067)
<i>N</i>	36,766	36,766	36,766	36,766	36,766	36,766	36,766
Firms	6,013	6,013	6,013	6,013	6,013	6,013	6,013
Year FE	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Region x Year FE	-	-	-	-	-	YES	YES
Sector x Year FE	-	-	-	-	-	-	YES

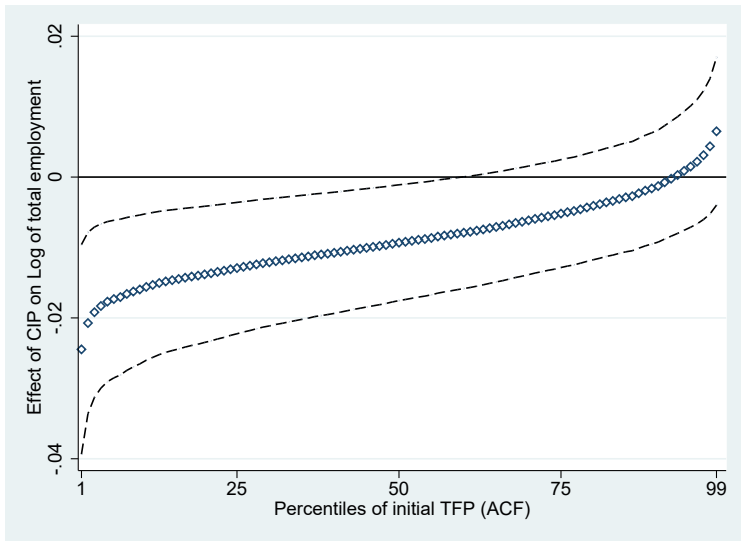
Notes. Exit=0 in active years and =1 one year before a firm leaves the panel. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Other import pen. measured as total value of non-China imports divided by domestic absorption. TFP measured following Akerberg, Caves and Frazer (2015). Importing (exporting) means exports (imports) >0. Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. *** p<0.01, ** p<0.05, * p<0.1.

ESTIMATES WITH TFP INTERACTIONS (2SLS)

	Log total employment		Log total revenue		Firm's exit rate	
	(1)	(2)	(3)	(4)	(5)	(6)
China import pen.	-0.010*** (0.002)	-0.0090** (0.0042)	-0.010*** (0.003)	-0.0189** (0.0083)	0.0045*** (0.0010)	0.0065*** (0.0016)
China IP x TFP ₀	0.013*** (0.004)	0.0126*** (0.0041)	0.015*** (0.005)	0.0138*** (0.0046)	-0.0075*** (0.0017)	-0.0069*** (0.0016)
Other import pen.	-0.000 (0.001)	0.0001 (0.0004)	-0.000 (0.001)	0.0001 (0.0008)	-0.0006*** (0.0001)	-0.0006*** (0.0002)
TFP	0.087*** (0.016)	0.0889*** (0.0154)	1.040*** (0.027)	1.0473*** (0.0262)	-0.0619*** (0.0075)	-0.0602*** (0.0072)
Log(K/L ratio)	-0.079*** (0.010)	-0.0842*** (0.0108)	0.095*** (0.006)	0.0968*** (0.0055)	0.0102*** (0.0035)	0.0069** (0.0032)
Importing	0.045*** (0.013)	0.0416*** (0.0118)	0.090*** (0.011)	0.0878*** (0.0103)	-0.0176** (0.0072)	-0.0190*** (0.0070)
Exporting	0.090*** (0.013)	0.0894*** (0.0134)	0.104*** (0.015)	0.0937*** (0.0146)	-0.0229*** (0.0077)	-0.0255*** (0.0071)
<i>N</i>	44,346	44,346	44,346	44,346	36,766	36,766
Firms	6,681	6,681	6,681	6,681	6,013	6,013
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Region x Year FE	-	YES	-	YES	-	YES
Sector x Year FE	-	YES	-	YES	-	YES

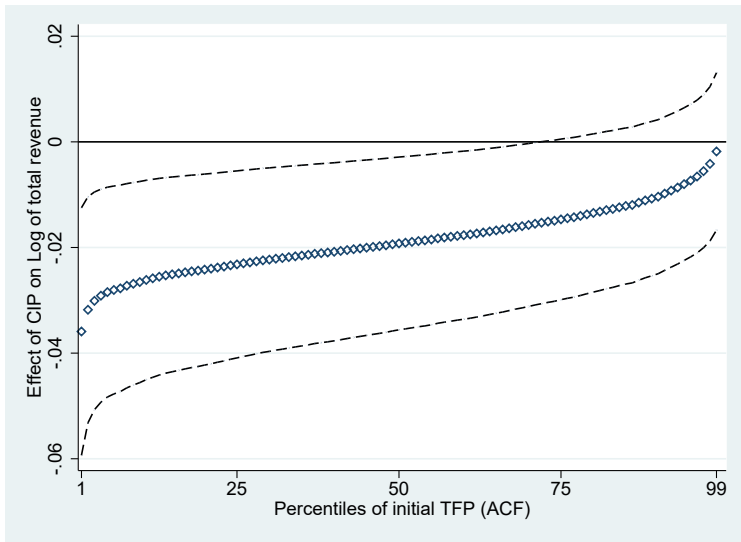
Notes. Chinese import penetration and its interaction with initial TFP are instrumented with the average Chinese industry import shares across a subset of high-income countries and its interaction with initial TFP. TFP measured following Akerberg, Caves and Frazer (2015). Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. All regressions pass the weak instruments F-test. *** p<0.01, ** p<0.05, * p<0.1.

Linear prediction: Employment



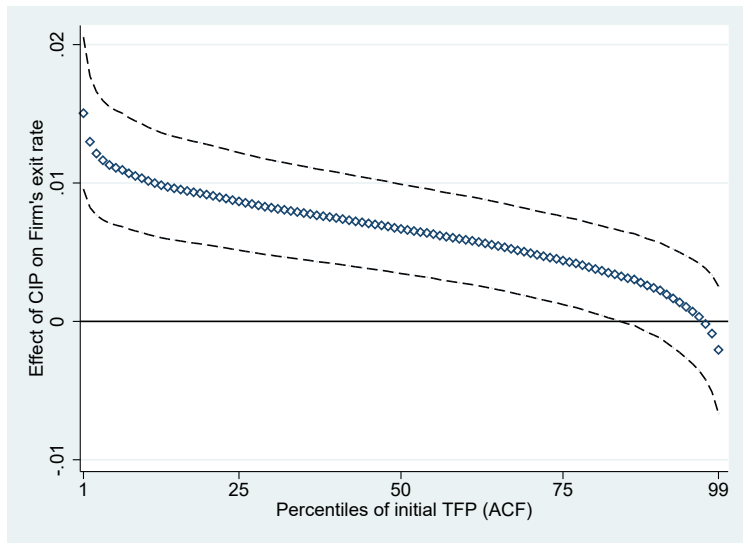
Notas. Estimated coefficients and 95% confidence intervals of the estimated effect of China IP on firm's total employment for firms located at different percentiles of the initial TFP sector distribution. Regressions include all controls (column 7). Robust standart errors clustered by industries are estimated by Delta method.

Linear prediction: Revenue



Notas. Estimated coefficients and 95% confidence intervals of the estimated effect of China IP on firm's total revenue for firms located at different percentiles of the initial TFP sector distribution. Regressions include all controls (column 7). Robust standard errors clustered by industries are estimated by Delta method.

Linear prediction: Exit probability



Notas. Estimated coefficients and 95% confidence intervals of the estimated effect of China IP on firm's probability of exiting the market for firms located at different percentiles of the initial TFP sector distribution. Regressions include all controls (column 7). Robust standard errors clustered by industries are estimated by Delta method.

Economic magnitude

- Counterfactual employment:

$$L_{ijt}^{sim} = L_{ijt} [1 + (1 - \exp(\hat{\beta}_L * \Delta CIP_{jt} * R_{IV}^2))] \quad (6)$$

- Result: if China IP had not grown, employment contraction would have been 34.4% lower in exposed industries, *ceteris paribus*.

Robustness

- Results are robust to:
 - Alternative IVs (OECD, G7, Latin America, Mercosur);
 - Outliers (10% of the distribution of IP China, employment, sales, K/L ratio);
 - Dropping entire (10) sectors one by one;
 - Using labor productivity (sales per worker) instead of estimated TFP;
 - Estimate with the entire sample (111 industries instead of 78). Careful, cannot include K/L ratio neither TFP.

Conclusion

- Firms exhibit heterogeneous short-term adjustment costs in response to a trade induced competitive shock;
- Firms with lower (higher) initial productivity are more (less) exposed to the shock (channel of quality differentiation?);
- Results are consistent with theories of heterogeneous firms and trade (Melitz, 2003);
- Findings relevant for DC with visible problems of unemployment, missallocation (significant share of labor force employed in low-competitive sectors/low-productivity firms) and labor market frictions.

Thank you very much!

INDUSTRY ESTIMATES FOR NUMBER OF FIRMS, 1996-2005

	OLS	2SLS			
	(1)	(2)	(3)	(4)	(5)
China import pen.	-0.017*** (0.003)	-0.016*** (0.005)	-0.016*** (0.005)	-0.017*** (0.005)	-0.016*** (0.005)
Other import pen.	-0.003*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
Avg. TFP			-0.150* (0.080)	-0.149* (0.080)	-0.106 (0.093)
Avg. Log(K/L ratio)				-0.010 (0.047)	0.009 (0.033)
Share importing					-0.484** (0.217)
Share exporting					-0.166 (0.203)
<i>N</i>	936	936	936	936	936
Industries	78	78	78	78	78
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES

Notes. Dependent variable is the log quantity of firms within an industry. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Other import pen. measured as total value of non-China imports divided by domestic absorption. TFP measured following Akerberg, Caves and Frazer (2015). Importing (exporting) means exports (imports) >0. Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. *** p<0.01, ** p<0.05, * p<0.1.

INDUSTRY ESTIMATES FOR REVENUE, 1996-2005

	OLS	2SLS			
	(1)	(2)	(3)	(4)	(5)
China import pen.	-0.029*** (0.005)	-0.020*** (0.007)	-0.019*** (0.007)	-0.017*** (0.006)	-0.016*** (0.006)
Other import pen.	-0.010** (0.004)	-0.010** (0.004)	-0.007* (0.004)	-0.008** (0.004)	-0.008** (0.004)
Avg. TFP			0.618*** (0.120)	0.611*** (0.109)	0.570*** (0.112)
Avg. Log(K/L ratio)				0.218*** (0.065)	0.203*** (0.063)
Share importing					0.239 (0.323)
Share exporting					0.331 (0.210)
<i>N</i>	936	936	936	936	936
Industries	78	78	78	78	78
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES

Notes. Dependent variable is the log quantity of total workers within an industry. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Other import pen. measured as total value of non-China imports divided by domestic absorption. TFP measured following Akerberg, Caves and Frazer (2015). Importing (exporting) means exports (imports) >0. Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. *** p<0.01, ** p<0.05, * p<0.1.

INDUSTRY ESTIMATES FOR EMPLOYMENT, 1996-2005

	OLS	2SLS			
	(1)	(2)	(3)	(4)	(5)
China import pen.	-0.005** (0.002)	-0.006** (0.003)	-0.006** (0.003)	-0.006** (0.003)	-0.005* (0.003)
Other import pen.	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Avg. TFP			0.165** (0.065)	0.165** (0.065)	0.097 (0.069)
Avg. Log(K/L ratio)				0.018 (0.019)	-0.008 (0.012)
Share importing					0.450*** (0.121)
Share exporting					0.505*** (0.166)
<i>N</i>	936	936	936	936	936
Industries	78	78	78	78	78
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES

Notes. Dependent variable is the log quantity of total workers within an industry. Chinese import penetration measured as total value of imports from China divided by domestic absorption (production minus net exports) and varies at industry-year level. This variable is instrumented with the average Chinese industry import shares across a subset of high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland). Industries defined at 4 digits ISIC Rev. 3. Other import pen. measured as total value of non-China imports divided by domestic absorption. TFP measured following Akerberg, Caves and Frazer (2015). Importing (exporting) means exports (imports) >0. Regions are the country's first-level administrative division. Industries are grouped into 10 broad manufacturing sectors. Robust standard errors clustered by industries. *** p<0.01, ** p<0.05, * p<0.1.

TFP estimation

- Ass. that production function is Cobb-Douglas (in logs):

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \omega_{it} + \varepsilon_{it} \quad (7)$$

- Identification problem: ω_{it} observed by firm i but not by econometrician.
 - Simultaneity: inputs (k_{it} l_{it} m_{it}) and TFP (ω_{it});
 - Selection (attrition): firm exit and future TFP.
- Traditional solutions (FE, IV) does not work well on practice;
- Olley & Pakes (1996) use NP investment function as a proxy for $\omega_{it} = \omega_{it}(i_{it}, k_{it})$;
- Identification strategy based in a dynamic model of firm optimization in discrete time t ;
- Assumes: Markov evolution of ω_{it} ; deterministic relation between i_{it} and ω_{it} (monotonicity); and timing (i_{it-1} y l_{it}).
- Levinsohn & Petrin (2003) use intermediate inputs instead of investment.

Akerberg, Caves & Frazer (2015)

- Corrects functional dependency issues in OP/LP;
- Assume labor is chosen before materials: $m_{it}(\varepsilon_{it}, k_{it}, l_{it})$;
- First Stage:

$$y_{it} = \phi_t(k_{it}, l_{it}, m_{it}) + \eta_{it} \quad (8)$$

- Recovers only $\hat{\phi}_t$, and the β are recovered in the second stage:

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \dots$$

$$g(\phi_{t-1} - \beta_k k_{it-1} - \beta_l l_{it-1} - \beta_m m_{it-1}) + \xi_{it} + \eta_{it} \quad (9)$$

- It is estimated using l_{it-1} as an instrument for l_{it} (2SLS or GMM).

TFP ESTIMATION

	OLS	ACF	ACF
		<i>Proxy = materials</i>	<i>Proxy = energy</i>
Log(labor)	0.181*** (0.005)	0.061*** (0.021)	0.095*** (0.025)
Log(capital)	0.068*** (0.002)	0.111*** (0.006)	0.099*** (0.005)
Log(materials)	0.696*** (0.004)	0.553*** (0.018)	0.583*** (0.019)
Log(energy)	0.082*** (0.003)	0.028*** (0.004)	0.032*** (0.004)
<i>N</i>	44,346	37,665	37,665
R-squared	0.544		
Firms	6,681		

Notes. Revenue is the log of total sales of manufacturing products deflated with an industry-level index at 4 digits ISIC Rev. 3 (INE). Labor is the total number of workers per firm. Capital is the sum of land, buildings, machinery and vehicles, deflated by a general index (World Bank). Materials include raw materials and materials and is deflated with industry-level index at 4 digits (INE). Energy refers to consumed electricity deflated by an electricity price index (INE). The second stage of the ACF method (cols 2-3) is estimated by GMM, instrumenting labor with its lag. Robust standard errors calculated by bootstrap (n=200). *** p < 0.01, ** p < 0.05, * p < 0.1.