The impact of export restrictions on targeted firms: Evidence from Antidumping against South Korea

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1. Objective

How do firms react when faced with trade restrictions in their export markets?
I look at markups of South Korean firms facing Antidumping (AD) duties in foreign markets.

2. Motivation

• ***Why Antidumping?*** Intensively used, discriminatory (MFN exception).

• ***Why markups?*** AD "industrial policy in disguise", great potential anticompetitive effects.

• ***Why firms in targeted country?*** Previous literature on protected firms (Konings & Vandenbussche, JIE, 2005; Rovegno, IRES, 2010). On targeted firms: Blonigen & Park (AER, 2004) pricing using data from case files; Vandenbussche & Zarnic (RWE, 2008) steel 2002 safeguards.

3. Intuition: Antidumping and pricing behaviour

• AD = ad valorem tariffs => border price effect: foreign firm absorbs part of the tariff. Markup ups should go down.

• But: Absorption is in principle not allowed => border price should increase to avoid further duties. Markups should go up (provided marginal costs do not increase more than prices).

• Is this really effective? Blonigen & Park (AER, 2004): the effect on prices will depend on foreign firms' ex-ante belief about the likelihood of AD measures.

Expected result ambiguous

4. Data

• ***Antidumping***: Global Antidumping Database (World Bank). *AVD considered*: Steel Wire Strand (USA, 2004), Optical Fiber (China, 2005), Kraft Liner/Linerboard (China, 2005), Refrigerators (EU, 2006), Spendex (China, 2006)

• ***Firm data***: ORIANA 2009, balance sheet data, 2001-2008, unbalanced.

• ***Industry data***: Mining and Manufacturing Survey, Korean Statistical Department; and UN Comtrade.

5. Two methods to estimate markups

Method 1: ***Observable markups***

If labour and material costs are linear with respect to output, the Lerner index can be approximated by observable price-cost margins:

$$PCM_{it} = \frac{P_{it}Q_{it} - P_{Mit}M_{it} - W_{it}L_{it}}{P_{it}Q_{it}}$$

Re-arrange and obtain the observable markup: $\tilde{\mu}_{it} = \frac{P_{it}Q_{it}}{P_{Mit}M_{it} + W_{it}L_{it}}$

(+) simplicity

(-) it does not separate markup effects from productivity effects

Method 2: ***Production function based*** (De Loecker and Warzynski, 2009 & 2010)

Starting with a gross output production function: $Q_{it} = A_{it}F(M_{it}, L_{it}, K_{it})$.

Assuming no adjustment costs in materials, F.O.C. for cost minimization imply: $\mu_{it} \equiv \frac{P_{it}}{C_{it}} = \frac{\theta_{it}}{\alpha_{it}}$

where $\theta_{it} = \frac{\partial F(M_{it}, L_{it}, K_{it})}{\partial M_{it}}$ is the output elasticity of materials, and $\alpha_{it} = \frac{P_{Mit}M_{it}}{P_{it}Q_{it}}$ is the share of material costs on total sales.

(+) it separates markup from productivity effects

(+) it provides an estimation of productivity as well

(-) it requires estimating a production function

• *Gross output trans-log production function:*

$$y_{it} = \beta_m m_{it} + \beta_l l_{it} + \beta_k k_{it} + \beta_{mm} m_{it}^2 + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lm} l_{it} m_{it} + \beta_{km} k_{it} m_{it} + \beta_{kl} k_{it} l_{it} + \omega_{it} + \varepsilon_{it}$$

• *Estimation method: Wooldridge (2009) using materials as proxy.*

• *Estimated output elasticity of materials:* $\hat{\theta}_{it} = \hat{\beta}_m + 2\hat{\beta}_{mm} m_{it} + \hat{\beta}_{lm} l_{it} + \hat{\beta}_{km} k_{it}$

• Adjusted expenditure shares: $\hat{\alpha}_{it} = \frac{P_{Mit}M_{it}}{P_{it}\tilde{Q}_{it} / exp(\varepsilon_{it})}$

6. Difference-in-difference specification

$$log(\mu_{it}) = \beta.AD_{st}^{x} + \alpha_i + \gamma_t + \delta.X_{it} + \nu_{it}$$

Two sets of treatment variables:

• **AD_{st} = 1 if AD duty in place in sector s at time t**
• **AD^{x}_{st} = 1 year x since AD duty in place**

α_i firm fixed effect
γ_t time effects (complete set of year dummies)
X_{it} set of controls (log of capital/sales ration and log of labour/sales ration instrumented with its one period lags)

7. Choice of control groups

• "Treatment" is at the sector level phenomenon.

• Need to compare affected firms to non-affected similar firms.

• Three control groups using propensity score matching (PSM) and covariate nearest neighbour matching (CNNM):

1. *Sector level PSM (multinomial logit)*
2. *Sector level PSM + firm level CNNM*
3. *Firm level CNNM drawing from any sector not involved in AD.*

• Covariates used in firm level CNNM *(all average values prior to imposition of AD duty - unbalanced panel):*
  - *Growth rate of sales (log difference)*
  - *Observable price cost margins*
  - *Estimated price cost margins*
  - *Estimated total facto productivity*
  - *Labour costs/sales ratio*
  - *Capital/sales ratio*
  - *Number of times observed before and after treatment.*

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8. Sector level propensity score

Multinomial logit estimation of determinants of AD

Dependent variable: "1" if no petitions; "2" if petitions but no tariffs; "3" if tariffs. Base outcome: "1".

Results for outcome "3"	(1)	(2)	(3)
Export intensity	0.138**	0.141***	0.139***
Export intensity squared	-0.00119**	-0.00121**	-0.00123**
Price cost margins	-0.0887***	-0.0877***	-0.0865***
Capital intensity	4.891***	4.786***	4.689***
Share Korean exports in Chinese imports in sector	0.0581**	0.0593**	0.0530**
Share of Korean exports in EU imports in sector	-0.0684	-0.0732	
Share of Korean exports in USA imports in sector	0.0844*	0.0911**	0.0499
Growth rate of Korean exports to China in sector	-0.003		
Growth rate of Korean exports to EU in sector	0.000		
Growth rate of Korean exports to US in sector	0.000		
Growth rate of worldwide imports in sector	-0.0717***	-0.0760***	-0.0759***
AD petitions against sector in the previous 3 years (*)	0.613***	0.631***	0.616***
Year dummies	Yes	Yes	Yes
Chi-squared statistic	227.9***	199.4***	272.6***
Pseudo-R2	0.366	0.367	0.364
Obs.	1219	1284	1284

Notes: Significance according to joint Wald test. Regressors lagged one period except(*)

9. Pooled cases

Effects of AD on markups, difference-in-difference estimation

Dependent variable	$log(\tilde{\mu})$ (observed markups)			$log(\hat{\mu})$ (estimated markups)		
Control group	PSM	PSM + CVM	CVM	PSM	PSM + CVM	CVM
AD	-0.00395 (0.00586)	-0.0101 (0.00617)	-0.00275 (0.00654)	0.0876*** (0.00826)	0.0171** (0.00851)	0.0113 (0.00998)
AD¹	-0.00668 (0.00609)	-0.0101 (0.00630)	-0.00689 (0.00662)	0.0767*** (0.00733)	0.0201*** (0.00767)	0.0164** (0.0083)
AD²	-0.00571 (0.00691)	-0.0145* (0.00742)	-0.00120 (0.00733)	0.0855*** (0.00846)	0.0188** (0.00939)	0.0110 (0.0112)
AD³	0.000526 (0.00894)	-0.00405 (0.00915)	0.00389 (0.0102)	0.0842*** (0.0108)	-0.00731 (0.0119)	-0.0153 (0.0149)
AD⁴	0.0161 (0.0104)	0.0032 (0.0111)	0.0178 (0.0114)	0.161*** (0.0120)	0.0533*** (0.0160)	0.0376** (0.0188)
Obs.	5,262	3,338	3,345	5,262	3,338	3,338
No. firms	1,018	642	643	1,018	642	642

Note: ***/**/* denotes statistically different from zero at 1/5/10 % levels respectively. Standard errors for regressions on observed markups were clustered by firm while standard errors for regressions on estimated markups were cluster bootstrapped (400 repetitions). PSM indicates the control group constructed on the basis of a sector-level propensity score matching; PSM + CVM refers to a control group constructed by combining a sector-level propensity score matching with a firm-level covariate matching; and CVM denotes a control group constructed using only a firm-level covariate matching.

10. Estimation by sector

Effects of AD on markups, difference-in-difference estimation

	Metal wire		Electric appliances for the kitchen		Other three sectors	
Dependent variable	$log(\tilde{\mu})$	$log(\hat{\mu})$	$log(\tilde{\mu})$	$log(\hat{\mu})$	$log(\tilde{\mu})$	$log(\hat{\mu})$
AD	0.0121 *(0.00815)*	0.206*** *(0.00638)*	-0.0215* *(0.0116)*	-0.113*** *(0.00803)*	-0.0200 *(0.0134)*	0.0086 *(0.0119)*
AD¹	0.00826 *(0.0104)*	0.240*** *(0.00943)*	-0.0135 *(0.0120)*	-0.0710*** *(0.00855)*	-0.0294** *(0.0122)*	0.00746 *(0.00928)*
AD²	0.00878 *(0.0101)*	0.196*** *(0.00931)*	-0.0416*** *(0.0151)*	-0.114*** *(0.0101)*	-0.00743 *(0.0166)*	0.00638 *(0.0139)*
AD³	0.0254** *(0.0128)*	0.159*** *(0.00963)*	-0.0111 *(0.0187)*	-0.195*** *(0.0131)*	-0.0202 *(0.0249)*	0.0269 *(0.0184)*
AD⁴	0.00853 *(0.0115)*	0.204*** *(0.0157)*			0.0108 *(0.0417)*	-0.0412** *(0.0193)*
AD⁵	0.0113 *(0.0114)*	0.189*** *(0.0148)*				
Obs.	984	984	1,62	1,62	734	734
No. Firms	192	192	316	316	134	134

Note: ***/**/* denotes statistically different from zero at 1/5/10 % levels respectively. Standard errors for regressions on observed markups were clustered by firm while standard errors for regressions on estimated markups were cluster bootstrapped (400 repetitions). All reported estimations obtained using a control group constructed by combining a sector-level propensity score matching with a firm-level covariate matching (PSM + CVM).

11. Conclusions

Pooled case estimation:

- Evidence of an increase in estimated markups and particularly stronger effect towards the end of the imposition period.

By sector estimation:

- Heterogeneity in the response across sectors.
- For "Metal wire" (targeted by US): strong increase in estimated markups.
- For "Electric appliances for the kitchen Appliances" (targeted by EU): decrease in observed and estimated markups.
- No effect for other three sectors (targeted by China).
- Possible explanation: lesser duty rule? In the EU do not have to match the entire dumping margin if a lower duty is sufficient to eliminate the material injury to the domestic industry. This can have an important effect on firms' incentives facing AD duty reviews. A foreign firm targeted with AD in the US may increase its price not only to avoid further duties, but also to affect their level. The second incentive is not necessarily present for foreign firms facing a revision of duties in the EU. In fact, these firms can absorb the tariff and still be faced with relatively low AD duties.