

Foreign affiliates' heterogeneous responses to antidumping duties

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Main questions

- Estimate the effects of anti-dumping (AD) imposition on productivity of foreign affiliates located in AD imposing countries
 - Consider AD imposition from the U.S. and China on U.S. and China affiliates
 - Use difference-in-difference (DID) approach

Anti-dumping duties

- Tariffs in addition to ordinary custom duties that are imposed by an importing country
- Counteract certain ‘unfair’ pricing practices by foreign private firms
- Major trade policy instrument for their ease of initiation and deliberate restriction of international trade
- AD duty imposition increased from 120 to 163 cases between 2012 and 2016
 - 33% of global AD duty imposition accounted by the U.S. and China

Anti-dumping duties and Korea

- Korea ranked as second highest dumping-defendant country after China
- 35% of AD cases on Korean exports initiated by the U.S. and China after 2000
- Trade war between the U.S. and China via AD duty imposition expect to have a impact on export-oriented countries like Korea
 - More Korean exports may be subject to AD cases from the U.S. and China

Korean international trade

- 38.4% of total Korean exports made to the U.S. and China after 2000
- 41.4% of Korean FDI outflows to the U.S. and China after 2000
 - the U.S. accounts for about 21.8% of total Korean FDI outflow and 13.3% of total Korean affiliates
 - China accounts for about 19.2% of total Korean FDI outflow and 36.8% of total Korean affiliates

AD duty imposition and FDI

- Tariff-jumping FDI
 - Dumping-defendant firms can directly produce in the AD duty imposing country via FDI and avoid the large transportation costs
 - E.g. Belderbos (1997, 2003), Blongien (2002)
- AD duty as host country's policy instrument to induce more FDI
 - Expect to have local economic development via capital inflows, technology spillover, and job creation
 - E.g. Trump's tweet over Samsung to engage in FDI in the U.S.
 - E.g. Harley Davidson's transferring production to EU due to the retaliation tariff by the EU

Trade policy studies from the importing country perspective

- AD duty effects on productivity of domestic import-competing firms
 - Firms experience productivity improvement during the AD duty imposition period
 - * EU firms (Konings and Vandebussche (2005, 2008))
 - * U.S. plants (Pierce (2011))
 - Productivity loss for Korean import-competing firms (Sun and Lee (2017))

Few AD studies from the foreign exporting firm perspective

- AD investigations lead to substantial decrease in export volume (Lu et al. (2013)) and in productivity of targeted firms (Chandra and Long (2013))
 - Empirical evidence from Chinese exporters that are subject to U.S. AD duties

- Investigate AD cases initiated by the U.S. and China on Korean exports between 2003 and 2013
- Use Korean firm and foreign affiliate data
 - Dumping-defendant firms simultaneously operate fully-owned foreign affiliates in dumping-complaint countries (48%)
 - Limited data on firm-level exports by the destination country
 - Foreign affiliates' operation and decision largely determined by the parent firm
- Estimate the changes in the productivity of foreign affiliates whose parents are subject to AD duties imposed by the host country before and after imposition
 - Use DID model
 - Compare two sets of treatment versus control groups
 - Examine the AD duty effects imposed by the U.S. and China separately

Different response to AD duties based on the location

- Productivity increase (decrease) for U.S. (China) affiliates whose parents are subject to AD duties during the imposition period
- Robust on different types of foreign affiliates and industries

⇒ U.S. affiliates “protected” by AD duty imposition, while China affiliates “not protected” by AD duty imposition

Working in process

- Finding the mechanism that explains the different AD duty effects
 - Industry- and location-specific characteristics
 - Foreign affiliates-specific characteristics

U.S. AD cases on Korean exports

Table 1: U.S. AD cases on Korean exports between 2003 and 2013

HS code	Product	Year of AD determination	AD tariff (%)
390530	Polyvinyl Alcohol	2003	38.74
392062	Polyethylene terephthalate film	1991	21.5
550320	Polyester Staple Fiber	2000	14.1
720840	Cut-to-length Carbon Steel Plate	1999	2.98
720917	Corrosion resistant/Cold-rolled Flat Steel Products	2002	17.7
721420	Steel Concrete Reinforcing Bar	2001	102.28
721911	Hot-rolled Stainless Steel Plate in Coils	2001	6.08
721932	Cold-rolled Stainless Steel Sheet and Strip in Coils	1999	58.79
722100	Stainless Steel Wire Rod	1998	28.44
722211	Stainless Steel Bar	2002	13.38
722240	Stainless Steel Angle	2001	99.56
730421	Oil Country Tubular Goods	1996	12.17
730630	Circular Welded non-alloy Steel pipes	1992	15.97
730640	ASTM A-312 Welded Stainless Steel pipes	1992	31.7
730660	Light-Walled Rectangular Pipe and Tube	2008	30.66
730723	Stainless Steel Butt-Welded Pipe Fitting	1992	21.2
731210	Prestressed Concrete Steel Wire Strand	2003	54.19
732393	Stainless Steel Cooking Ware	1986	31.23
845020	Large Residential Washers	2012	82.41
850423	Large Power Transformers	2012	60.81

Note: Information on HS 6-digit code, product name, year of AD determination, and AD duty rates are obtained from the KITA. If AD duty rates imposed across Korean exporters are different, the highest rate is specified in the table.

China AD cases on Korean exports

Table 2: China AD cases on Korean exports between 2003 and 2013

HS code	Product	Year of AD determination	AD tariff (%)
280461	Polysilicon	2014	80
282510	Hydrazine Hydrate	2005	35
290312	Methyl Chloride	2002	28
290313	Chloroform	2004	62
290711	Phenol	2004	16
290723	Bisphenol-A	2007	37.1
291030	Epichlorohydrin	2006	71.5
291411	Acetone	2008	8.9
291612	Acrylates	2003	20
291712	Adipic Acid	2009	16.7
291735	Phthalic Anhydride	2003	13
291736	Terephthalic Acid	2010	11.2
292910	Toluene Diisocyanate	2003	61.14
293499	Nucleotide	2006	119
382490	Dimethyl Cyclosiloxane	2009	25.1
390410	Polyvinyl Chloride	2003	76
390760	Polyester Chip	2003	52
392062	Polyethylene Terephthalate Film	2003	46
400219	Styrene Butadiene Rubber	2003	27
480100	Newsprint	1999	55
480411	Kraft Linerboard	2005	65.2
481013	Coated Art Paper	2003	51
540249	Polyurethane, Spandex	2006	43
550320	Polyester Staple Fiber	2003	48
721931	Cold-rolled Flat Products of Stainless Steel	2000	57
900110	Dispersion Unshifted Single-Mode Optical Fiber	2005	46

Note: Information on HS 6-digit code, product name, year of AD determination, and AD duty rates are obtained from the KITA. If AD duty rates imposed across Korean exporters are different, the highest rate is specified in the table.

U.S. and China AD cases on Korean exports

Summary

- AD cases on Korean exports from Korean International Trade Association and Temporary Trade Barriers Database of Bown (2012)
 - Provide information on dumped products in HS-6, AD tariff rates, name of dumping-defendant firms
- U.S. AD cases
 - Concentrated on steel products
 - Most products subject to the expiry reviews and further duty imposition
 - Average duty duration of 12.2 years (including expiry reviews)
- China AD cases
 - Mainly associated with chemical products
 - Particularly active since mid-2000s
 - Average duty duration of 7.5 years (including expiry reviews)

Table 3: U.S. and China affiliates between 2003 and 2013

	U.S.		China	
	2003	2013	2003	2013
<i>Panel 1: Share of affiliate's sales</i>				
To parent	0.082	0.088	0.271	0.217
To local unaffiliated parties	0.773	0.726	0.385	0.578
<i>Panel 2: Share of affiliate's sourcing</i>				
From parent	0.376	0.389	0.393	0.243
From local unaffiliated parties	0.438	0.423	0.337	0.580
<i>Panel 3: Affiliate characteristics</i>				
Affiliate size (asset)	176.07	141.41	77.72	77.22
Parent size (asset)	6957.2	8364.2	6907.9	5827.6
Share of AD affected affiliates	0.076	0.04	0.067	0.032

DID model

- Treatment group
 - Foreign affiliates in all industries whose parents are specifically named in AD duty orders
- Control group
 1. Foreign affiliates in industries where AD duty affected affiliates operate, but whose parents have never been subject to AD duties during sample period
 2. Matching control group
 - Foreign affiliates in industries that had never been subject to AD duties but with a predicted probability of AD duty imposition greater than the 75th percentile of the predicted probability in the group of industries that imposed AD duties

$$A.productivity_{ijt} = \beta_0 + \beta_1 AD_sector_{it} + \beta_2 AD_sector_{it} \times AD_parent_{jt} + \beta_3 X_{jt} + \varepsilon_{ijt}$$

- $A.productivity_{ijt}$: Affiliate j 's productivity operating in industry i at year t
 - Labor productivity measured by value-added per worker
 - TFP estimated by Levinsohn and Petrin (2003) technique
- AD_sector_{it} : Indicator variable whether the affiliate is in industry i at year t where AD duty affected affiliates operate
- AD_parent_{jt} : Indicator variable whether the affiliate j 's parent firm was specifically named in an AD duty order at year t
- X_{it} : Control variables consist of affiliate i 's age, financial leverage, and gross margin

Comparison between treatment and control group

Table A4: Summary statistics of foreign affiliate key variables (2003)

	U.S. affiliates					
	Treatment group		Control group 1		Control group 2	
	AD duty specified parents in AD duty affected industries		AD duty unspecified parents in AD duty affected industries		AD duty unspecified parents in matched industries	
	Mean	SD	Mean	SD	Mean	SD
ln(TFP)	0.694	0.197	0.683	0.377	0.690	0.218
ln(employment)	2.498	1.792	2.394	1.577	2.288	1.184
ln(sales)	10.927	2.181	10.302	2.530	10.753	2.539
local sale share	0.870	0.352	0.876	0.330	0.822	0.299
local purchase share	0.652	0.473	0.592	0.395	0.561	0.486
export share	0.130	0.352	0.124	0.330	0.178	0.299
import share	0.348	0.474	0.418	0.395	0.469	0.486
intra-firm trade share	0.086	0.271	0.105	0.298	0.098	0.265

	China affiliates					
	Treatment group		Control group 1		Control group 2	
	AD duty specified parents in AD duty affected industries		AD duty unspecified parents in AD duty affected industries		AD duty unspecified parents in matched industries	
	Mean	SD	Mean	SD	Mean	SD
ln(TFP)	0.538	0.472	0.518	0.513	0.511	0.403
ln(employment)	5.027	1.284	4.864	1.420	4.789	1.562
ln(sales)	11.043	1.711	10.823	1.781	10.914	1.909
local sale share	0.437	0.426	0.485	0.426	0.521	0.388
local purchase share	0.416	0.292	0.479	0.387	0.540	0.336
export share	0.563	0.367	0.515	0.395	0.479	0.413
import share	0.584	0.380	0.521	0.413	0.460	0.401
intra-firm trade share	0.402	0.433	0.385	0.414	0.394	0.466

Note: Affiliate-level TFP is estimated by using Levinsohn and Petrin (2003) technique. Export share is measured by dividing foreign affiliate's export to parent firm and other parties in Korea by its total sales. Import share is measured by dividing foreign affiliate's purchases from parent firm and other parties in Korea by its total purchases. Intra-firm trade share is computed by dividing foreign affiliate's purchases from the parent firm in Korea by its total purchases.

Table 4: Testing AD duties on affiliate productivity

Dependent variable	U.S.				China			
	Labor productivity		TFP		Labor productivity		TFP	
	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>AD sector</i>	-0.064 (0.065)	-0.254 (0.203)	-0.095 (0.067)	-0.086 (0.062)	-0.001 (0.002)	-0.001 (0.011)	-0.006 (0.037)	-0.062 (0.046)
<i>AD sector</i> × <i>AD parent</i>	0.488** (0.224)	1.220** (0.545)	0.151*** (0.035)	0.188*** (0.052)	-0.012** (0.005)	-0.018* (0.009)	-0.094* (0.053)	-0.035** (0.017)
Adj R^2	0.328	0.427	0.321	0.421	0.557	0.567	0.697	0.635
Observations	2115	3205	1710	3158	7956	3156	5370	2576

Note: All specifications include foreign affiliate and year specific fixed effects. Robust standard errors clustered at the parent firm level are reported in parentheses. ***/**/* denote statistical significance at the 1%, 5%, and 10% level respectively.

- Robustness check
 - Dynamics of AD duty effects
 - * How AD duty effects evolve over time through multiple indicator variables that represent years since the AD duty was imposed
 - Consider additional control group
 - * Affiliates operating in the industry where AD duty was imposed but whose parents are not specifically named in AD duty orders
 - Consider single foreign affiliates
 - Exclude specific industries with heavy AD duties
 - * Exclude steel industries from the U.S. and chemical industries from China
 - Consider foreign affiliates and industries that had AD duties imposed only once
 - * Exclude those subject to expiry review cases

Estimation results

Table 5: AD duty effects on foreign affiliate productivity: Dynamic analysis

Dependent variable	U.S.				China			
	Labor productivity		TFP		Labor productivity		TFP	
	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>AD sector</i> × <i>AD 1 year</i>	-0.346 (0.348)	-0.864* (0.509)	-0.015 (0.131)	-0.065 (0.162)	-0.016** (0.005)	-0.024*** (0.005)	-0.115** (0.041)	-0.297** (0.082)
<i>AD sector</i> × <i>AD parent</i> × <i>AD 1 year</i>	0.068 (0.088)	0.488 (0.371)	0.015 (0.034)	0.027 (0.040)	-0.015*** (0.005)	-0.024** (0.005)	-0.036*** (0.009)	-0.071*** (0.012)
<i>AD sector</i> × <i>AD 2 year</i>	-0.261 (0.293)	-0.773* (0.399)	-0.029 (0.031)	-0.057 (0.051)	-0.008** (0.004)	-0.018** (0.006)	-0.017** (0.008)	-0.038** (0.010)
<i>AD sector</i> × <i>AD parent</i> × <i>AD 2 year</i>	0.757* (0.413)	0.240 (0.135)	0.025 (0.032)	0.047 (0.031)	-0.008* (0.004)	-0.018** (0.006)	-0.048*** (0.011)	-0.046*** (0.015)
<i>AD sector</i> × <i>AD 3 year</i>	-0.141 (0.208)	-0.615 (0.420)	-0.036 (0.027)	-0.033 (0.029)	-0.009* (0.005)	-0.012 (0.008)	-0.063 (0.041)	-0.037*** (0.012)
<i>AD sector</i> × <i>AD parent</i> × <i>AD 3 year</i>	0.752** (0.330)	0.589* (0.309)	0.071** (0.032)	0.062* (0.031)	-0.008* (0.005)	-0.014*** (0.004)	-0.040*** (0.013)	-0.016*** (0.005)
<i>AD sector</i> × <i>AD 4 year</i>	-0.069 (0.218)	-1.007 (0.718)	-0.013 (0.011)	0.015 (0.030)	-0.010 (0.007)	-0.010 (0.012)	-0.044 (0.045)	0.065 (0.055)
<i>AD sector</i> × <i>AD parent</i> × <i>AD 4 year</i>	0.422*** (0.033)	0.669** (0.245)	0.064** (0.031)	0.075* (0.041)	-0.009 (0.007)	-0.020** (0.006)	-0.044*** (0.009)	-0.011** (0.005)
<i>AD sector</i> × <i>AD 5 year</i>	-0.293 (0.281)	-0.235 (0.305)	0.016 (0.016)	0.014 (0.033)	-0.011 (0.008)	-0.014* (0.007)	-0.001 (0.003)	0.005 (0.006)
<i>AD sector</i> × <i>AD parent</i> × <i>AD 5 year</i>	0.554* (0.304)	0.363** (0.126)	0.057* (0.029)	0.078* (0.042)	-0.009 (0.014)	-0.011 (0.006)	-0.009 (0.016)	-0.003 (0.014)
Adj R^2	0.138	0.218	0.656	0.694	0.716	0.798	0.446	0.456
Observations	2115	1359	2115	1359	8127	3156	8127	3156

Note: *ADyear* denotes years since the AD duty was imposed on parent firms. All specifications include foreign affiliate and year specific fixed effects. Robust standard errors clustered at the parent firm level are reported in parentheses. ***/**/* denote statistical significance at the 1%, 5%, and 10% level respectively.

Table 6: Testing AD duties on affiliate productivity: Single affiliates

Dependent variable	U.S.				China			
	Labor productivity		TFP		Labor productivity		TFP	
	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>AD sector</i>	-0.101 (0.079)	-0.019 (0.102)	-0.148 (0.091)	-0.454 (0.442)	-0.001 (0.006)	-0.010 (0.008)	-0.007 (0.045)	-0.011 (0.010)
<i>AD sector</i> × <i>AD parent</i>	0.812** (0.378)	0.878* (0.454)	0.087** (0.042)	0.151*** (0.041)	-0.010* (0.005)	-0.007** (0.003)	-0.099** (0.048)	-0.095** (0.037)
Adj R^2	0.335	0.231	0.149	0.116	0.457	0.399	0.684	0.736
Observations	1277	809	1020	688	4234	1670	1842	1336

Note: All specifications include foreign affiliate and year specific fixed effects. Robust standard errors clustered at the parent firm level are reported in parentheses. ***/**/* denote statistical significance at the 1%, 5%, and 10% level respectively.

Table 7: Testing AD duties on affiliate productivity: Excluding industries

Dependent variable	U.S.				China			
	Labor productivity		TFP		Labor productivity		TFP	
	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>AD sector</i>	-0.210 (0.142)	-0.321 (0.203)	-0.135** (0.056)	-0.123* (0.066)	-0.002 (0.004)	-0.005 (0.006)	-0.027 (0.031)	-0.049 (0.120)
<i>AD sector</i> × <i>AD parent</i>	0.518** (0.260)	1.477** (0.626)	0.181*** (0.060)	0.218*** (0.060)	-0.007** (0.003)	-0.071** (0.003)	-0.011** (0.033)	-0.239** (0.099)
Adj R^2	0.114	0.133	0.224	0.225	0.461	0.449	0.608	0.845
Observations	1757	1074	1035	833	6137	2830	4753	2039

Note: All specifications include foreign affiliate and year specific fixed effects. Robust standard errors clustered at the parent firm level are reported in parentheses. ***/**/* denote statistical significance at the 1%, 5%, and 10% level respectively.

Table 8: Testing AD duties on affiliate productivity: Excluding expiry cases

Dependent variable	U.S.				China			
	Labor productivity		TFP		Labor productivity		TFP	
	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>AD sector</i>	-0.458 (0.257)	-0.601 (0.468)	-0.563*** (0.077)	-0.227* (0.108)	-0.002 (0.004)	-0.007 (0.011)	-0.068 (0.063)	-0.042 (0.111)
<i>AD sector</i> × <i>AD parent</i>	0.472* (0.210)	0.553** (0.014)	0.151** (0.053)	0.139*** (0.038)	-0.032* (0.019)	-0.116* (0.053)	-0.925*** (0.195)	-1.058*** (0.107)
Adj R^2	0.747	0.652	0.426	0.451	0.623	0.870	0.829	0.737
Observations	110	94	88	66	2772	6279	2282	3143

Note: All specifications include foreign affiliate and year specific fixed effects. Robust standard errors clustered at the parent firm level are reported in parentheses. ***/**/* denote statistical significance at the 1%, 5%, and 10% level respectively.

Determination of AD duty effects on affiliate productivity

- Location- and industry-specific characteristics of location
 - Different productivity changes driven by certain industry sectors with high or low concentrated competition?
- Affiliate-specific characteristics
 - AD duty effects on other operational measures: Labor, gross investment
 - Trade-diversion effects
 - Operation type
 - * Affiliates rely on intra-firm sourcing (imports)
 - * U.S. affiliates show market-seeking
 - * China affiliates show production tasks specialized to their parents
 - Knowledge transfer through expatriate managers

Table 9: Testing AD duties on affiliate production and intra-firm imports

Dependent variable	U.S.				China			
	Intra-firm imports		Production		Intra-firm imports		Production	
	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2	Control group 1	Control group 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>AD sector</i>	0.052 (0.482)	-0.841 (0.557)	0.444 (0.311)	-0.492 (0.646)	-0.319 (0.473)	0.047 (0.172)	-0.050 (0.072)	0.025 (0.101)
<i>AD sector</i> \times <i>AD parent</i>	2.289*** (0.483)	1.990*** (0.591)	2.463*** (0.224)	1.919*** (0.172)	-0.116** (0.059)	-0.214* (0.107)	-0.329*** (0.104)	-0.333*** (0.076)
Adj R^2	0.424	0.510	0.464	0.521	0.837	0.795	0.840	0.837
Observations	2405	1555	1820	1293	7769	3359	6112	2970

Note: All specifications include foreign affiliate and year specific fixed effects. Robust standard errors clustered at the parent firm level are reported in parentheses. ***/**/* denote statistical significance at the 1%, 5%, and 10% level respectively.

- Association between industry- and location-characteristics and AD duty effects
 - Industry concentration
 - Supply chain structure of affiliates and parents
 - * Upstream and downstream relations
 - * Dumped product characteristics
- Expatriate manager transfer from parent to affiliates and AD duty effects