

Technical Regulations, Intermediate Inputs and Performance of Domestic Firms: Evidence from India

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Outline

Introduction

Data and Stylized Facts

Empirical Methodology

Results

Non Tariff Measures

- ▶ All policy measures other than custom tariffs that can potentially have an effect on trade flows
- ▶ Broad categorization
 - ▶ Border Measures
 - ▶ Imports
 - ▶ Exports
 - ▶ Behind Border Measures
 - ▶ Sanitary and Phytosanitary Measures (SPS) Measures
 - ▶ Technical Barriers to Trade (TBT) Measures
- ▶ SPS and TBT measures apply to domestically produced products as well as imported products

Non Tariff Measures

- ▶ TBT measures set out regulations and standards governing product characteristics (size, shape, function etc.) or the production process.
- ▶ Generally
 - ▶ SPS measures → agricultural products
 - ▶ TBT measures → manufacturing products
- ▶ These measures serve legitimate public policy objective
- ▶ Potential for misuse by governments to protect domestic firms
- ▶ Impact on exporters
 - ▶ translation of foreign regulations
 - ▶ hiring of technical experts to explain foreign regulations
 - ▶ adjustment of production facilities to comply with the requirements

Motivation

- ▶ Tariff liberalization increased firm productivity (Topalova and Khandelwal 2011)
 - ▶ Input tariffs reduction more salient than output tariffs
- ▶ Product standards have a negative effect on extensive and intensive margin of exports (Fontagne et al. 2015)

Research Question

- ▶ Study the distribution of restrictive TBT measures across intermediate goods and final goods
- ▶ Effect of introduction of restrictive TBT measures by India on the productivity of domestic firms
 - ▶ Specific channel - import of intermediate inputs - linking restrictive TBT measures and firm productivity

Related Literature

- ▶ Related to three strands of literature
 - ▶ International trade and growth models predict increased productivity from increased access to intermediate inputs (Markusen, 1989; Grossman and Helpman, 1991; Rivera-Batiz and Romer, 1991).
 - ▶ Variety
 - ▶ Technology embodied in foreign inputs
 - ▶ Learning effects
 - ▶ Studies on trade liberalization and productivity of firms (Pavcnik, 2002; Amiti and Konings, 2007; Topalova and Khandelwal, 2011)
 - ▶ Studies on effects of non tariff measures on trade flows (Shepherd 2007, Fontagne et al. 2015)

Contribution

- ▶ Main contributions to literature
 - ▶ First study to link TBT measures to productivity of domestic firms
 - ▶ Particularly salient for TBT measures on inputs
 - ▶ Policy implications → TBT measures should be non discriminatory
 - ▶ Highlights the importance of including non tariff measures in firm level productivity studies
 - ▶ Separately estimates impact on importers
 - ▶ Novel for Indian firm level studies on productivity

Data and Stylized Facts

- ▶ Firm level dataset
 - ▶ Prowess dataset
 - ▶ Years 1996-2011
 - ▶ Reports data on imports
 - ▶ Raw materials
 - ▶ Capital Goods
 - ▶ Stores and Spares
 - ▶ Final Goods
- ▶ Specific Trade Concerns Database
 - ▶ All concerns raised by member countries against India in the TBT committees of WTO
 - ▶ Years 1995-2011
 - ▶ Advantages
 - ▶ Systematically reports restrictive TBT measures
 - ▶ Exact duration for which the measure is considered restrictive

Data and Stylized Facts

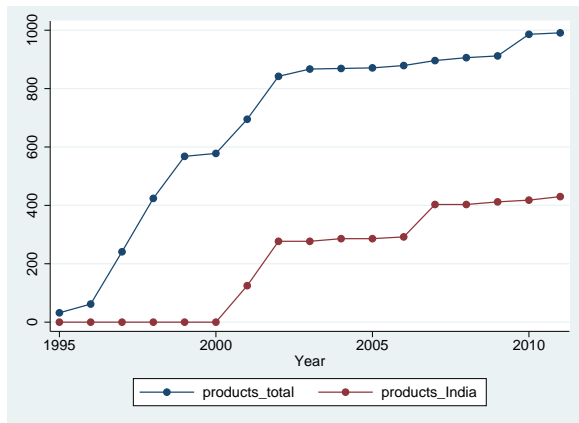


Figure: Products Covered by TBT Concerns

Data and Stylized Facts

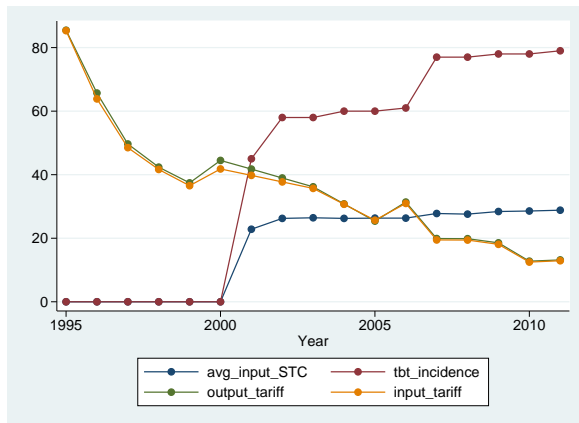


Figure: TBT Concerns and Tariffs

Data and Stylized Facts

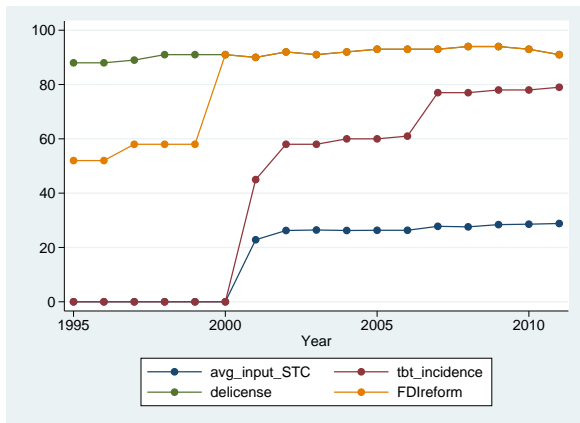


Figure: TBT Concerns and Trade Reforms

Data and Stylized Facts

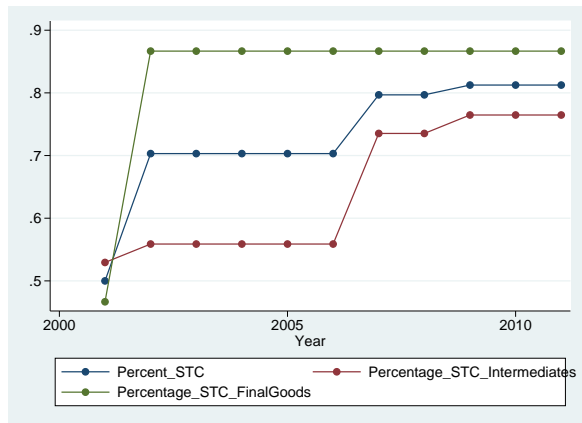


Figure: TBT Concerns for Intermediate and Final Goods

Empirical Strategy

- ▶ Step 1: Calculate firm level productivity by estimating the coefficients of production function by Levinson and Petrin method.

$$y_{ijt} = \alpha + \beta_1 l_{ijt} + \beta_2 p_{ijt} + \beta_3 m_{ijt} + \beta_4 k_{ijt} + \omega_{ijt} + \epsilon_{ijt} \quad (1)$$

$$tfp_{ijt} = y_{ijt} - \hat{\beta}_1 l_{ijt} - \hat{\beta}_2 p_{ijt} - \hat{\beta}_3 m_{ijt} - \hat{\beta}_4 k_{ijt} \quad (2)$$

- ▶ Step 2: Estimate the effect of restrictive TBT measures on firm level productivity

$$\begin{aligned} tfp_{ijt} = & \alpha_0 + \alpha_i + \alpha_{j(2),t} + \beta_1 concern_{j,t-1}^{output} + \beta_2 concern_{j,t-1}^{input} \\ & + \beta_3 concern_{j,t-1}^{input} importer_{ijt} + \beta_4 importer_{ijt} \\ & + \beta_5 tariff_{j,t-1} + \nu_{ijt} \end{aligned} \quad (3)$$

Stylized facts

Table: Yearly Incidence of STCs

Year	All Countries		India	
	concerns	products	concerns	products
	(1)	(2)	(3)	(4)
1995-2000	52	578	0	0
2001	15	317	2	125
2002	20	436	2	171
2003	15	471	0	0
2004	14	29	1	14
2005	12	337	0	0
2006	24	459	2	7
2007	27	329	4	142
2008	32	333	0	0
2009	46	363	3	193
2010	29	683	1	6
2011	31	514	3	237

Stylized facts

Table: Objectives of STCs

Objectives	Concerns
Human Health and Safety	12
Consumer Safety or protection	10
Environment	4
Quality	2

Stylized facts

Table: Issues raised in STCs

Objectives	Concerns
Unnecessary barrier to trade	13
Transparency	11
Clarification	9
Standards	5
Discrimination	4
Legitimacy and Rationale	4

Table: Endogeneity of Trade Policy

	1995-2011	1995-2001	2002-2011
	(1)	(2)	(3)
A: Output concern _{t+1}			
Industry Productivity _t	0.0754 (0.0514)	0.0699 (0.0512)	0.163** (0.0693)
B: Input concern _{t+1}			
Industry Productivity _t	0.0191 (0.0157)	0.00549 (0.0142)	0.0133 (0.0103)
C: Input tariff _{t+1}			
Industry Productivity _t	-1.770** (0.687)	-1.051 (0.747)	-1.640** (0.819)
D: Output tariff _{t+1}			
Industry Productivity _t	-1.935** (0.808)	-1.049 (1.069)	-1.691** (0.848)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	1631	707	924

Table: Basic Results

	Full Sample						Balanced
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$concern_{j,t-1}^{output}$	0.0179 (0.0197)	0.0188 (0.0198)	0.0264 (0.0200)	0.0268 (0.0201)	0.0222 (0.0196)	0.0227 (0.0197)	0.00597 (0.0311)
$concern_{j,t-1}^{input}$			-0.378*** (0.0988)	-0.385*** (0.0982)	-0.122 (0.101)	-0.130 (0.101)	-0.00973 (0.162)
$concern_{j,t-1}^{input} \times importer_{ijt}$					-0.424*** (0.0539)	-0.423*** (0.0539)	-0.379*** (0.104)
$tariff_{j,t-1}^{input}$	0.163 (0.146)		0.141 (0.146)		0.136 (0.145)		
$tariff_{j,t-1}^{output}$	-0.316*** (0.110)		-0.262** (0.110)		-0.265** (0.109)		
ERP_{t-1}		-0.122** (0.0618)		-0.0894 (0.0614)		-0.0919 (0.0612)	-0.109 (0.0975)
$importer_{ijt}$					-0.0353** (0.0163)	-0.0357** (0.0163)	-0.0620* (0.0360)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit) \times Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit) \times Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53685	53685	53685	53685	53685	53685	13808
Adjusted R^2	0.952	0.952	0.952	0.952	0.953	0.953	0.978

Table: Trade Reforms and Productivity

	Delicense		FDI Reforms	
	(1)	(2)	(3)	(4)
$concern_{j,t-1}^{output}$	0.0216 (0.0197)	0.0211 (0.0197)	0.0259 (0.0197)	0.0252 (0.0197)
ERP_{t-1}	-0.0861 (0.0613)	-0.0841 (0.0613)	-0.0962 (0.0613)	-0.0940 (0.0613)
$concern_{j,t-1}^{input}$	-0.137 (0.100)	0.273 (0.633)	-0.0967 (0.101)	0.374 (0.634)
$concern_{j,t-1}^{input} \times importer_{ijt}$	-0.423*** (0.0539)	-0.424*** (0.0539)	-0.431*** (0.0540)	-0.433*** (0.0540)
$delicense_t$	-0.205** (0.0961)	-0.205** (0.0961)		
$concern_{j,t-1}^{input} \times delicense_t$		-0.411 (0.629)		
FDI_t			0.0892*** (0.0273)	0.0898*** (0.0273)
$concern_{j,t-1}^{input} \times FDI_t$				-0.472 (0.630)
$importer_{ijt}$	-0.0356** (0.0163)	-0.0353** (0.0163)	-0.0319* (0.0164)	-0.0315* (0.0163)
Firm FE	Yes	Yes	Yes	Yes
Industry(2 digit) \times Year FE	Yes	Yes	Yes	Yes
Observations	53685	53685	53173	53173
Adjusted R^2	0.953	0.953	0.945	0.945

Results

Table: Industry Characteristics

	Intermediate Goods			Final Goods		Import Intensity	
	Basic	Intermediates	Capital Goods	Durables	Non-durables	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$concern_{j,t-1}^{output}$	-0.00601 (0.0664)	0.215*** (0.0610)	0.0661** (0.0280)	0.0108 (0.0453)	0.0243 (0.0536)	-0.00241 (0.0259)	0.0163 (0.0299)
ERP_{t-1}	0.0478 (0.0723)	-1.023** (0.431)	-0.425*** (0.153)	-0.322 (0.449)	-0.257 (0.212)	-0.0535 (0.0729)	-0.163 (0.149)
$concern_{j,t-1}^{input}$	-0.367*** (0.130)	-0.809 (0.921)	0.104 (0.428)	-0.338 (0.911)	0.458 (0.290)	-0.0132 (0.138)	0.0109 (0.181)
$concern_{j,t-1}^{input} \times importer_{ijt}$	-0.195** (0.0790)	-0.620*** (0.130)	-0.178 (0.187)	-0.261** (0.120)	-0.937*** (0.131)	-0.460*** (0.0629)	-0.229** (0.105)
$importer_{ijt}$	-0.0608* (0.0329)	0.0298 (0.0493)	-0.00854 (0.0544)	-0.00616 (0.0438)	-0.0105 (0.0261)	-0.0390* (0.0209)	-0.0313 (0.0258)
HHI_t	0.183 (0.243)	-0.692* (0.362)	0.349 (0.223)	0.536*** (0.193)	-0.467** (0.182)	-0.103 (0.152)	0.163 (0.137)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit) \times Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9950	7122	6444	8593	21060	37134	15964
Adjusted R^2	0.922	0.953	0.968	0.957	0.923	0.936	0.956

Results

Table: Firm Characteristics

	Firm Size			Firm Ownership			Exporting Status	
	Large	Medium	Small	Domestic	Foreign	Government	Exporters	Non Exporters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$concern_{j,t-1}^{output}$	-0.249** (0.115)	0.0413* (0.0234)	0.0205 (0.0327)	0.0175 (0.0232)	0.0841 (0.162)	0.0448 (0.0991)	0.0419* (0.0222)	0.0228 (0.0333)
ERP_{t-1}	-0.196 (0.169)	-0.0748 (0.0620)	-0.141 (0.124)	-0.130* (0.0686)	0.379 (0.714)	0.0337 (0.260)	-0.0554 (0.0685)	-0.0658 (0.0959)
$concern_{j,t-1}^{input}$	0.467 (0.383)	-0.218* (0.126)	-0.203 (0.160)	0.0501 (0.115)	0.0473 (2.035)	-1.046 (0.708)	-0.0956 (0.143)	-0.290** (0.128)
$concern_{j,t-1}^{input} \times importer_{ijt}$	-0.691** (0.300)	-0.139* (0.0742)	-0.337*** (0.0737)	-0.456*** (0.0842)	0.328 (1.860)	0.409 (0.394)	-0.282*** (0.0818)	-0.257*** (0.0642)
$importer_{ijt}$	-0.287*** (0.0942)	-0.0782*** (0.0242)	-0.0471** (0.0208)	-0.566*** (0.0253)	-0.662*** (0.184)	-0.813*** (0.175)	-0.0197 (0.0261)	-0.0438** (0.0188)
FDI_t	0.123 (0.0876)	0.116*** (0.0308)	0.0490 (0.0522)	0.0500* (0.0303)	0.323*** (0.120)	0.248 (0.209)	0.132*** (0.0298)	0.0359 (0.0443)
$delicense_t$		-0.303*** (0.111)	0.0502 (0.170)	-0.328*** (0.1000)		-0.831*** (0.368)	-0.0724 (0.165)	-0.236** (0.116)
Firm FE	Yes	Yes	Yes	No	No	No	Yes	Yes
Industry(2 digit) \times Year FE	Yes	Yes	Yes	No	No	No	Yes	Yes
Industry FE	No	No	No	Yes	Yes	Yes	No	No
Year FE	No	No	No	Yes	Yes	Yes	No	No
Observations	13584	41530	11625	48830	859	1639	27321	24953
Adjusted R^2	0.972	0.957	0.857	0.724	0.863	0.757	0.972	0.913

Table: Global Crisis

	Pre-Crisis 1995-2007		Full Sample 1995-2011			
	(1)	(2)	(3)	(4)	(5)	(6)
$concern_{j,t-1}^{output}$	0.0637*** (0.0201)	0.0563*** (0.0199)	0.0250 (0.0197)	0.0253 (0.0195)	0.0258 (0.0195)	0.0255 (0.0195)
ERP_{t-1}	-0.162*** (0.0588)	-0.161*** (0.0585)	-0.0895 (0.0613)	-0.0877 (0.0611)	-0.0895 (0.0612)	-0.0862 (0.0610)
$concern_{j,t-1}^{input}$	-0.387*** (0.0896)	-0.118 (0.0943)	-0.112 (0.0971)	-0.146 (0.0962)	-0.154 (0.0994)	-0.179* (0.0962)
$concern_{j,t-1}^{input} \times importer_{jt}$		-0.433*** (0.0549)	-0.432*** (0.0540)	-0.384*** (0.0524)	-0.335*** (0.0520)	-0.314*** (0.0515)
$concern_{j,t-1}^{input} \times Crisis_t$			0.0338 (0.0657)	-0.0653 (0.0872)		-0.0474 (0.0872)
$concern_{j,t-1}^{input} \times importer_{jt} \times Crisis_t$				0.192** (0.0943)		0.158* (0.0936)
$importer_{jt} \times REER_t$					-0.292** (0.132)	-0.202 (0.127)
$exporter_{jt} \times REER_t$					-0.725*** (0.127)	-0.735*** (0.127)
$importer_{jt} \times Crisis_t$				-0.126*** (0.0314)		-0.110*** (0.0307)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit)* Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	36670	36670	53173	53173	53173	53173
Adjusted R^2	0.950	0.951	0.945	0.945	0.945	0.945

Table: Robustness Checks

	Mark-up			Import Channel			Placebo
	Industry concentration		Market share	Raw material	Capital goods	Spares	Final goods
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$concern_{j,t-1}^{output}$	0.0256 (0.0195)	0.0294 (0.0194)	0.0257 (0.0194)	0.0292 (0.0194)	0.0258 (0.0192)	0.0260 (0.0197)	0.0310 (0.0196)
ERP_{t-1}	-0.0943 (0.0613)	-0.0935 (0.0611)	-0.0938 (0.0613)	-0.0969 (0.0613)	-0.0908 (0.0610)	-0.0895 (0.0615)	-0.0908 (0.0616)
$concern_{j,t-1}^{input}$	-0.148 (0.100)	-0.167* (0.100)	-0.139 (0.101)	-0.178* (0.0979)	-0.259*** (0.0940)	-0.302*** (0.0968)	-0.354*** (0.0961)
$concern_{j,t-1}^{input} \times importer_{jt}$	-0.335*** (0.0520)	-0.352*** (0.0563)	-0.348*** (0.0542)				
$concern_{j,t-1}^{input} \times importer_{jt} \times high$ concentration _t		0.129 (0.0950)					
$concern_{j,t-1}^{input} \times importer_{jt} \times$ marketshare _t			0.602 (0.483)				
HHI_t	0.0833 (0.0922)	0.00577 (0.0964)	0.101 (0.0934)	0.0823 (0.0923)	0.0913 (0.0922)	0.0945 (0.0922)	0.0924 (0.0920)
$concern_{j,t-1}^{input} \times ImporterRM_t$				-0.321*** (0.0491)			
$concern_{j,t-1}^{input} \times ImporterCG_t$					-0.283*** (0.0413)		
$concern_{j,t-1}^{input} \times ImporterSS_t$						-0.151*** (0.0448)	
$concern_{j,t-1}^{input} \times ImporterFG_t$							-0.0410 (0.0730)
$importer_{jt} \times REER_t$	-0.291** (0.132)	-0.294** (0.132)	-0.291** (0.132)				
$Exporter_t \times REER_t$	-0.724*** (0.127)	-0.713*** (0.127)	-0.725*** (0.127)	-0.729*** (0.127)	-0.623*** (0.126)	-0.943*** (0.128)	-1.048*** (0.122)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digits)*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53173	53173	53173	53173	53173	53173	53173
Adjusted R ²	0.945	0.945	0.945	0.945	0.945	0.945	0.945

Results

Table: Robustness Check: Arellano Bond Estimation

	AB1	AB2	AB1	AB2	AB1	AB2
	(1)	(2)	(3)	(4)	(5)	(6)
TFP_{t-1}	0.00120 (0.291)	0.325*** (0.0504)	-0.0486 (0.314)	0.322*** (0.0505)	0.115 (0.236)	0.328*** (0.0508)
$concern_{j,t-1}^{output}$	0.0281 (0.0192)	0.0243* (0.0133)	0.0304 (0.0204)	0.0250* (0.0134)	0.0236 (0.0169)	0.0215 (0.0132)
$concern_{j,t-1}^{input}$	-0.368** (0.160)	-0.231*** (0.0704)	-0.408** (0.174)	-0.243*** (0.0698)	-0.100 (0.0947)	-0.0623 (0.0675)
$concern_{j,t-1}^{input} \times importer_{ijt}$					-0.347*** (0.105)	-0.263*** (0.0415)
ERP_{t-1}			-0.0892 (0.0614)	-0.0983** (0.0452)	-0.0983* (0.0532)	-0.102** (0.0446)
$tariff_{j,t-1}^{input}$	0.138 (0.145)	0.192* (0.106)				
$tariff_{j,t-1}^{output}$	-0.258** (0.108)	-0.245*** (0.0813)				
$importer_{ijt}$			-0.114*** (0.0270)	-0.0856*** (0.00974)	-0.0306** (0.0144)	-0.0311*** (0.0119)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit)* Year FE	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	-0.543	-8.435	-0.381	-8.492	-1.153	-8.575
AR(2)	-1.258	-0.568	-1.340	-0.621	-1.114	-0.608
Observations	39814	39814	39814	39814	39814	39814

Results

Table: Robustness Checks: Alternative Productivity Measures

	OLS		Log(real output per unit compensation)		No Foreign firms	
	(1)	(2)	(3)	(4)	(5)	(6)
$concern_{j,t-1}^{output}$	0.0360** (0.0144)	0.0339** (0.0144)	0.0550** (0.0221)	0.0509** (0.0222)	0.0259 (0.0193)	0.0195 (0.0190)
ERP_{t-1}	-0.123** (0.0559)	-0.125** (0.0558)	-0.196*** (0.0682)	-0.200*** (0.0680)	-0.0881 (0.0577)	-0.0926 (0.0572)
$concern_{j,t-1}^{input}$	-0.275*** (0.0712)	-0.175** (0.0771)	-0.211* (0.121)	-0.0147 (0.132)	-0.487*** (0.0975)	-0.204** (0.101)
$concern_{j,t-1}^{input} \times importer_{ijt}$		-0.159*** (0.0410)		-0.310*** (0.0602)		-0.450*** (0.0537)
$importer_{ijt}$	-0.00908 (0.00877)	0.0234* (0.0126)	0.141*** (0.0138)	0.205*** (0.0185)	-0.118*** (0.0116)	-0.0246 (0.0162)
HHI_t	0.0545 (0.0684)	0.0516 (0.0686)	-0.227** (0.105)	-0.233** (0.105)	0.113 (0.0924)	0.102 (0.0924)
$delicense_t$	0.00650 (0.0737)	0.00568 (0.0738)	0.123 (0.0805)	0.122 (0.0808)	-0.222** (0.0963)	-0.225** (0.0969)
FDI_t	0.0727*** (0.0226)	0.0728*** (0.0226)	0.0744** (0.0327)	0.0745** (0.0327)	0.116*** (0.0272)	0.116*** (0.0271)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit) \times Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53649	53649	53721	53721	52322	52322
Adjusted R^2	0.603	0.603	0.846	0.846	0.950	0.950

Results

Table: Robustness Checks: Instrumental Variables Estimations

	(1)	(2)	(3)	(4)	(5)	(6)
$concern_{j,t-1}^{output}$	0.197 (0.145)	0.194 (0.144)			0.0221 (0.113)	0.00716 (0.114)
$concern_{j,t-1}^{input}$			-0.418*** (0.120)	-0.395*** (0.120)	-0.407*** (0.132)	-0.234 (0.157)
$concern_{j,t-1}^{input} \times importer_{ijt}$						-0.297** (0.141)
ERP_{t-1}		-0.257** (0.125)		-0.0657 (0.0647)	-0.0814 (0.101)	-0.0744 (0.102)
$importer_{ijt}$		-0.121*** (0.0117)		-0.121*** (0.0117)	-0.121*** (0.0116)	-0.0595* (0.0326)
$delicense_t$		-0.199** (0.0989)		-0.232** (0.0967)	-0.230** (0.0973)	-0.233** (0.0977)
FDI_t		0.122*** (0.0308)		0.0929*** (0.0274)	0.0943*** (0.0289)	0.0932*** (0.0288)
HHI_t		0.138 (0.0917)		0.113 (0.0936)	0.111 (0.0941)	0.102 (0.0941)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry(2 digit) \times Year FE	Yes	Yes	Yes	Yes	Yes	Yes
First Stage F stat	[49.74]	[52.91]	[4568.02]	[5878.87]	[65.67; 3208.38]	[46.05; 2159.45; 371.9]
Observations	53685	53173	53685	53173	53173	53173
Adjusted R^2	0.952	0.944	0.952	0.944	0.944	0.945

limitations

- ▶ Channels of productivity losses
- ▶ Physical Efficiency not accurately captured