

The China Shock in World Markets: Chinese Competition and German Exporters

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China Shock 2.0 Conference, Banca d'Italia
28 September 2026

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I. Introduction and Motivation

The China Shock in World Markets

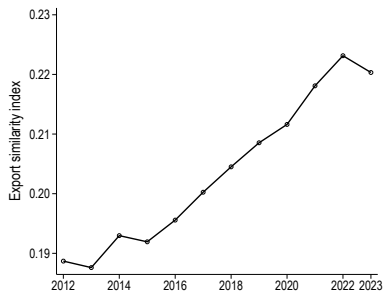
- ▶ Research on the first wave of the China shock centered on rising **Chinese import competition** in advanced economies (Autor et al., 2013, 2014; Dauth et al., 2014; Acemoglu et al., 2016).
- ▶ More recently, China has placed greater emphasis on **technological upgrading** and domestic capabilities, including through Made in China 2025.
- ▶ Chinese firms have become more innovative, and China's export basket has become more **sophisticated** and **quality-intensive**.
- ▶ As Chinese firms move into more advanced product markets, they increasingly compete directly with **incumbent exporters from advanced economies in third markets**.

Why Germany Is Particularly Exposed

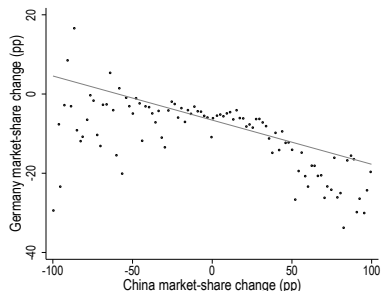
- ▶ Germany is unusually **export-oriented**, ranks among the **world's three largest goods exporters**, and is a benchmark for advanced manufacturing competitiveness.
- ▶ Machinery, motor vehicles, and electrical equipment accounted for about **45 percent** of German goods exports in 2011.
- ▶ This export specialization leaves Germany especially exposed to China's expansion into **more technologically advanced product markets**.
- ▶ **Germany's share of world exports has recently declined**, and these losses weighed **materially on aggregate GDP growth** (Deutsche Bundesbank, 2025).

Table

China and Germany increasingly compete abroad



(a) Export similarity index



(b) Market-share changes

Chinese and German exporters increasingly **compete head-to-head** in the same foreign markets, and **Germany loses most where China gains most**.

Contributions and Main Findings

- ▶ **Foreign-market competition:** We shift the focus from **Chinese imports at home** to **Chinese competition abroad**.
- ▶ **Generalized China-shock instrument:** We generalize Autor et al. (2013) to a multi-destination setting, using Chinese gains in the same product in **structurally similar destinations**.
- ▶ **Firm effects:** Chinese market-share gains reduce German firms' **exports and domestic outcomes**.
- ▶ **Sources of resilience:** Pre-existing **quality, product, and destination advantages** cushion the losses.
- ▶ **Aggregate adjustment:** **Market exit and weaker entry** account for more than half of the overall German export decline.
- ▶ **Sources of China's gains:** A structural decomposition points to **export competitiveness**; gains are stronger with **intense firm competition** and **export-oriented policy infrastructure**.

II. Methods

Measuring Chinese Competition

We define a market as a **destination-HS6 product** pair, jk , and measure Chinese competition as the change in China's share of **non-German imports**:

$$\Delta MS_{CN,jk} = \frac{X_{CN,jk,2023}}{M_{(-DE),jk,2023}} - \frac{X_{CN,jk,2012}}{M_{(-DE),jk,2012}}.$$

- ▶ Excluding Germany avoids a **mechanical link** between German export losses and Chinese market-share gains.
- ▶ The measure is invariant to **proportional destination-product demand shocks**.
- ▶ Unobserved **supplier-specific destination-product shocks** may both raise China's share and reduce German exports.
- ▶ We therefore treat $\Delta MS_{CN,jk}$ as **endogenous**.

Firm-destination-product level: Adjustment within affected markets

$$g_{fjk}^y = \beta^{FJK} \Delta MS_{CN,jk} + \mu_f + \lambda_j + \kappa_k + \varepsilon_{fjk}.$$

- ▶ Endogenous variable: $\Delta MS_{CN,jk}$, the **market-level China shock**.
- ▶ Instrument: Z_{jk} , the corresponding **market-level instrument**.

Firm level: Effects of portfolio exposure on firm outcomes

$$g_f^y = \beta^F \Delta MS_{CN,f} + W_{f,2011} \gamma + \delta_{s(f)} + \varepsilon_f.$$

- ▶ Endogenous variable: $\Delta MS_{CN,f}$, a **shift-share exposure** based on predetermined 2011 export shares.
- ▶ Instrument: Z_f , constructed from the **market-level instruments** using the same export shares.

Instrument for Chinese Market-Share Changes

We generalize the Autor et al. (2013) China-shock instrument to a **multi-destination setting**.

$$Z_{jk} = \frac{1}{|\mathcal{J}(j)|} \sum_{\ell \in \mathcal{J}(j)} \Delta MS_{CN, \ell k}.$$

- ▶ For each destination j , $\mathcal{J}(j)$ contains the **ten most similar destinations**.
- ▶ **Similarity** is based on a **PCA** of **predetermined 2011 characteristics**: market size, income, import composition, China's initial presence, and bilateral links with China.
- ▶ **Relevance**: Chinese product-level competitiveness shocks should generate similar gains in similar destinations
- ▶ **Exclusion restriction**: conditional on fixed effects and controls, Z_{jk} should affect German exports only through China's market-share gain in market jk .

III. Data

- ▶ **German firm-level trade data:** AFiD-Panel Foreign Trade Statistics, by firm, destination, product, and year (DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0).
- ▶ **Domestic firm outcomes:** revenue and employment from the AFiD-Panel Business Register (DOI: 10.21242/52121.2022.00.01.1.1.0).
- ▶ **International trade data:** CEPII BACI bilateral product-level trade flows for market shares and supplier structures.
- ▶ **Additional data:** CEPII Gravity database, product technology groups, tariffs, sanctions, production-cost measures, Chinese firm-level export data, and policy exposures.

Summary Statistics for German Exporters

	2011	2012	2023
Number of firms	122,510	124,939	128,132
Average firm exports, EUR	5,938,269	5,934,924	8,891,804
Median firm exports, EUR	126,329	119,690	121,726
Average number of destinations	8.4	8.3	8.2
Median number of destinations	3	2	2
Average number of HS6 products	13.8	14.0	16.5
Median number of HS6 products	3	3	3
Average share of largest HS6 product	0.74	0.74	0.75

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

The data exhibit the **standard features of firm-level trade data** (Bernard et al., 2007; Eaton et al., 2011): exporter size is **highly skewed**, the typical exporter serves only a few destinations and products, and product portfolios are **concentrated**.

IV. Results

Firm Destination-Product Effects

Dep. var.	IV Exports (1)	IV Exports (2)	OLS Exports (3)	IV Exports (4)	IV Exports (5)	IV Exit (6)	IV Quantity (7)
$\Delta MS_{CN,jk}$	-1.6768*** (0.1626)	-0.9459*** (0.2926)	-0.1478*** (0.0282)	-0.6104*** (0.2093)	-1.2217** (0.5564)	0.2700*** (0.0731)	-0.4872** (0.2004)
First-stage F-statistic	148.0	63.4		59.4	42.1	59.4	59.4
Log firm size	Yes	Yes	No	No	No	No	No
Main-sector FE	Yes	No	No	No	No	No	No
Product FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	Yes	Yes	Yes
Continuing cells only	No	No	No	No	Yes	No	No
Observations	5,040,567	5,040,512	5,018,606	5,018,606	2,003,132	5,018,606	5,018,240
Firms	90,622	90,619	68,716	68,716	31,736	68,716	68,710
Destination-product pairs	268,418	268,363	268,095	268,095	179,970	268,095	268,023

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

Firm-Level Effects

Dep. var.	Export outcomes					Domestic outcomes	
	OLS Exports (1)	IV Exports (2)	IV Exports (3)	IV Exit (4)	IV Exports (5)	IV Revenue (6)	IV Employment (7)
$\Delta MS_{CN,t}$	-0.7267*** (0.1068)	-1.6607*** (0.3150)	-1.9339*** (0.4582)	0.1408* (0.0719)	-1.6073*** (0.2048)	-0.8023** (0.3216)	-0.3842 (0.2943)
Large firm _{<i>t</i>} ($\times \Delta MS_{CN,t}$)					0.5133* (0.2758)		
First-stage F-statistic		254.0	292.1	254.0	146.3	518.6	518.6
Log firm size (2011)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continuing exporters only	No	No	Yes	No	No	No	No
Observations	90,622	90,622	69,455	90,622	90,622	82,749	82,749

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0, 10.21242/51911.2024.00.05.1.1.0, and 10.21242/52121.2022.00.01.1.1.0; own calculations.

Quality, Prices, and Competitive Advantage

Dep. var.	Quality (1)	Unit value (2)	QAP (3)	Exports (4)	Exports (5)
$\Delta MS_{CN,jk}$	-1.0847*** (0.3607)	-0.5823* (0.3109)	0.4285** (0.1754)	-0.6735*** (0.2096)	-0.7204*** (0.2135)
Quality rank $_{fjk} \times \Delta MS_{CN,jk}$				0.8131*** (0.1461)	
QAP rank $_{fjk} \times \Delta MS_{CN,jk}$					-0.9461*** (0.1906)
First-stage F-statistic	41.9	41.9	41.9	29.9	30.1
Firm FE	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes
Continuing cells only	Yes	Yes	Yes	No	No
Observations	2,002,361	2,002,361	2,002,361	5,014,929	5,014,929
Firms	31,714	31,714	31,714	68,666	68,666
Destination-product pairs	179,643	179,643	179,643	266,507	266,507

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

Quality and price heterogeneity

Firm, Product, and Destination Sources of Resilience

Dep. var.	Exports (1)	Exports (2)	Exports (3)	Exports (4)	Exports (5)
$\Delta MS_{CN,jk}$	-0.6726*** (0.2070)	-0.6094*** (0.2111)	-0.4892** (0.2137)	-0.5187** (0.2048)	-0.5508** (0.2140)
$\Delta MS_{CN,jk} \times \text{Core product}_{jk}$	0.1577** (0.0738)				0.1598** (0.0743)
$\Delta MS_{CN,jk} \times \text{High-tech}_k$		0.6739*** (0.2179)			0.5728*** (0.2204)
$\Delta MS_{CN,jk} \times \text{EU status relative to competitors}_{jk}$			0.5877*** (0.2079)		0.2972 (0.2845)
$\Delta MS_{CN,jk} \times \text{Proximity relative to competitors}_{jk}$				0.2303*** (0.0719)	0.1642* (0.0949)
First-stage F-statistic	31.0	30.0	29.6	26.5	12.3
Firm FE	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes
Observations	5,018,606	5,017,547	5,013,859	5,013,859	5,013,859
Firms	68,716	68,686	68,664	68,664	68,664
Destination-product pairs	268,095	267,621	265,340	265,340	265,340

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

Aggregate German Adjustment Margins

We decompose **aggregate German export growth** in each destination-product market into contributions from **continuing exporters**, **market exit**, and **market entry** in the spirit of Bernard et al. (2009).

Dep. var.: $g_{DE,jk}^f$	Total (1)	Extensive margin		Intensive margin	
		Exit (2)	Entry (3)	Top (4)	Other (5)
$\Delta MS_{CN,jk}$	-2.6367*** (0.6528)	-0.9397*** (0.2294)	-0.4933 (0.3018)	-0.5816** (0.2541)	-0.6221*** (0.1865)
Share of total effect	1.000	0.356	0.187	0.221	0.236
First-stage F-statistic	42.9	42.9	42.9	42.9	42.9
Destination FE	Yes	Yes	Yes	Yes	Yes
HS6 product FE	Yes	Yes	Yes	Yes	Yes
Observations	406,826	406,826	406,826	406,826	406,826

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

Sources of China's Gains: Structural Decomposition

Structural-gravity decomposition:

- ▶ China's **value market share more than doubled**; Germany's fell by about one third.
- ▶ The divergence is driven by **quantities**, not unit values.
- ▶ Main component: **exporter-product competitiveness**.
- ▶ **Costs** matter little; **trade frictions** moved against China.

	China	Germany	China-Germany
Value market-share growth	0.778	-0.384	1.161
Quantity growth	0.628	-0.478	1.106
Unit-value growth	0.192	0.137	0.055
Market denominator	-0.043	-0.043	0.000
<i>Quantity growth decomposition</i>			
Exporter-product competitiveness	1.877	0.929	0.948
Production costs	-0.965	-1.021	0.056
Observed trade frictions	-0.151	-0.020	-0.131
Bilateral residual	-0.093	-0.326	0.233
Common market conditions	-0.040	-0.040	-0.000

Sources of China's Gains: Chinese-Side Factors

We relate **China's 2012–2023 market-share changes** to pre-period Chinese exporter characteristics, market structure, and policy exposure.

- ▶ **Specification:** Controls for China's 2011 market share, 2011 market size, destination fixed effects, and product fixed effects.
- ▶ Chinese gains are **not systematically associated** with initial **state ownership** or **dominance by a single exporter**.
- ▶ Gains are stronger where **many Chinese firms compete** and **exporter churning** is higher.
- ▶ Gains are also stronger with exposure to **special economic zones** and **export incentives** (Evenett et al., 2025).

Table

▶ **Negative-control outcomes:** [Table](#)

- ▶ Pre-treatment outcomes over 2007–2012;
- ▶ Germany's market position and export performance;
- ▶ Broader market conditions and supplier structure.

▶ **Alternative instruments:** [Table](#)

- ▶ Alternative PCA comparison countries;
- ▶ Looser product matches;
- ▶ Exclusion of contiguous destinations;
- ▶ Conceptually distinct structural-gravity instruments.

▶ **Additional specification checks:** [Table](#)

- ▶ Predetermined 2011 market controls;
- ▶ Placebo and pre-period Chinese market-share changes;
- ▶ Region-by-HS4 fixed effects;
- ▶ Firm-product or firm-destination fixed effects;
- ▶ Exclusion of sanctioned destinations;
- ▶ Alternative standard-error clustering.

- ▶ We shift the focus from **Chinese import competition at home** to **Chinese competition abroad**.
- ▶ We generalize the China-shock instrument to a **multi-destination setting** usable in other countries and periods.
- ▶ Chinese market-share gains reduce German firms' **exports and domestic outcomes**.
- ▶ Resilience depends on German firms' **quality, product, and destination advantages**.
- ▶ Aggregate adjustment operates through **incumbent contraction, market exit, and weaker entry**.
- ▶ China's gains reflect rising **exporter-product competitiveness**, and are associated with **intense firm competition** and **export-oriented policy infrastructure**.

A. Appendix

Appendix: market-share changes by sector and region

Group	Export share	Δ Market share		Contribution	
	Germany	China	Germany	China	Germany
<i>Panel A. Product groups</i>					
87 Vehicles	17.4	4.1	-7.3	17.8	18.0
84 Machinery	17.3	6.9	-5.9	29.7	14.5
85 Electrical machinery	9.8	6.2	-6.2	15.1	8.6
39 Plastics	5.0	4.2	-5.7	5.2	4.0
30 Pharmaceuticals	4.6	1.1	-2.9	1.3	1.9
90 Precision and medical instruments	4.3	4.6	-5.6	4.9	3.4
27 Mineral fuels	2.7	1.0	-6.4	0.7	2.4
72 Iron and steel	2.6	3.1	-6.8	2.0	2.6
29 Organic chemicals	2.5	9.2	-11.7	5.8	4.2
88 Aircraft and spacecraft	2.4	0.9	-32.0	0.6	10.9
<i>Panel B. Destination regions</i>					
European Union	61.5	1.6	-7.1	24.5	62.3
Other Europe	12.9	12.9	-9.5	41.4	17.5
North America	8.4	-1.1	-2.9	-2.3	3.4
Latin America	3.2	8.6	-5.0	7.0	2.3
Advanced Asia	4.9	5.7	-7.4	7.0	5.1
Emerging Asia	3.1	11.9	-6.3	9.3	2.8
Middle East and North Africa	3.7	9.3	-8.9	8.6	4.7
Sub-Saharan Africa	1.3	9.3	-7.5	3.0	1.4
Oceania	1.0	6.9	-3.9	1.7	0.6
<i>Panel C. Total</i>					
Total	100.0	4.0	-7.0	100.0	100.0

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Quality and Price Heterogeneity

Dep. var.	Quality (1)	Quality (2)	Unit value (3)	Unit value (4)	QAP (5)	QAP (6)
$\Delta MS_{CN,jk}$	-1.1529*** (0.3535)	-1.1843*** (0.3682)	-0.5861* (0.3023)	-0.5666* (0.3150)	0.5057*** (0.1778)	0.5576*** (0.1751)
Quality rank $_{fjk} \times \Delta MS_{CN,jk}$	0.4230* (0.2168)		-0.1556 (0.1913)		-0.7000*** (0.1406)	
QAP rank $_{fjk} \times \Delta MS_{CN,jk}$		-0.7803*** (0.2657)		0.1180 (0.2240)		1.0100*** (0.1817)
First-stage F-statistic	21.0	21.0	21.0	21.0	21.0	21.0
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Continuing cells only	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,002,355	2,002,355	2,002,355	2,002,355	2,002,355	2,002,355

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

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Structural Decomposition: Methodology

Value market-share decomposition

$$\Delta \ln s_{ijk}^{value} = \underbrace{\Delta \ln q_{ijk}}_{\text{quantity growth}} + \underbrace{\Delta \ln uv_{ijk}}_{\text{unit-value growth}} - \underbrace{\Delta \ln M_{jk}^{value}}_{\text{market denominator}}.$$

Demand equation

$$\frac{\ln q_{ijkt}}{\sigma_k} + \ln p_{ikt} = \beta_{ikt} + \lambda_{jkt} + \zeta_{ijk} + \mathbf{r}'_{ijkt} \gamma + u_{ijkt}.$$

Supply efficiency

$$\Delta \ln \phi_{ik} = \Delta \ln c_{ik} - \Delta \ln p_{ik}.$$

Quantity decomposition

$$\begin{aligned} \Delta \ln q_{ijk} = & \underbrace{(\sigma_k \Delta \beta_{ik} + \sigma_k \Delta \ln \phi_{ik})}_{\text{exporter-product competitiveness}} - \underbrace{\sigma_k \Delta \ln c_{ik}}_{\text{production costs}} + \underbrace{\sigma_k \Delta (\mathbf{r}'_{ijk} \gamma)}_{\text{observed trade frictions}} \\ & + \underbrace{\sigma_k \Delta \lambda_{jk}}_{\text{common market conditions}} + \underbrace{\sigma_k \Delta u_{ijk}}_{\text{bilateral residual}}. \end{aligned}$$

Chinese-Side Factors and Market-Share Changes

Dep. var.: $\Delta MS_{CN,jk}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SOE share _{jk} (2011)	-0.036 (1.027)							-0.415 (0.997)
Largest Chinese-firm share _{jk} (2011)		-1.097* (0.658)						
Log effective firms _{jk} (2011)			1.228*** (0.405)					1.305*** (0.428)
Excess entry–exit _{jk} (2008–2011)				1.337*** (0.314)				1.455*** (0.334)
Special/high-tech-zone share _{jk} (2011)					2.138** (1.042)		1.128 (0.847)	1.171 (0.870)
Export incentives _k (p75) (2012–2023)						1.746** (0.743)		
Export incentives _k (p75) × zones _{jk}							4.381** (2.150)	5.049* (2.797)
2011 market controls _{jk}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	HS6	HS6	HS6	HS6	HS6	HS2	HS6	HS6
Observations	305,339	305,339	305,339	305,339	305,339	305,441	305,339	305,339

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Negative-Control Outcomes

Outcome period:	Negative-control outcomes 2007–2012							Benchmark 2012–2023
	$\Delta MS_{DE,jk}$ (1)	$g_{DE,jk}^{value}$ (2)	$\Delta Rank_{DE,jk}$ (3)	$\Delta UV_{DE/CN,jk}$ (4)	g_{jk}^{value} (5)	$\Delta MS_{HI,jk}$ (6)	$\Delta HH_{jk}^{ex\ CN}$ (7)	$g_{DE,jk}^{value}$ (8)
<i>Panel A: Reduced form and OLS benchmark</i>								
Baseline PCA instrument	-1.417 (3.397)	-0.029 (0.119)	-0.161 (2.846)	24.457 (24.816)	0.049 (0.107)	-3.648 (3.522)	0.001 (0.037)	
$\Delta MS_{CN,jk}$								-0.556*** (0.147)
Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	HS6	HS6	HS6	HS6	HS6	HS6	HS6	HS6
Observations	359,498	364,021	292,048	206,002	387,317	379,402	372,333	365,236
<i>Panel B: Instrumental variable regressions</i>								
$\Delta MS_{CN,jk}$	-5.784 (13.868)	-0.120 (0.488)	-0.672 (11.915)	110.102 (114.332)	0.198 (0.430)	-14.588 (14.351)	0.004 (0.136)	-2.369*** (0.803)
First-stage F-statistic	22.0	22.1	18.8	15.9	23.1	22.9	22.5	21.5
Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	HS6	HS6	HS6	HS6	HS6	HS6	HS6	HS6
Observations	359,498	364,021	292,048	206,002	387,317	379,402	372,333	365,236

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Alternative Instruments

	PCA instruments					Gravity instruments	
	Countries $L=11-20$ (1)	Countries $L=51-100$ (2)	HS2 excl. own HS4 (3)	Section excl. own HS2 (4)	No contig. countries (5)	FE-only controls (6)	RTA/tariff controls (7)
$\Delta MS_{CN,jk}$	-1.4889** (0.6333)	0.0140 (1.1394)	-1.2834*** (0.4303)	-4.0175 (2.6614)	-0.7212*** (0.2641)	-0.5258*** (0.0990)	-0.6384*** (0.1576)
First-stage F-statistic	15.4	6.5	17.1	1.9	65.4	130.4	69.5
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,018,606	5,018,606	5,018,606	5,018,606	5,018,606	5,018,606	5,005,602
Firms	68,716	68,716	68,716	68,716	68,716	68,716	68,618
Destination-product pairs	268,095	268,095	268,095	268,095	268,095	268,095	264,019

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

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Additional Robustness and Specification Checks

	Pre-trends			Fixed effects			Sanctioned countries		Inference	
	Market controls (1)	Placebo 2007–12 (2)	Baseline +placebo (3)	Region × HS4 FE (4)	Firm × product FE (5)	Firm × destination FE (6)	Excl. in sample (7)	Excl. in instrument (8)	HS4 cluster (9)	HS6 cluster (10)
$\Delta MS_{CN,jk}$	-0.6200*** (0.2116)		-0.4921** (0.2170)	-0.6040** (0.3042)	-1.2369** (0.5866)	-0.3530** (0.1687)	-0.8215*** (0.2697)	-0.6962** (0.2956)	-0.6104** (0.2374)	-0.6104*** (0.2138)
$\Delta MS_{CN,jk}^{07-12}$		-0.4994 (0.3422)	-0.5955 (0.4057)							
First-stage F-statistic	56.4	67.2	8.5	18.1	20.6	29.1	91.2	84.1	32.6	65.6
Firm FE	Yes	Yes	Yes	Yes	–	–	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	–	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes	–	Yes	Yes	Yes	Yes
Firm × product FE	No	No	No	No	Yes	No	No	No	No	No
Firm × destination FE	No	No	No	No	No	Yes	No	No	No	No
Market controls	Yes	No	No	No	No	No	No	No	No	No
Region × HS4 FE	No	No	No	Yes	No	No	No	No	No	No
Observations	4,791,670	5,018,606	5,018,606	5,017,871	4,552,984	4,713,524	4,766,739	4,766,739	5,018,606	5,018,606
Firms	65,997	68,716	68,716	68,698	51,792	55,531	64,862	64,862	68,716	68,716
Destination-product pairs	219,456	268,095	268,095	267,470	261,556	259,156	249,445	249,445	268,095	268,095

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States of Germany, DOI: 10.21242/51911.2018.00.05.1.1.0 and 10.21242/51911.2024.00.05.1.1.0; own calculations.

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