Firms, Trade and Industrial Policy

Meredith A. Crowley

University of Cambridge and CEPR

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The future of global trade amid shifting geopolitcs

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Reshaping global trade through trade and industrial policy

The EU begins to consider import tariffs on Chinese Electric Vehicles

"From wind to steel, from batteries to electric vehicles, our ambition is crystal clear: The future of our clean tech industry has to be made in Europe."

Employees work on the assembly line of C11 electric SUV at a factory of Chinese EV startup Leapmotor on April 26, 2023 in Jinhua, Zhejiang Province of China.

Vcg | Visual China Group | Getty Images

"...global markets are now flooded with cheaper Chinese electric cars. And their price is kept artificially low by huge state subsidies."

- Von der Leyen, 13 September 2023

Evidence in this talk comes from:

- 'Markets and Markups: A New Empirical Framework and Evidence on Exporters from China,' by G. Corsetti, M. Crowley, L. Han, and H. Song. March 2023. CEPR Discussion Paper 13904.
- 'The pro-competitive effects of trade agreements," by M. Crowley, L. Han, and T. Prayer, CEPR Discussion Paper 17463, 2022.
- 'Invoicing and the Dynamics of Pricing to Market: Evidence from UK Export Prices around the Brexit Referendum,' by G. Corsetti, M. Crowley, and L. Han. Journal of International Economics, 2022.
- "The Value of Deep Trade Agreements in the Presence of Pricing to Market," by M. Crowley, L. Han, and T. Prayer, World Bank Policy Research Working Paper No. 9600, 2021.
- 'Policy shocks and stock market returns: Evidence from Chinese solar panels," by M. Crowley, N. Meng, and H. Song, Journal of the Japanese and International Economies, 2019.

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Roadmap

Part 1. Pro-competitive gains from trade agreements

$\Rightarrow$ Trade policy has substantive impacts on market structure and market power

Part 2. Case study: Solar panels from China and EU trade policy

$\Rightarrow$ What policy mix is 'right' for learning-by-doing/IRS industries with positive externalities?

Part 3. Concluding throughts

The price-cost markups of exporting firms

- Research on pricing and exchange rates has found exchange rate disconnect (Amiti, Itskhoki, Konings, 2014), pricing to market (Fitzgerald and Haller, 2014) and that larger, more productive firms adjust markups more in response to exchange rate fluctuations (Berman, Martin and Mayer, 2012).

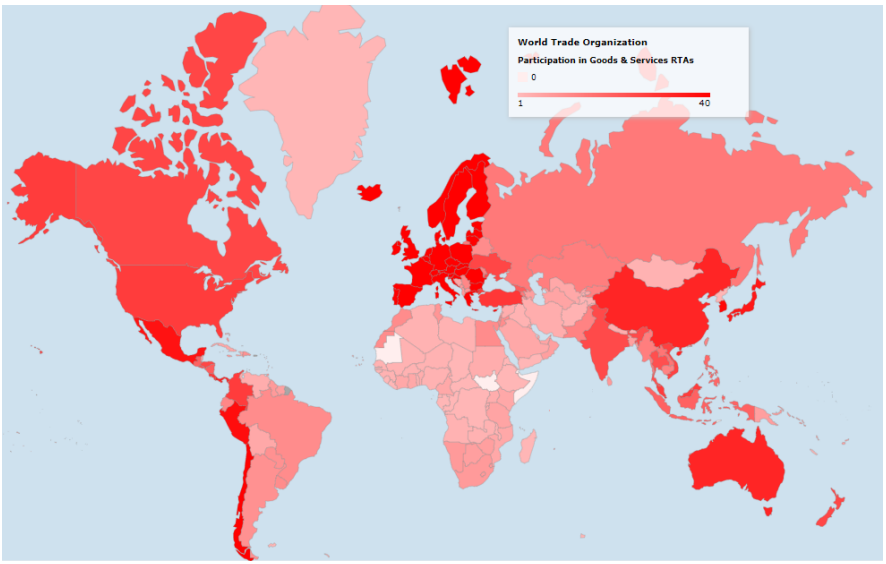
- Research (CCH 2022 and CCHS 2023) using the universe of international trade transactions for the UK (2010-2017) and China (2000-2014) has found that firms that export to multiple foreign destinations employ different pricing strategies.

- Pricing-to-market is correlated with observables and more prevalent for:

  - highly differentiated products,
  - consumer versus intermediate goods,
  - goods exported by foreign-invested firms (China),
  - goods invoiced in the local currency of the destination (UK).

Pro-competitive Trade Agreements

A WTO member belongs to 13 Preferential Trade Agreements (PTAs) on average.



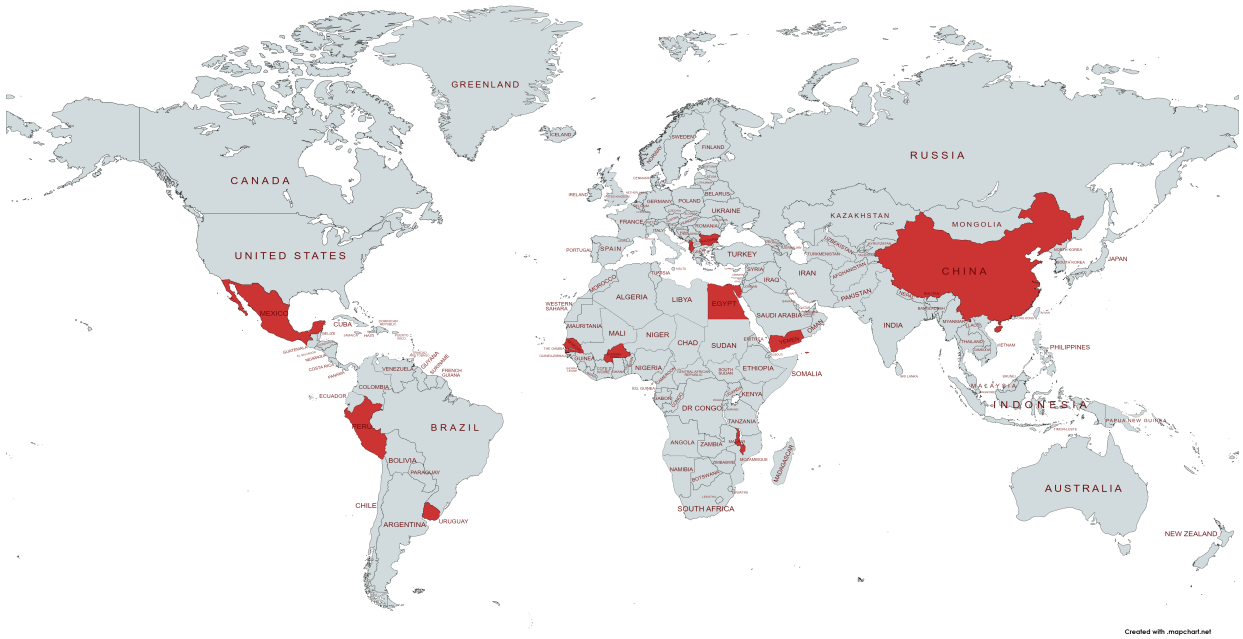
- Darkest Red $\Rightarrow$ 40 PTAs
- Lightest Pink $\Rightarrow$1 PTA

Research questions:

- How do preferential trade agreements affect market competition, and exporters' market power and markups?
- Do PTAs lead to greater market integration, more intense competition, and less market power for exporting firms?

Firms' product-level exports from 11 origin countries

15.7 million firm-product-origin-destination-year observations



Albania	2004-2012	Egypt	2005-2013	Senegal	2000-2012
Burkina Faso	2005-2012	Malawi	2006-2012	Uruguay	2001-2012
Bulgaria	2001-2006	Mexico	2000-2012	Yemen	2008-2012
China	2000-2006	Peru	2000-2013		

HS06 product-level tariff data for 165 destinations from WTO

- MFN, pref. and/or unilateral tariff imposed on each origin by destinations
- Follow Feenstra and Romalis procedure to fill in missing data and phase-ins

Observation: Limited competition among firms

For low and middle-income countries, small numbers of active firms at the product level

	Mean	25th	Median	75th	Obs
Counts of firms conditional on positive *od* trade value for product *i*					
Number of Firms	8.89	1.00	2.00	5.00	2,956,796
Number of Entrants	6.27	1.00	1.00	4.00	2,403,979
Number of Exiters	6.12	1.00	2.00	4.00	1,744,997
Number of Incumbents	1.87	0.00	0.00	1.00	2,000,356

- Contrast this to Melitz (2003) and Arkolakis, Costinot, Donaldson, and Rodriguez-Clare (2018) who analyse the consequences of a trade liberalisation when the productivity of firms follows a Pareto distribution.
- Our empirical starting point builds on the 'Export Superstars' work of Freund and Pierola (2015 and 2020) who find the export concentration in low and middle-income countries is high.

Big data provide new insights into price-cost markups

Using product-level exports from 225k firms located in 11 emerging and low-income countries to 165 destinations, we examine 83 PTAs to estimate impacts on

- number of firms participating in a market,
- market shares and markups.

In response to a 10% cut in a tariff, we find:

- the number of exporting firms $\uparrow$ 25%
- an exporting firm's import market share in a destination $\uparrow$ 8%
- an exporting firm's markup $\downarrow$ 4%.

Theoretical contribution

We build a GE trade model featuring oligopolistic competition from multiple origins and variable markups. We extend Atkeson and Burstein (2008):

1. introduce multiple origins competing in multiple destinations
2. introduce an additional nest to CES consumption to allow for more intense competition among firms from the same origin

$\Rightarrow$ Two different market shares - **origin** AND **firm within origin** - enter demand elasticity

$\Rightarrow$ Tariff cut **raises** the market power of the origin in the destination, but **reduces** the market power of individual firms among compatriots.

$\Rightarrow$ Markups can (theoretically) rise or fall depending upon which force dominates.

Literature

Empirical: Price and Markup Responses to ...

- **Trade policy:** De Loecker, Goldberg, Khandelwal & Pavcnik 2016; Fitzgerald & Haller 2018; Amiti, Redding & Weinstein 2019; Fajgelbaum, Goldberg, Kennedy & Khandelwal 2019; Kikkawa, Mei, Santamarina 2019
- **Exchange rates:** Fitzgerald & Haller 2014; Amiti, Itskhoki, and Konings 2014, 2019; Corsetti, Crowley, Han & Song 2021; Corsetti, Crowley & Han 2022

Our contribution $\Rightarrow$

Exporters cut markups after a trade liberalization

- **crucial to examine multiple origins** to understand how and why

Theoretical: Macro models of international pricing

- Atkeson & Burstein (2008); Edmond, Midrigan, and Xu (2015)

Our contribution $\Rightarrow$

Extend to show **two market share reallocation effects** – across origins AND across firms within an origin – impact a firm's elasticity of demand and its markup.

Impacts of PTAs on Firm's Market Share in the Destination

	Firm's mkt share in dest. ω_{fiodt}
PTA_{odt}	0.02
	(0.021)
$Tariff_{iodt}$	-0.78***
	(0.244)
Observations	15,712,501
Fixed Effects	
Firm-prod-origin-year	✓
Product-destin-year	✓
Origin-destination	✓

PTA effects come via tariff cuts

10% cut in tariff ⇒

- MS ↑ 8%

- The preferential tariff cut increases the market access of firms from the preferred origin (at the expense of firms from other origins and domestic firms).

How *should* markups adjust?

Predictions from Atkeson-Burstein (2008) Nested CES Model

The markup of firm f selling product i from origin o in destination d is:

$$\mu_{fiodt} = \frac{\varepsilon(\omega_{fiodt})}{\varepsilon(\omega_{fiodt}) - 1}$$

where the demand elasticity is a function of the firm's market share in the destination ω_{fiodt}, the elasticity of substitution within product ρ, and across products η:

$$\varepsilon(\omega_{fiodt}) = \rho - (\rho - \eta)\omega_{fiodt}$$

when $\rho >> \eta$.

Implication: If a bilateral tariff cut leads the firm's market share to increase, then it will face a less elastic demand curve and its markup will increase.

Impacts of PTAs on Markups

	Firm's mkt share in dest. ω_{fiodt}	Markups FOB μ_{fiodt}
PTA_{odt}	0.02	-0.02***
	(0.021)	(0.008)
$Tariff_{iodt}$	-0.78***	**0.41*** **
	(0.244)	(0.073)
Observations	15,712,501	15,712,501
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

Signing a PTA ⇒

- Markups ↓ 2%

10% cut in tariff ⇒

- Mkt shares ↑ 8%
- Markups ↓ 4%

Puzzle: Markups fall as market power (firm's mkt sh in the destin) increases!
Findings contradict the predictions of an oligopolistic comp. model.

Decomposing market share changes

$$\text{Mkt share measures} = \beta_1 \cdot \text{PTA}_{odt} + \beta_2 \cdot \text{Tariff}_{iodt} + \text{Fixed Effects} + \zeta_{fiodt}$$

1. Firm's within-origin mkt share

$$ms_{fiodt} = \frac{v_{fiodt}}{\sum_{f \in \mathcal{F}_{iodt}} v_{fiodt}}$$

2. Origin's mkt share in destination-product market

$$ms_{iodt} = \frac{v_{iodt}}{\sum_{o} v_{iodt}}$$

- A firm's market share in a destination is $\omega_{fiodt} = ms_{fiodt} * ms_{iodt}$

f, i, o, d, t = firm, HS06 product, origin, destination, and year

Understanding market share changes

	Origin's mkt share ms_{iodt}	Firm's within-origin mkt share ms_{fiodt}
PTA_{odt}	-0.04	0.06**
	(0.031)	(0.027)
$Tariff_{iodt}$	**-3.67*** **	**2.88*** **
	(0.429)	(0.322)
Observations	15,712,501	15,712,501
Fixed Effects		
Firm-prod-origin-year	✓	✓
Product-destin-year	✓	✓
Origin-destination	✓	✓

10% cut in tariff $\Rightarrow$

- Origin's mkt share $\uparrow$ 37%
- Average within-origin mkt share $\downarrow$ 29%

Firm's market share in destination is

$\omega_{fiodt} = ms_{fiodt} ms_{iodt}$

Tariff cut **raises** the market power of the origin in the destination, but **reduces** the within-origin market power of individual firms.

Understanding market share changes

	Origin's mkt share ms_{iodt}	Firm's within-origin mkt share ms_{fiodt}	No. of Firms (PPML)
PTA_{odt}	-0.04	0.06**	-0.06***
	(0.031)	(0.027)	(0.011)
$Tariff_{iodt}$	-3.67***	**2.88*** **	**-2.45*** **
	(0.429)	(0.322)	(0.162)
Observations	15,712,501	15,712,501	1,563,040
Fixed Effects			
Firm-prod-origin-year	✓	✓	
Product-origin-year			✓
Product-destin-year	✓	✓	✓
Origin-destination	✓	✓	✓

- A 10% tariff cut $\Rightarrow$ 25% $\uparrow$ in number of exporters.
- Entry from one's own origin drives the decline in firms' within-origin market shares.

Mechanism that drives reductions in price-cost markups:

In response to a 10% cut in a tariff, we find:

- a 25% increase in the number of exporters from the preferred origin country;
- a 37% increase in the preferred origin's market share in the destination; and
- a decline in the average within-origin market share of 29%.

Entry by new exporting firms from the origin country drives the decline in the average within-origin market share.

The decline in the within-origin market share drives reductions in the price-cost markups of incumbent exporters.

Model outline

Goal: Develop a model of oligopolistic competition in which markups $\Downarrow$ when a firm's mkt share in the destination $\Uparrow$

$\Rightarrow$ Decompose the conventional mkt share channel into two opposing effects

Key elements:

- Multi-country GE with heterogeneous products and firms
- Limited number of firms at product-origin-destination level
- Firms re-optimize exporting decisions after a trade policy shock
- Variable markups which depend on market structure

  $\Rightarrow$ allow for different degree of competition for firms from the same origin versus those from other origins

Market structure

A triple nested CES demand structure with limited number of firms within each origin to incorporate imperfect competition

Across products
$$Y_{dt} = \left(\int_i y_{idt}^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}},$$

Within product, across origins
$$y_{idt} = \left(\sum_o y_{iodt}^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}},$$

Across firms within an origin
$$y_{iodt} = \left(\sum_{f \in \mathcal{F}_{iodt}} y_{fiodt}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

allowing for $\sigma \neq \rho$.

Notation: f (firm), i (product), o (origin), d (destination), t (time)

Markups and demand elasticities

The triple nested market structure implies two distinct market shares that matter for demand elasticity ε_{fiodt} and markup μ_{fiodt}:

$$\varepsilon_{fiodt} = \sigma - ms_{fiodt}[\sigma - \rho + (\rho - \eta)ms_{iodt}]$$
$$\mu_{fiodt} = \frac{\varepsilon_{fiodt}}{\varepsilon_{fiodt} - 1}$$

where

- ms_{fiodt}: firm f's market share **among all firms from origin** o selling product i in destination d at time t
- ms_{iodt}: origin o's market share of product i in destination d at time t

Implication: A bilateral tariff reduction leads to $\Uparrow ms_{iodt}$ and $\Downarrow ms_{fiodt}$

$\Rightarrow$ Demand facing a firm could become more or less elastic, depending on which of the two forces dominates

$\Rightarrow$ Markups may rise or fall

The effect of entry on incumbent exporters' markups

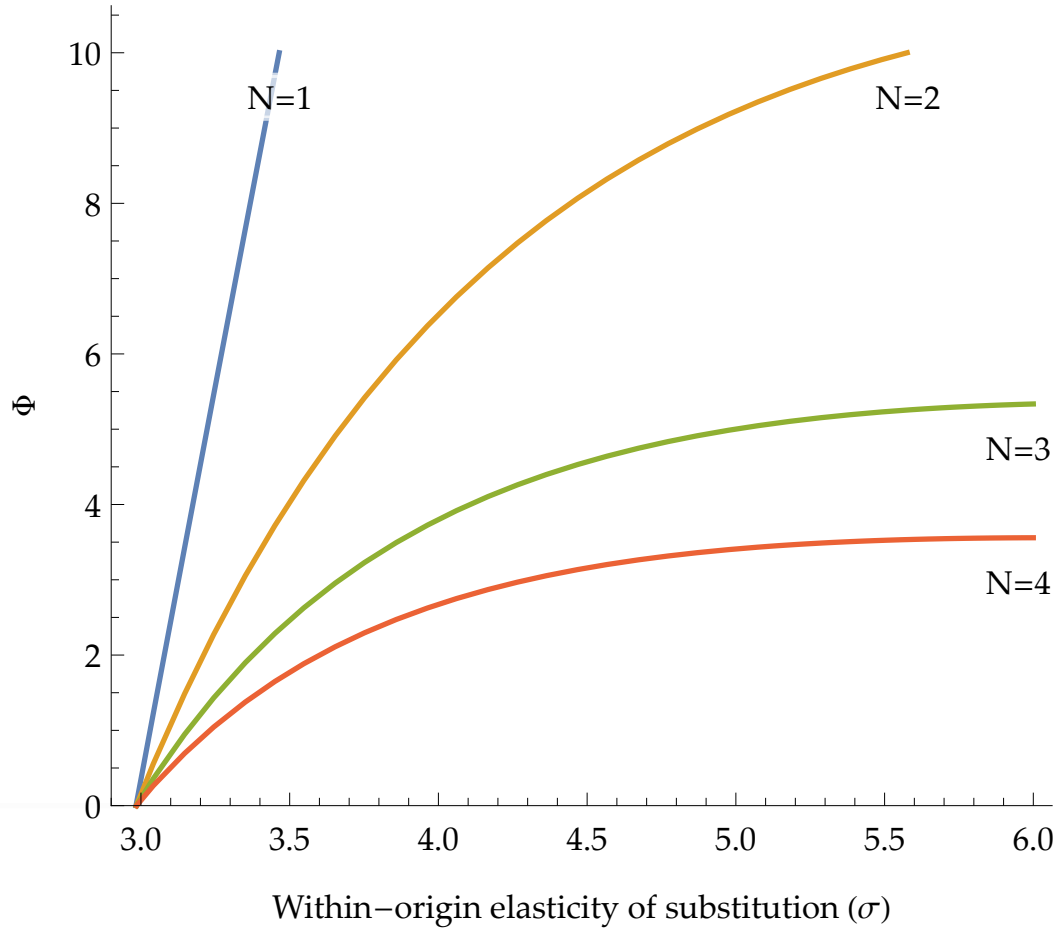
Under a 1% preferential tariff reduction, the markup adjustment (in percentage) of firms from the preferred origin (up to a first order approximation) is given by:

$$\widehat{\mu}_{fiodt} \approx \Upsilon_{fiodt} - \underbrace{(1 - \Upsilon_{fiodt})\,\Phi_{iodt}\,\widetilde{ms}_{jiodt}}_{\textbf{Entry effect}}$$

where

1. $0 \leq \Upsilon_{fiodt} < 1$ is the markup adjustment in absence of entry;
2. Φ_{iodt} captures the strength of the entry effect;
3. $\widetilde{ms}_{jiodt}$ is the sum of within-origin market shares of new entrants from origin o in product-market id (due to the preferential tariff reduction).

The strength of the entry effect, Φ_{iodt}



Notes: The figure plots the Φ_{iodt} function for different values of σ and the number of incumbent firms N in the market before the tariff cut hits with $ms_{fiodt} = 1/N$, $ms_{iodt} = 0.1$, $\rho = 3$ and $\eta = 1.2$.

Understanding market share changes

Firm's market share in destination =
(origin mkt share)*(firm's within origin mkt share)

10% cut in tariff $\Rightarrow$

- Firm's market share in destination: $\uparrow$ 8%

  This can be decomposed into two offsetting effects:
- Origin's mkt share $\uparrow$ 37%
- Average within-origin mkt share $\downarrow$ 29%

Tariff cut **raises** the market power of the origin in the destination, but **reduces** the within-origin market power of individual firms.

Implication: When a PTA induces intense competition among exporters from the same country/area $\Rightarrow$ markups fall, benefitting consumers in the importing country.

Policy implications

Impacts of PTAs and preferential tariffs on market competition:

- PTAs and tariff reductions are in general pro-competitive

  $\Rightarrow$ Encourage entry and reduce markups

- Suggests trade agreements with low barriers to entry for small firms - e.g. simple Rules of Origin procedures could have larger beneficial impacts on consumer welfare than previously understood

  $\Rightarrow$ Conversely, in contexts such as Brexit and the Trade and Cooperation Agreement, this suggests the exit of small firms has a much bigger negative impact than previously understood

  $\Rightarrow$ An additional cost of leaving the EU that is not included in CGE models

Policy to support infant industries and technology adoption

An inconclusive (and often discouraging) history

- Alwyn Young's Tale of Two Cities: Singapore and Hong Kong
- US Steel: cycles of protection and investment and tech catch up from 1960 to today
- Harley Davidson Motorcycles: safeguard protection and the early 1980s turnaround
- The US Auto VER (1982-1994): High consumer costs, monopoly rents and a rebuilt industry
- Korea v. Japan in WTO dispute over subsidies to Hynix in its bailouts of 2001 & 2002, today it is the second largest DRAM supplier in the world
- Morocco v. Turkey in WTO dispute over anti-dumping to protect Morocco's infant steel industry

Policy intervention is often justified on the grounds that the industry is characterized by increasing returns to scale or learning-by-doing.

Research on industrial policy in learning by doing industries

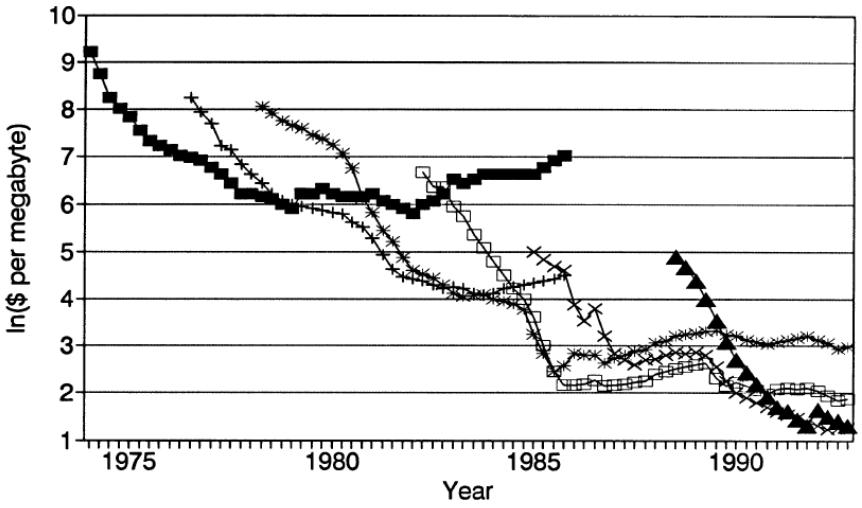


FIG. 1.—DRAM prices (source: Dataquest)

Studying quarterly firm-level data on (DRAMs) semiconductors over 1974-92, Irwin and Klenow (1994) find

1. learning rates average 20 percent,
2. firms learn three times more from an additional unit of their own cumulative production than from an additional unit of another firm's cumulative production,
3. learning spills over just as much between firms in different countries as between firms within a given country.

Conclusions: 'Any country that subsidizes its domestic firms in part provides an international public good ... the policy implications of our findings are not at all clear.'

Case Study: Solar Panels and Policy Shock

Lessons for the EU with Chinese Electric Vehicles?

Pilar Lee/Reuters

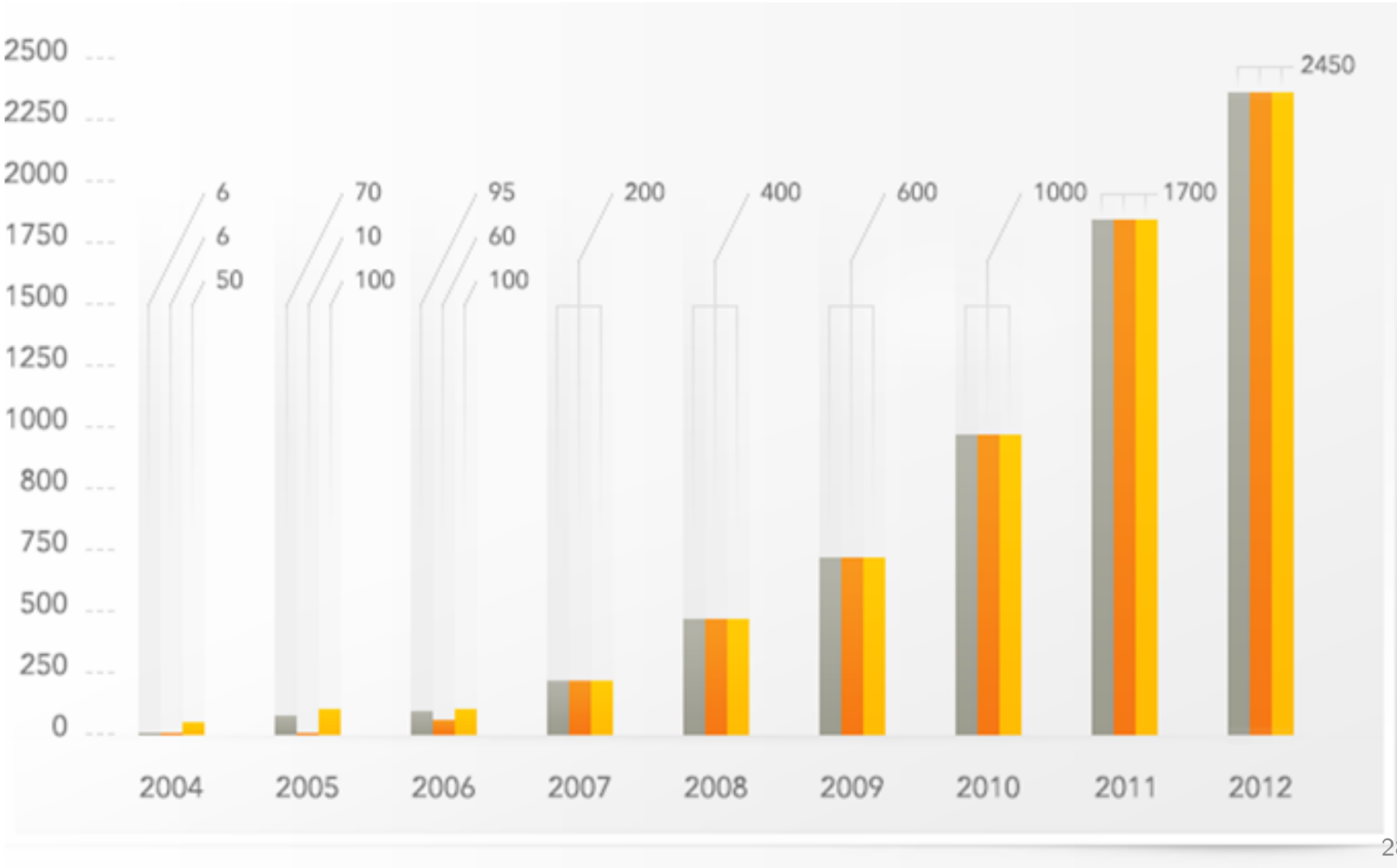
Solar panels at Yingli Solar in Baoding, China; the country is a major exporter of solar panels.

Yingli Solar Workers from the New York Times, June 2013

Yingli Solar's Advertising Displayed at the 2014 FIFA World Cup in Brazil

Growth of Yingli Solar's Output (Megawatts)

Grey = Wafers, Orange = PV Cells, Yellow = PV Modules



Solar panel policy in Europe and China

Europe historically subsidised consumption of solar panels by paying a high (subsidised) feed-in tariff.

- "100,000 Solar Roofs Initiative" of 1999-2003
- Renewable Energy Sources Act 2000, 2004, 2009

European feed-in subsidies were reduced in Germany in 2010 and suspended in Spain in 2012 in the wake of the financial crisis

Beginning in 2000, China subsidised production in the solar panel industry at the R&D, production, and application stages.

In 2012, China declared solar panels a "strategically important emerging industry."

The evolution of Chinese Solar Panel sales in Europe

In 2011, China's share of the EU market for solar panel modules hit 80%.

In 2012, China exported €21 billion in solar panel products to the EU.

Chinese solar panels comprised about 7% of total Chinese exports to the EU.

In July 2012, a German firm filed an antidumping petition claiming that Chinese firms were pricing their products unfairly and should be subject to antidumping tariffs.

As the EU's antidumping case proceeded over 2012-2013, Chinese solar panel producers were hit with a series trade policy and domestic industrial policy shocks.

What do we do in this paper?

We estimate the abnormal returns of Chinese firms that are publicly listed in three different stock markets: Shanghai-Shenzhen, New York, and Hong Kong.

We find that the abnormal returns vary by labor productivity, export share, the market in which a firm lists, a firm's size and corporate structure, and a firm's position on the value chain of production.

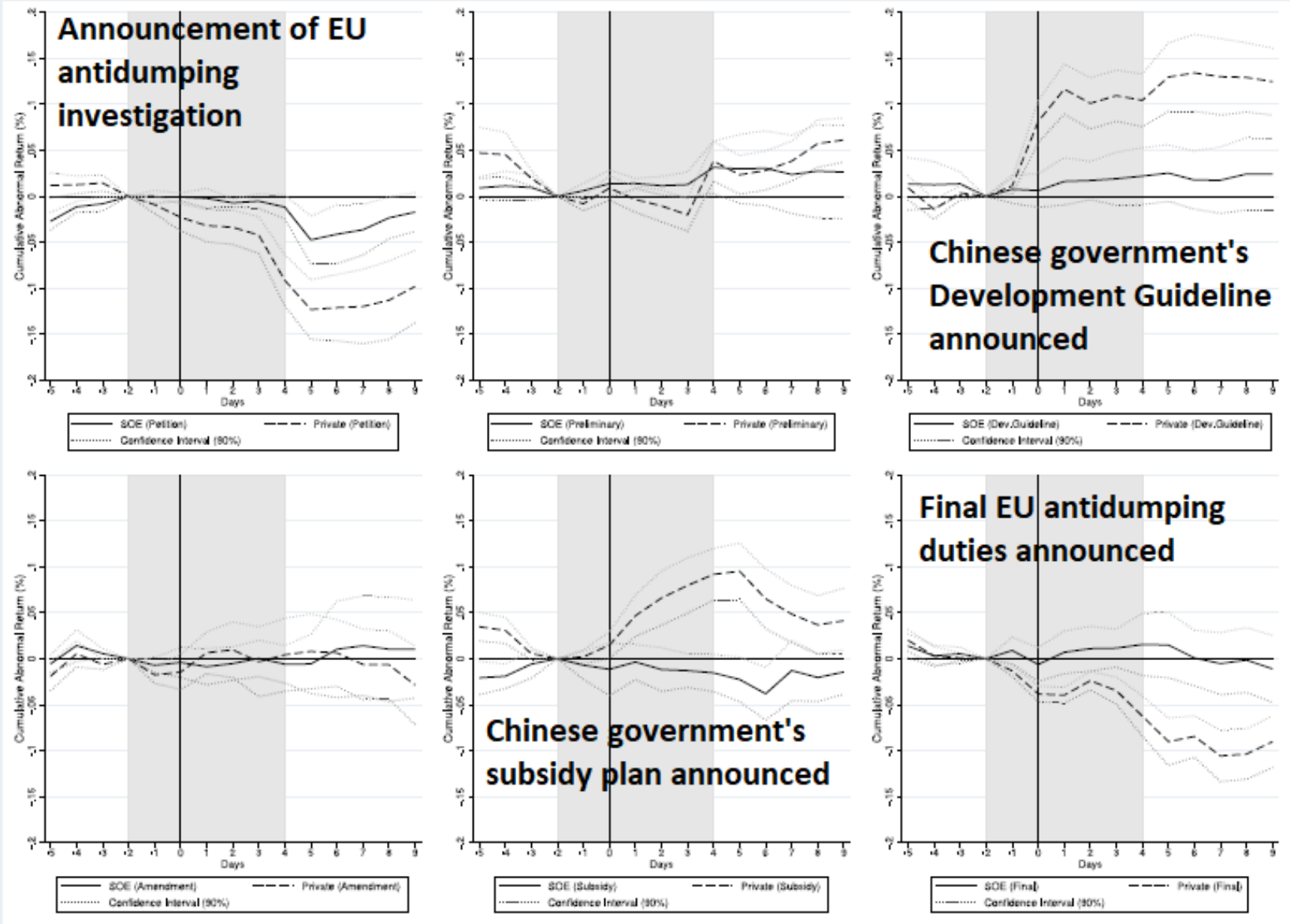
The punchline: The EU's import restrictions on Chinese firms had a negative impact on the profitability of private sector firms, especially those which listed in New York, but had no effect on China's publicly listed State Owned Enterprises.

The Chinese government policies benefited firms listed in New York, but had almost no impact on publicly listed State Owned Enterprises.

European and Chinese policy announcements: 2012 - 2013

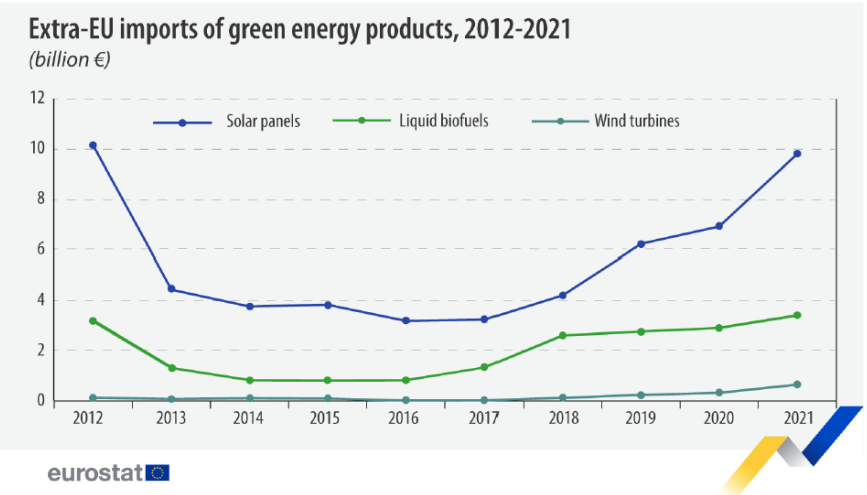
Event	Date	Description
Petition	24 Jul. 2012	EU PV firms filed petition for AD protection against Chinese imports
Preliminary Ruling	4 Jun. 2013	Provisional AD duty announced
Development Guideline	15 Jul. 2013	Industiral development guideline announced by the State Council of China
Amendment	2 Aug. 2013	Provisional AD duty amended
Subsidy Scheme	30 Aug. 2013	China's National Development and Reform Commission announced a solar panel subsidy
Final ruling	2 Dec. 2013	Application of voluntary quota & import tariffs

Policy impacts on firms' stock prices: Cumulative Abnormal Returns

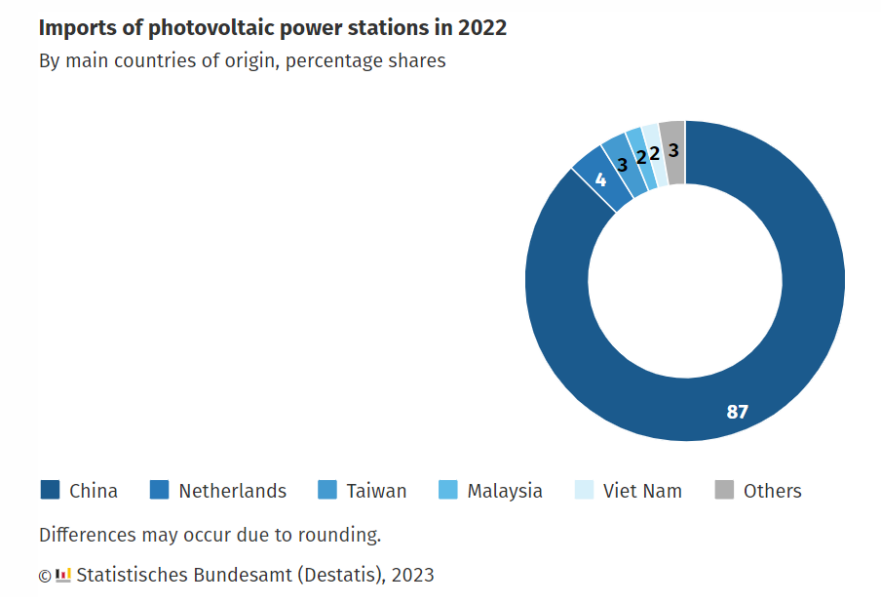


Long-term impacts of the EU's trade policy for solar panels

Imports from China fell, but rebounded and remain high



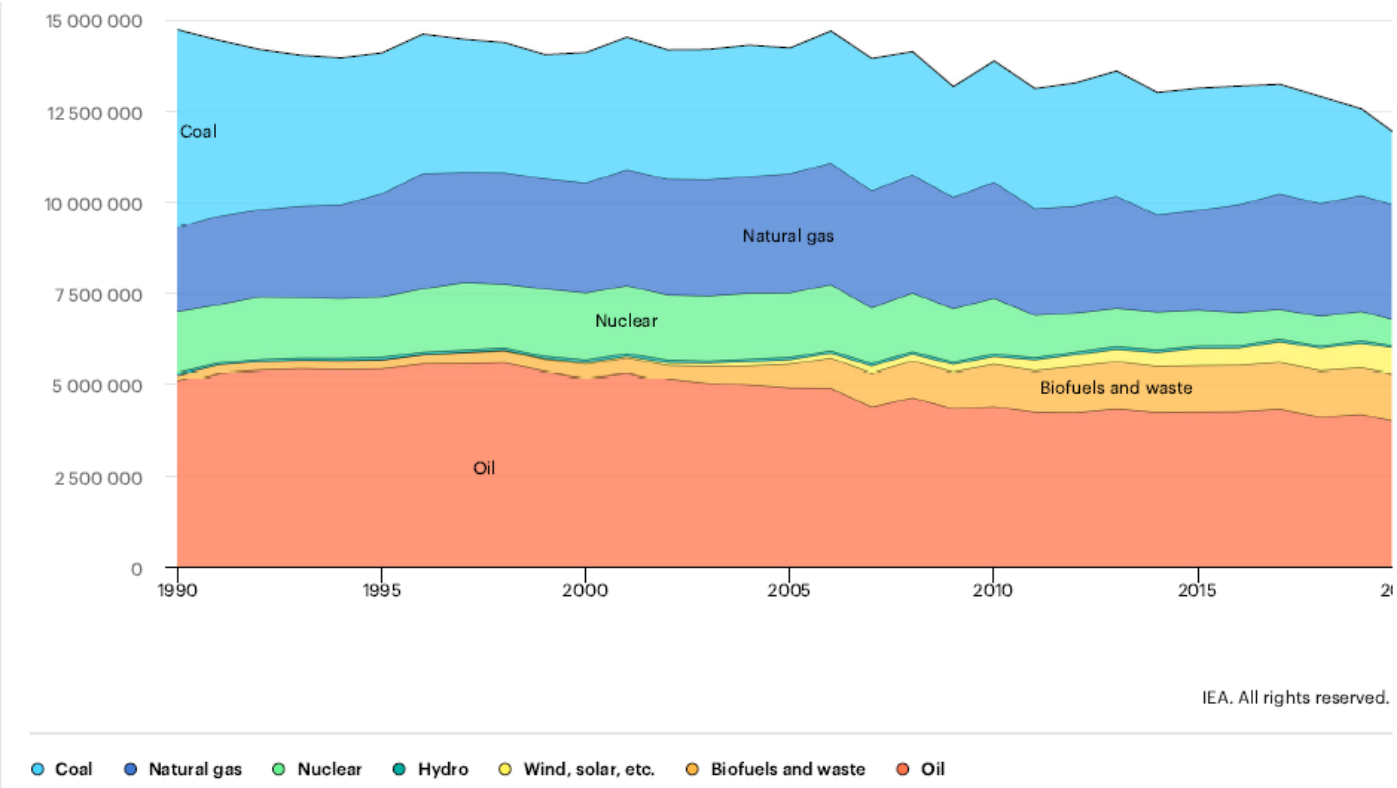
Solar panel imports fell with import restrictions and rose when restrictions were removed in 2018.



In 2022, China comprised 87% of German solar panel imports

Long-term impacts of the EU's trade policy for solar panels

German energy generation by source; yellow is solar



Post Script: The European Solar PV Industry Alliance was launched in December 2022 "to build resilience and strategic autonomy for Europe's solar photovoltaic (PV) value chain."

Lessons from solar panels

- Learning-by-doing in China seems not to have led to production spillovers to the EU – maybe the Irwin and Klenow (1994) conclusion about international spillovers in DRAMs does not apply here
- But the main consequence of the EU's solar panel import restrictions seems to have been a delay in the rollout of solar-powered energy in Europe..
- This seems to call into question the wisdom of restricting solar...
- But, the counterargument of today is that policy must ensure a minimum level of production in Europe to ensure a future supply of solar panels, EV batteries, EVs, & ...

Concluding thoughts

Economists have decades of economic research showing that trade liberalisations yield benefits to consumers and raise productivity.

We have decades of research and case studies that (mostly) show various types of infant industry protection fail to deliver on their promised benefits.

But, in declining average cost or learning by doing industries, government intervention can potentially aid firms in gaining a commanding share of the market.

What does this talk imply for the EU and EV policy?

$\Rightarrow$ It's not entirely clear.

Do we even know which parts of the EV auto supply chain embody learning by doing?

Tradeoffs:

- Foreign entrants into markets have price-reducing effects
  - $\Rightarrow$ Bad idea to restrict Chinese EVs if goal is an EV transition
- If learning by doing creates international spillovers, the Chinese EV subsidies are a gift to the EU.
- If the (political) objective is to ensure future EV independence from China, then there might be a justification for import restrictions.