

# Product Standards and Margins of Trade: Firm Level Evidence

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# Motivation

- Direct evidence on protection suggests high average market access: world average (applied) tariff protection in manufacturing: 3.2% in 2007 (MacMap-HS6)
- However, indirect evidence suggests a different picture:
  - Qualitative information from business community says market access is often difficult.
  - Overall protection revealed by *indirect* measure like border effects still very high:  $\gg 100\%$ , controlling for tariffs (De Sousa, Mayer & Zignago 2012).
- Regulations, standards: NTMs.

# Motivation

Research questions:

- ① Impact of restrictive NTMs on individual firms' participation and behavior in export markets.
- ② Heterogeneous impact of NTMs.

## Motivation

- NTMs may represent a fixed cost (e.g. product adaptation)
  - Increases cost of entry
  - Less productive firms may be driven out of the export market
  - Large firms may see their market share increased ceteris paribus.
- Or a variable costs (e.g. systematic inspection of shipments)
  - Affect domestic and foreign producers differently.
  - Affect equally exporters of different size.
  - Affect less exporters of high-quality products.
- Heterogeneous exporters face shock to NTM-related fixed and variable costs differently

## Motivation

- Limited empirical evidence on firm level effect of NTMs (Chen, Otsuki & Wilson 2006; Reyes 2011)
- Chen et al. (2006)
  - World Bank Technical Barrier to Trade Survey (2004)
  - 619 firms in 24 agricultural and manufacturing industries in 17 developing countries
  - Testing procedures in destination markets reduce  $X/total\ sales$  by 19%
- Reyes (2011)
  - Response of US manufacturing firms in the electronic sector to a reduction of TBT (in the EU)
  - US Longitudinal Firm Trade Transaction Database
  - Product standards harmonization increases the probability that high-productivity firms enter the EU market

# Motivation

- Direct measures of NTMs:
  - **Comprehensive list of measures** (de jure) imposed by countries at product level.
    - TRAINS (notifications)
    - Perinorm
  - **Surveys** on the *perception* by exporters of obstacles on foreign markets (ITC).
- But
- Comprehensive list of all measures in force mixes up trade affecting and un affecting measures. Subject to non-notification or irregular update.
- Surveys are very informative but cannot be considered a systematic record of all binding measures. Subject to the perception of the interviewees.

## STCs as proxy for NTMs

- Former problems can be solved by restricting the analysis to the **subset of regulatory measures that are considered as sizeable barriers by exporters**
- So we focus on Specific Trade Concerns (STC)
  - Affected exporters manage to incentive their origin country to bring the case to Geneva.
  - Country raises a concern in SPS committee of the WTO.
  - Forum to discuss issues related to an SPS measure taken by other members.
  - These concerns and their resolution are recorded by the WTO.
  - → New WTO dataset on Specific Trade Concerns (STCs) on SPS.

## STCs as proxy for NTMs: examples

- EU - USA concern: discrimination across firms
  - Raised in 1998 by the EU against USA
  - requirements on refrigeration and labeling only for production units of more than 3000 hens.
- Not only Agri-food: EU - China case on cosmetics
  - Concern raised in June 2002 by the EU against China.
  - EU noticed that China had imposed (in March 2002) import restrictions on cosmetics (containing ingredients of bovine or ovine origin) from 18 exporting countries.
  - Justification: to prevent introducing BSE (Bovine Spongiform Encephalopathy) into China.
  - Discriminatory: did not apply in the same manner to all countries where identical sanitary conditions prevailed.



## What we do

- Address trade effect of restrictive product standards on the various margins of trade.
  - Probability to export (firm-product extensive margin - participation)
  - Probability to exit
  - Value exported (firm-product intensive margin)
  - Pricing strategy (trade unit values)
- Combine two data sets
  - Specific Trade Concerns (WTO)
  - Individual exporter reporting to French Customs' Authority

## What we find

- SPS concerns have a negative effect on the extensive *and* intensive margins of trade.
  - → cost to entry the foreign market.
  - Exporters upgrade their products (and/or increase their prices)
- Magnitude of effects is policy relevant:
  - **At the extensive margin:**
    - SPS concern decreases the probability of exporting by 4%.
    - A 10 % increase in the tariff reduces the probability of exporting by 2%.
    - → **SPS concern is equivalent to a 20% increase in the tariff.**
  - **At the intensive margin:**
    - SPS concern reduces export value (for firms staying in the market) by 18%
    - Mean tariff opposed to French exports is 6.4%: a 1 pp increase in tariffs reduces on average exports by 2%
    - → **SPS concern is equivalent to 9 pp increase in the tariff.**
- Heterogeneous effect across firms: big players less affected.

## Data and sample restrictions

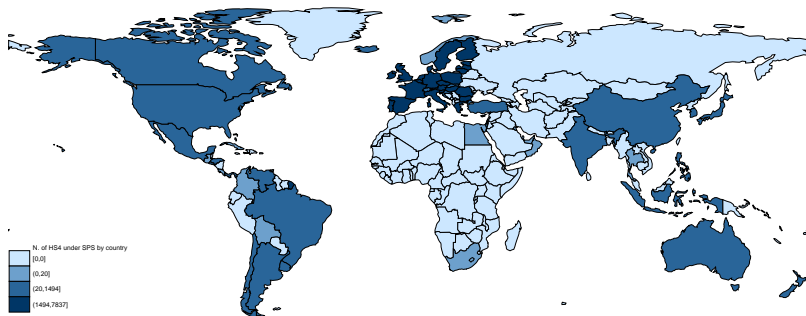
- **French firms dataset.** Customs
- Exports at firm, product and market level.
- Classifies product categories using CN8, here converted into HS4-rev.1992 to be consistent with the STCs database.
- Large number of observations: for each HS4 heading some 100,000 potential French exporters, 200 destinations over the period 1995-2005.
  - **Sample restrictions.**
  - All but services sectors (98 and 99 in the HS classification).
  - Only extra-EU27 destination countries (EU acts as single player at WTO).
  - We compute the total export flows by year and destination country, and restrict our sample to destination markets above the median.
  - Final dataset includes only combinations firm/product/country with at least four positive flows over the time span (1995-2005). Rob check: "at least two/three" positive flows and results hold.

## Data

- **STCs dataset** concerns raised in the SPS committee at the WTO between 1995-2010. Information covers:
  - Country raising a concern, and country imposing the measure.
  - Product (HS 4-digit) for which the concern is raised.
  - Year in which the concern has been raised at the WTO.
  - Whether and when the concern has been resolved
- 312 concerns related to SPS measures.
- Involving 203 HS 4-digit product lines.
- 89 claiming countries; 58 countries imposing at least one SPS measure.
- 21% of the measures challenged were imposed by the EU (US + Canada 13%; Japan 7.5%).
- Most sensitive industry is Meat and Edible Meat sector. Fresh fruit and vegetables also important.

## Data

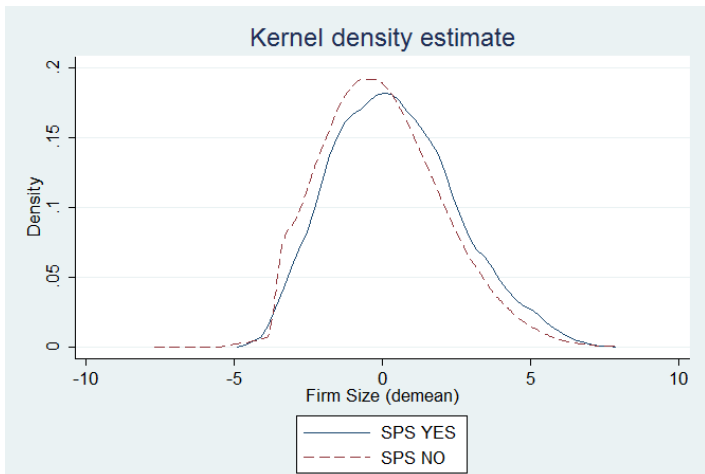
**Figure:** Number of HS4 lines under STCs by imposing country. Period 1996-2010



## Data

Firms' size distribution has a larger mean value for firms exporting in markets subject to SPS concerns

Figure: Firm size distribution in presence/absence of SPS



## Empirical Strategy

- A set of dependent variables describing exporters' behaviour.
- Explanatory variables: SPS dummy, firm's characteristics and their interactions, FE.

$$y_{i,s,j,t} = \alpha + \beta_1 SPS_{s,j,t} + \beta_2 X_{i,s,j,t} + \beta_3 (SPS_{s,j,t} * \ln(size)_{i,t-1}) + \beta_4 (SPS_{s,j,t} * \ln(visibility)_{i,HS2,j,t-1}) + \phi_{HS2,j,t} + \phi_i + \varepsilon_{i,s,j,t}$$

- where  $i$  ,  $s$  ,  $j$  and  $t$  indicate firm, (HS4) sector, destination country and year.
- SPS: a dummy equal to one if (when) there is an ongoing concern between the EU and country  $j$  in sector HS4.

# Empirical Strategy: Dependent variable

**Dependent variable**  $y$  is in turn:

- $=1$  for positive trade flow into a certain product/market combination (extensive margin of trade, or participation);
- $=1$  if the firm does not export in the current year but exported the year before (market exit);
- Export value (in log) by exporting firm (intensive margin of trade);
- Trade Unit Value (in log) by firm as a proxy for quality or price (pricing strategy)



# Empirical Strategy: Firm Characteristics

## Proxies for Firm Characteristics

- Exporters with better productivity draw are larger
- Firm's **Size** proxied by year-specific firm export value (year fixed effects control for overall French exports)

$$\ln(\text{size})_{i,t-1} = \ln \left( \sum_{s \in S} \sum_{j \in J} \text{exports}_{i,s,j,t-1} \right) \quad (1)$$

- Targeting: reverse causality/endogeneity issue.
- **Visibility** (among French firms) proxied by sector(HS2)-country-year specific market share hopefully *not significant*

$$\ln(\text{visibility})_{i,HS2j,t-1} = \ln \left( \frac{\sum_{s \in HS2} \text{exports}_{i,s,j,t-1}}{\sum_{i \in I} \sum_{s \in HS2} \text{exports}_{i,s,j,t-1}} \right) \quad (2)$$

# Empirical Strategy: dealing with omitted variable bias

- Firms FE
- 3-way FE. Concerns raised by the EU, not by France. Thus SPS measures could involve sectors and markets not relevant for French exporters → potential bias in our SPS dummy coefficients. → Sector(HS2)-Country-Year FE.
- Impact of tariffs not to be attributed to NTMs.
  - We control for tariffs faced by EU exporters
  - Dimension product category(HS4)-destination-year
- Thus, the set of control variables  $X_{i,s,j,t}$  includes:
  - Firm's visibility:  $\ln(visibility)_{i,HS2,j,t-1}$
  - Firm's size:  $\ln(size)_{i,t-1}$
  - Tariff level:  $t_{j,s,t}$
  - fixed effects

# Empirical Strategy: dealing with endogeneity

## Endogeneity

- Omitted variable problem: 3-way FE control for any county-sector specific shock in a given year (i.e. Australia might impose a SPS on Rochefort following a negative shock in the Australian dairy sector)
- Reverse causality problem if a country imposes a SPS measure because of increased imports from a specific French firm
  - We test for *visibility*
  - Our SPS dummy is not France-specific. This reduces endogeneity concerns
  - *Lagged* SPS dummy reduces endogeneity.
  - IV approach to solve remaining concerns on reversal causality
    - First Instrument: total number of concerns in similar products. That is, concerns raised in a certain *HS2* sector (excluding the concerns raised on the specific *HS4* product).
    - Second Instrument: overall number of concerns that have been raised against country *j* by exporters *other* than EU in a certain sector *s* (non-discriminatory nature of SPS) - not

Table: Firm-Product Participation

	(1)	(2)	(3)	(4)	(5)
SPS concern	-0.043*** (0.011)	-0.049*** (0.011)	-0.038*** (0.011)	-0.049*** (0.011)	-0.046*** (0.011)
Firm Size *SPS		0.010** (0.004)		0.008** (0.004)	0.011*** (0.004)
Firm Size		0.181*** (0.001)		0.172*** (0.001)	0.172*** (0.001)
Firm Visibility *SPS			0.066 (0.096)	0.041 (0.096)	-0.011 (0.111)
Firm Visibility			1.151*** (0.009)	0.829*** (0.009)	0.829*** (0.009)
Ln(Tariff +1)	-0.024*** (0.009)	-0.024*** (0.009)	-0.016* (0.009)	-0.019** (0.009)	-0.019** (0.009)
Firm FE	yes	yes	yes	yes	yes
HS2-Year-Country FE	yes	yes	yes	yes	yes
Sample	Full	Full	Full	Full	Excluding SPS bans
Observations	1818220	1636167	1636167	1636167	1635960
R-squared	0.108	0.150	0.122	0.155	0.155

Firm Size and Visibility always in lag. Robust standard errors in parentheses.

\*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .

Table: Exit probability estimations

	(1)	(2)	(3)	(4)	(5)
SPS concern	0.017** (0.007)	0.024*** (0.008)	0.019** (0.008)	0.024*** (0.008)	0.023*** (0.008)
Firm Size *SPS		-0.008*** (0.003)		-0.007*** (0.003)	-0.008*** (0.003)
Firm Size		0.014*** (0.001)		0.016*** (0.001)	0.016*** (0.001)
Firm Visibility *SPS			-0.025 (0.070)	0.016 (0.072)	-0.021 (0.083)
Firm Visibility			-0.158*** (0.007)	-0.188*** (0.007)	-0.189*** (0.007)
Ln(Tariff +1)	0.006 (0.006)	0.006 (0.007)	0.005 (0.007)	0.005 (0.007)	0.005 (0.007)
Firm FE	yes	yes	yes	yes	yes
HS2-Year-Country FE	yes	yes	yes	yes	yes
Sample	Full	Full	Full	Full	Excluding SPS bans
Observations	1818220	1636167	1636167	1636167	1635960
R-squared	0.047	0.047	0.047	0.048	0.048

Firm Size and Visibility always in lag. Robust standard errors in parentheses.

\*\*\*  $p < 0,01$ ; \*\*  $p < 0,05$ ; \*  $p < 0,1$ .

Table: Intensive margin estimations

	(1)	(2)	(3)	(4)	(5)
SPS concern	-0.165*** (0.047)	-0.206*** (0.050)	-0.170*** (0.047)	-0.190*** (0.049)	-0.170*** (0.049)
Firm Size *SPS		0.033* (0.017)		0.016 (0.017)	0.015 (0.018)
Firm Size		0.374*** (0.005)		0.257*** (0.004)	0.257*** (0.004)
Firm Visibility *SPS			0.365 (0.413)	0.243 (0.424)	1.178** (0.459)
Firm Visibility			9.960*** (0.040)	9.713*** (0.040)	9.713*** (0.040)
Ln(Tariff +1)	-0.141*** (0.041)	-0.138*** (0.043)	-0.063 (0.041)	-0.065 (0.041)	-0.070* (0.041)
Firm FE	yes	yes	yes	yes	yes
HS2-Year-Country FE	yes	yes	yes	yes	yes
Sample	Full	Full	Full	Full	Excluding SPS bans
Observations	1246603	1142191	1142191	1142191	1142065
R-squared	0.350	0.356	0.387	0.389	0.389

Firm Size and Visibility always in lag. Robust standard errors in parentheses.

\*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .

Table: Trade unit value estimations

	(1)	(2)	(3)	(4)	(5)
SPS concern	0.055** (0.026)	0.083*** (0.028)	0.066** (0.026)	0.083*** (0.028)	0.087*** (0.028)
Firm Size *SPS		-0.025*** (0.010)		-0.021** (0.010)	-0.023** (0.010)
Firm Size		-0.008*** (0.003)		-0.003 (0.003)	-0.003 (0.003)
Firm Visibility *SPS			-0.510** (0.233)	-0.389 (0.240)	-0.240 (0.260)
Firm Visibility			-0.375*** (0.023)	-0.372*** (0.023)	-0.373*** (0.023)
Ln(Tariff +1)	-0.404*** (0.023)	-0.403*** (0.023)	-0.405*** (0.023)	-0.405*** (0.023)	-0.406*** (0.023)
Firm FE	yes	yes	yes	yes	yes
HS2-Year-Country FE	yes	yes	yes	yes	yes
Sample	Full	Full	Full	Full	Excluding SPS bans
Observations	1246603	1142191	1142191	1142191	1142065
R-squared	0.804	0.805	0.805	0.805	0.805

Firm Size and Visibility always in lag. Robust standard errors in parentheses.

\*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .

**Table:** Robustness check - IV regression (Second stage)

Instrument: concerns within an HS2				
	Extensive margin		Exit probability	
	(1)	(2)	(3)	(4)
SPS	-0.028*	-0.031**	0.026***	0.028***
	(0.015)	(0.016)	(0.007)	(0.007)
Size *SPS	0.027***	0.031***	-0.021***	-0.023***
	(0.008)	(0.009)	(0.004)	(0.004)
Size	0.040***	0.035***	-0.003***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Visibility		0.764***		-0.181***
		(0.012)		(0.006)
Mkt Share		0.093***		-0.043***
		(0.006)		(0.003)
Ln(Tariff+1)	-0.001	-0.001	-0.000	0.000
	(0.845)	(0.007)	(0.003)	(0.003)
Fixed Effects:				
Country-Year	yes	yes	yes	yes
HS2-Year	yes	yes	yes	yes
Observations	1636167	1636167	1636167	1636167
R-squared	0.045	0.050	0.008	0.009

Firm size and visibility lagged. Robust standard errors in parentheses.

\*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .



**Table:** Robustness check - IV regression (Second stage)

Instrument: concerns within an HS2				
	Intensive margin		Trade unit value	
	(1)	(2)	(3)	(4)
SPS	-0.105 (0.104)	-0.192* (0.102)	0.157** (0.076)	0.175** (0.076)
Size *SPS	0.454*** (0.090)	0.532*** (0.081)	-0.012 (0.049)	-0.02 (0.049)
Size	0.284*** (0.003)	0.214*** (0.003)	0.062*** (0.002)	0.075** (0.002)
Visibility		9.916*** (0.131)		-1.784** (0.072)
Mkt Share		2.538*** (0.050)		-0.492** (0.042)
Ln(Tariff+1)	-0.054 -0.049	-0.058 (0.047)	-0.475*** (0.035)	-0.474** (0.035)
Fixed Effects:				
Country-Year	yes	yes	yes	yes
HS2-Year	yes	yes	yes	yes
Observations	1142191	1142191	1142191	114219
R-squared	0.107	0.162	0.448	0.40

Firm size and visibility lagged. Robust standard errors in parentheses.

\*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .

## Conclusion

- This paper adds on empirical literature on trade effects of Non Tariff Measures, by:
  - Using new database containing only trade affecting SPS measures (concerns).
  - Using firm level custom data for the universe of exporters located in France.
  - Considering the role of firms' heterogeneity on the effects of NTMs.
- We show that SPS concerns:
  - Have negative effect on the extensive margin (reduce participation in export market and increase exit probability)
  - Negatively affect the intensive margin of exports
  - Large exporters suffer less.
- Firms exporting to markets interested by an STC upgrade their products / increase their prices

Thank you !

## Additional tables

# Results - OLS (lagged SPS)

	Extensive margin			Exit probability			Intensive margin			Trade unit values		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SPS concern (lag)	-0.041*** (0.012)	-0.050*** (0.012)	-0.049*** (0.012)	0.019** (0.008)	0.026*** (0.009)	0.025*** (0.009)	-0.105** (0.053)	-0.146*** (0.055)	-0.128** (0.054)	0.024 (0.029)	0.053* (0.030)	0.053* (0.030)
Firm Size (lag)*SPS (lag)		0.009** (0.004)	0.008* (0.004)		-0.009*** (0.003)	-0.009*** (0.003)		0.042** (0.019)	0.022 (0.019)		-0.029*** (0.010)	-0.025** (0.011)
Firm Size (lag)		0.181*** (0.001)	0.172*** (0.001)		0.014*** (0.001)	0.016*** (0.001)		0.374*** (0.005)	0.257*** (0.004)		-0.008*** (0.003)	-0.003 (0.003)
Firm Visibility (lag)*SPS (lag)			0.046 (0.107)			0.048 (0.080)			0.336 (0.477)			-0.322 (0.270)
Firm Visibility (lag)			0.829*** (0.009)			-0.189*** (0.007)			9.713*** (0.040)			-0.373*** (0.023)
Ln(Tariff + 1)	-0.024*** (0.009)	-0.024*** (0.009)	-0.018** (0.009)	0.006 (0.006)	0.006 (0.007)	0.005 (0.007)	-0.138*** (0.041)	-0.135*** (0.043)	-0.062 (0.041)	-0.406*** (0.022)	-0.404*** (0.023)	-0.407*** (0.023)
Firm FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
HS2-Year-Destination FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1818220	1636167	1636167	1818220	1636167	1636167	1246603	1142191	1142191	1246603	1142191	1142191
R-squared	0.108	0.150	0.155	0.047	0.047	0.048	0.350	0.356	0.389	0.804	0.805	0.805

Robust standard errors in parentheses. \*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .

# Results - IV first stage

Instrument: concerns within an HS2

	Extensive margin		Exit probability		Intensive margin		Trade unit values	
	SPS concern	Firm Size x SPS	SPS concern	Firm Size x SPS	SPS concern	Firm Size x SPS	SPS concern	Firm Size x SPS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SPS HS2	0.002*** (0.000)	0.0003*** (0.000)	0.002*** (0.000)	0.0003*** (0.000)	0.002*** (0.000)	0.0003*** (0.000)	0.002*** (0.000)	0.0003*** (0.000)
SPS HS2*Ln Size	0.0005*** (0.000)	0.003*** (0.000)	0.0005*** (0.000)	0.003*** (0.000)	0.0005*** (0.000)	0.003*** (0.000)	0.0005*** (0.000)	0.003*** (0.000)
Destination-Year FE	yes	yes	yes	yes	yes	yes	yes	yes
HS2-Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1636167	1636167	1636167	1636167	1142191	1142191	1142191	1142191
Shea R2	0.263	0.386	0.263	0.386	0.248	0.366	0.248	0.460
R-squared	0.317	0.465	0.317	0.465	0.311	0.460	0.311	0.460
F-stat	1125	305	1125	305	959	269	959	269

Robust standard errors in parentheses. \*\*\*  $p < 0, 01$ ; \*\*  $p < 0, 05$ ; \*  $p < 0, 1$ .