TRADE BARRIERS OR CATALYSTS?

NON-TARIFF MEASURES AND FIRM-LEVEL TRADE MARGINS IN AFRICA

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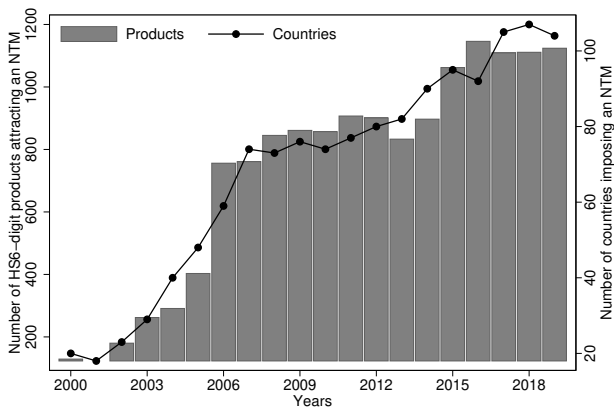
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Trade, Value Chains, and Financial Linkages in the Global Economy
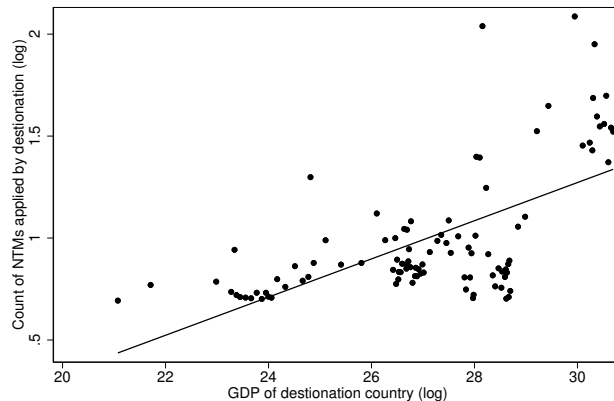*Banca d'Italia - Rome*
December 2025

THE INCREASING USE OF NON-TARIFF MEASURES TO REGULATE TRADE

Figure 1. The proliferation of NTMs over time and development level of destinations

(a) Proliferation of NTMs

(b) The use of NTMs by income status

The incidence and intensity of NTMs have increased alongside tariff reductions (e.g., Ghodsi et al., 2017; Kuenzel, 2020; Taglioni & Kee, 2025).

MOTIVATION

► Technical measures (e.g. TBT and SPS) mitigate market imperfections by addressing genuine health and safety risks (Disdier, Fugazza, et al., 2020).

► However they could function as disguised protectionism (Baldwin et al., 2000).

► Many African countries and firms lack the capacity to meet the stricter standards required in export markets

► NTMs could shape their integration into global markets (De Melo & Nicita, 2018; World Bank, 2025)
  - Regulation can be beneficial when it reassures consumers about product quality

  - Strict standards can limit developing-country firms' trade opportunities

  - High market concentration increases vulnerability to shocks and policy shifts.

VALUE ADDED

Examine impact of technical regulations on firm level export margins in Africa

1. Firm-level data and focusing on both the agriculture and manufacturing sectors.
   - Existing literature predominantly at the country level for the agriculture sector (e.g., Czubala et al., 2009; Kareem et al., 2017; Otsuki et al., 2001; Sanjuán López et al., 2021; Tchakounte & Fiankor, 2021; Traoré & Tamini, 2022),

2. Mechanisms by which these technical measures operate by looking at firm export decisions at extensive and intensive margins
   - Builds upon Fernandes et al., 2019

3. Heterogeneous effect of NTMs (e.g., Curzi et al., 2020; Disdier et al., 2023; Doan & Zhang, 2023)

CONCEPTUAL FRAMEWORK

▶ Additional trade costs (De Melo & Shepherd, 2018; Ing et al., 2016)
  - Fixed costs: Enforcement and process adaption costs

  - Variable cost: Sourcing costs

  - Fixed costs may reduce market entry and encourage exit (Chaney, 2008, 2018; Helpman et al., 2004; Melitz, 2003)

  - Variable cost could diminish firm export or lead to the exit of marginal exporters,

▶ Quality Upgrading (e.g., Crozet et al., 2012; Disdier et al., 2023; Hallak, 2006; Kugler & Verhoogen, 2011)
  - Upgrade or withdraw from market

  - Upgrading depends on firm-specific attributes e.g productivity

▶ Industry Structure (Abel-Koch, 2013)
  - Trade cost effect: ↑ cost $\implies$ market exit for lower-quality firms and deter potential new exporters

  - Quality Effect: ↑ consumer trust $\implies$ ↑ demand and ↑ profits could incentivize market entry

SUMMARY OF KEY FINDINGS

► Technical regulations reduce trade in both agriculture and manufacturing sectors.

► Small firms are disproportionately impacted compared to medium and large firms.

► Final goods face greater trade reduction than intermediate goods.

► Export sales of high-quality firms are less affected than those of low-quality firms

DATA: FIRM LEVEL CUSTOMS TRANSACTION DATA

▶ Firm-level customs transaction data is drawn from the Exporter Dynamics Database (Fernandes et al., 2016), compiled by the World Bank.

▶ Collected from customs agencies and statistical institutes of selected African countries.

▶ Each transaction includes firm ID, origin, destination, HS6 product code, year, FOB value and quantity.

▶ Unit of Analysis: Observations are structured at the firm–product–destination–year level.

▶ Country Coverage:
  • Small sample: Analysis focuses on Burkina Faso (2005–2012), Malawi (2006–2019), and Senegal (2000–2019) based on data availability. ▶ Summary

  • Large sample: 28 African countries

▶ Export Margins

DATA: NON-TARIFF MEASURES

► Bilateral NTM measures are constructed using the wiiw NTM Database (Ghodsi et al., 2017) , based on WTO notifications via I-TIP and Bown, 2016.

► Covers 100+ importers, 5,000+ products, and the period 1995–2019, including SPS, TBT, and other trade measures.

► Product codes are harmonized at the HS6-digit level, enabling consistent panel analysis.

► Most NTMs are non-discriminatory (applied to all WTO members), with a few bilateral exceptions.

► We compute a count of SPS/TBT measures per HS6 product–origin–destination–year, capturing regulatory burden. ▶ Summary

EMPIRICAL STRATEGY

$$y_{icpdt} = \exp\left[\beta_0 + \beta_1 NTM_{pcdt} + \beta_2 \ln(1 + Tariff_{cp_{hs4}dt}) + \omega_{icp} + \lambda_{ipt} + \gamma_{dt}\right] + \epsilon_{icpdt}, \tag{1}$$

Outcomes (y_{icpdt}):

- ▶ firm exit dummy,

- ▶ firm entry dummy and

- ▶ firm export value,

RHS:

- ▶ NTM_{pdt}: count of the number SPS and TBT imposed by the importing country d, on product p, in year t

- ▶ $Tariff_{cp_{hs4}dt}$: specific bilateral tariff imposed by d at the HS4-digit product level, on imports from c

- ▶ ω_{icp}: firm-origin-HS6 product fixed effect

- ▶ λ_{ipt}: firm-HS6 product-year fixed effect

- ▶ γ_{dt}: destination country year fixed effect

- ▶ ϵ_{icpdt}: error term.

IDENTIFICATION STRATEGY

▶ Main coefficient: β_1, capturing how technical regulations affect firm-level export margins

▶ Identification: changes in outcomes within the same firm-origin-HS6-digit product combination, in response to the variation in the number of NTMs (importing country- product level) over time

▶ Omitted Variables: A rich set of fixed effects accounts for unobservable firm traits, product characteristics, and origin–destination dynamics .

▶ Reverse Causality: Mitigated by conducting analysis at firm level

▶ Consistency with Literature: This approach aligns with existing firm-level studies on NTMs and trade margins (e.g., (Fernandes et al., 2019; Fontagné et al., 2015)).

BASELINE RESULTS (INTENSIVE MARGIN)

► Technical measures reduce firm-level trade at the intensive margin (ranging between 1.3% and 23%).

► Consistent with models where such measures raise firms' costs more than the benefits they provide to consumers.

Table 1. The effect of non-tariff measures on firm-level intensive margin

Outcome:	Small Sample			Large Sample (OLS)		
	Export Value			Export Value (log)		
	All	Agric.	Manuf.	All	Agric.	Manuf.
	(1)	(2)	(3)	(4)	(5)	(6)
NTM_{pcdt}	-0.013***	-0.022***	-0.267*	-0.025***	-0.053**	-0.019*
	(0.005)	(0.006)	(0.157)	(0.008)	(0.022)	(0.011)
$Tariff_{cp_{hs4}dt}$	-0.002**	0.002***	-0.012***	-0.013	0.008	-0.022*
	(0.001)	(0.001)	(0.003)	(0.012)	(0.022)	(0.012)
Observations	374,784	133,846	237,131	9,839,217	1,819,910	8,018,875

Notes: All denotes all sectors, Agric. denotes the agriculture and food sectors, while Manuf. indicates the Manufacturing sector. Robust standard errors clustered at the origin-destination-product level are in parentheses. ***, ** and * denote significance at 1%, 5%, and 10%. All models include controls for firm-origin-product, firm-product-year and destination-year fixed effects, which are excluded from the table for brevity.

HETEROGENEOUS EFFECTS-SMALL SAMPLE

1. Type of Technical Measures ▸ Results

2. Product Position along the Value Chain ▸ Results

3. Firm Size ▸ Results

4. Initial Product Quality ▸ Results

BASELINE RESULTS (EXTENSIVE MARGIN)-LARGE SAMPLE

Table 2. The effect of non-tariff measures on firm-level extensive margins

Outcome:	Extensive margins					
	Export Entry Dummy			Export Exit Dummy		
	All	Agric.	Manuf.	All	Agric.	Manuf.
	(1)	(2)	(3)	(4)	(5)	(6)
NTM_{pcdt}	0.000	0.000	-0.001***	0.001***	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
$Tariff_{cp_{hs4}dt}$	-0.002***	-0.003***	-0.002***	-0.001***	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	176,565,777	20,743,387	155,775,062	186,613,698	22,049,218	164,517,966
Adjusted R^2	0.025	0.038	0.024	0.021	0.032	0.021

Notes: All denotes all sectors, Agric. denotes the agriculture and food sectors, while Manuf. indicates the Manufacturing sector. Robust standard errors clustered at the origin-destination-product level are in parentheses. ***, ** and * denote significance at 1%, 5%, and 10%. All models include controls for firm-origin-product, firm-product-year and destination-year fixed effects, which are excluded from the table for brevity.

- ▶ reduce manufacturing firms probability of entering destination market

- ▶ increase firms probability of exiting destination market

CONCLUSION

▶ We assess how technical regulations shape African firms' export decisions.

▶ SPS and TBT measures reduce exports on average.

▶ Impacts vary by firm characteristics and product attributes.

▶ Trade-reducing effects are largely driven by small firms and final goods.

▶ Quality Matters: Higher-quality firms are less constrained by standards; promoting quality upgrading strengthens competitiveness.

NEXT STEPS

▶ Account for other NTMs

▶ Expand heterogeneous analysis to the large sample and intensive margin

▶ Use an IV approach

Table 3. Firm-level characteristics across countries and sectors

	N	Firms	HS6	Dest.	HI Dest.	Value	Quantity	Per firm	
							Dest.	HS6	
Total sample	233,922	16,021	3,632	233	79	214,812	340,802	3	29
Countries									
Burkina Faso	17,091	1,579	1,664	156	54	508,819	299,290	3	6
Malawi	62,666	8,015	2,598	193	69	226,952	17,7068	2	16
Senegal	154,165	6,428	3,300	225	79	177,283	411,966	4	16
Product sectors									
Agriculture	66,665	5,171	549	220	75	336,710	282,125	3	34
Manufacturing	167,257	12,729	3,083	223	76	166,226	364190	2	28

Notes: N is the total number of observations. HS6 denotes the number of products defined at the HS6 digit level. Dest. denotes the number of unique destinations while HI Dest. denotes the number of unique high-income destinations.

EXPORT MARGINS

► Extensive Margin

  • inserting zero export values for the years when exports within the firm-product-destination grouping do not take place (Fernandes et al., 2016).

  • firm entry: takes the value of 1 if firm i in country c exports product p to destination d in year t but did not do so in year $t − 1$, and zero otherwise

  • We exclude
    ► firms that have exported to a product-destination market every year

    ► the initial year of the sample

  • firm exit: takes the value of 1 if firm i in country c did not export product p to destination d in year t but did so in year $t − 1$, and zero otherwise.
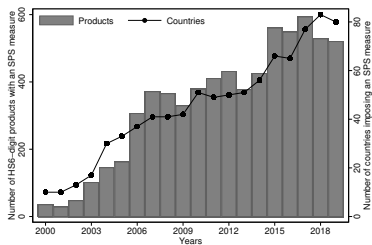   ► exclude firms that exported solely to a product-destination market in the last year of the sample

► Intensive Margin

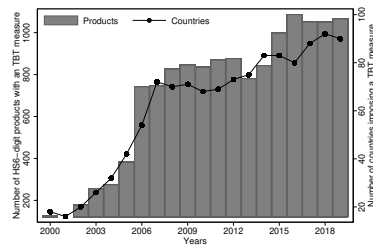 • the FOB export value in USD of firm i in country c of product p to destination d in year t.

SUMMARY STATISTICS-NTMS

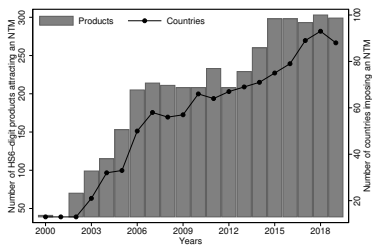**Figure 2.** The proliferation SPS and TBT measures over time and across sectors

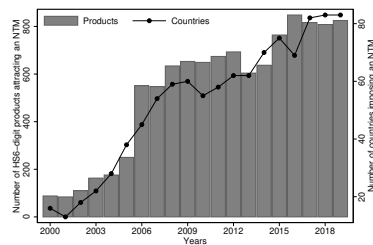**(a)** SPS measures

(b) TBT measures

(c) Agriculture sector

(d) Manufacturing sector

SUMMARY STATISTICS-ESTIMATION SAMPLE

Table 4. Summary statistics

Variable	N	Mean	Min	Max	SD
Export value (USD)	374,784	118697.59	0.00	3.52e+08	2313158.25
NTM_{pcdt}	374,784	1.01	0.00	118.00	4.25
SPS_{pcdt}	374,784	0.59	0.00	117.00	3.82
TBT_{pcdt}	374,784	0.42	0.00	45.00	1.22
$(1 + Tariff_{cp_{hs4}dt})$	374,784	8.86	1.00	801.30	20.46

HETEROGENEOUS ANALYSIS:TYPE OF TECHNICAL MEASURES

▶ Nature of the quality regulation could have different effects on trade (e.g., Rosenow, 2024; Zavala et al., 2023)

Table 5. The effect of non-tariff measures on firm-level intensive margin of trade: Heterogeneity by type of technical measure.

Outcome:	Export Value		
	All	Agric.	Manuf.
	(1)	(2)	(3)
SPS_{pcdt}	-0.011**	-0.026***	-0.016
	(0.005)	(0.007)	(0.012)
TBT_{pcdt}	-0.031	0.013	-0.158**
	(0.062)	(0.146)	(0.072)
$Tariff_{cp_{hs4}dt}$	-0.002**	0.002***	-0.012***
	(0.001)	(0.001)	(0.003)
Observations	374,784	133,846	237,131

Notes: Robust standard errors clustered at the origin-destination-product level are in parentheses. ***, ** and * denote significance at 1%, 5%, and 10%. All models include controls for firm-origin-product, firm-product-year and destination-year fixed effects, which are excluded from the table for brevity.

HETEROGENEOUS ANALYSIS:PRODUCT POSITION ALONG THE VALUE CHAIN

► Trade costs impact final and intermediate goods differently because they vary in protection, substitutability, and risk (e.g., Antras & Chor, 2018; Franco-Bedoya & Frohm, 2020)

► Technical measures have stronger effects on products that pose direct health and safety risks.

Table 6. The effect of non-tariff measures on firm-level intensive margin of trade: Heterogeneity by product position along the value chain.

Outcome:	Export Value		
	All	Agric.	Manuf.
	(1)	(2)	(3)
NTM_{pcdt}	-0.027***	-0.037**	-0.052**
	(0.009)	(0.016)	(0.022)
$NTM_{pcdt} \times Intermediate_p$	0.030***	0.033**	0.303***
	(0.009)	(0.016)	(0.106)
$Tariff_{cp_{hs4}dt}$	-0.002**	0.002	-0.012***
	(0.001)	(0.002)	(0.003)
Observations	374,784	133,846	237,131

Notes: $Intermediate_p$ is equal to one if the product is an intermediate one, and zero otherwise, following the Broad Economic Classification (BEC).

HETEROGENEOUS ANALYSIS: FIRM SIZE

◄ Back

► Trade reducing effect decreasing in firm size

Table 7. The effect of non-tariff measures on firm-level intensive margin of trade: Heterogeneity by Firm Size.

Outcome:	Export Value		
	All	Agric.	Manuf.
	(1)	(2)	(3)
NTM_{pcdt}	-0.048**	-0.031**	-0.389***
	(0.023)	(0.016)	(0.080)
$NTM_{pcdt} \times LF_i$	0.036**	0.010	0.312***
	(0.016)	(0.015)	(0.100)
$NTM_{pcdt} \times MF_i$	0.035*	0.008	0.202**
	(0.020)	(0.015)	(0.086)
$Tariff_{cp_{hs4}dt}$	-0.002***	0.002***	-0.015***
	(0.001)	(0.001)	(0.003)
Observations	374,784	133,846	237,131

Notes: LF_i and MF_i are dummy variables indicating whether a firm is large or medium respectively.

HETEROGENEOUS ANALYSIS: INITIAL PRODUCT QUALITY

► NTM effects may be moderated by product quality (Disdier et al., 2023)

► The trade-reducing effect is less pronounced for high-quality firms

Table 8. The effect of non-tariff measures on firm-level intensive margin of trade: Heterogeneity by initial product quality.

Outcome:	Export Value		
	All	Agric.	Manuf.
	(1)	(2)	(3)
NTM_{pcdt}	-0.215***	-0.182***	-0.808***
	(0.055)	(0.102)	(0.102)
NTM_{pcdt} x $HighQuality_{ipcd}$	0.207***	0.182***	0.620***
	(0.071)	(0.065)	(0.192)
$Tariff_{cp_{hs4}dt}$	0.006***	0.006***	0.011
	(0.002)	(0.002)	(0.008)
Observations	79,742	34,514	44,971

Notes: Initial product quality is defined following Khandelwal et al., 2013 as the estimated quality of the product a firm first exports to a destination within the sample period. The variable $HighQuality_{ipcd}$ equals 1 if this estimated quality is above the median of the quality distribution, and 0 otherwise.

BASELINE RESULTS (EXTENSIVE MARGINS)-SMALL SAMPLE

Table 9. The effect of non-tariff measures on firm-level extensive margins of trade

Outcome:	Extensive margins					
	Export Entry Dummy			Export Exit Dummy		
	All	Agric.	Manuf.	All	Agric.	Manuf.
	(1)	(2)	(3)	(4)	(5)	(6)
NTM_{pcdt}	0.000	0.001	-0.000	-0.000	0.000	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
$Tariff_{cp_{hs4}dt}$	-0.000	-0.000	-0.000**	-0.000	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,319,162	403,212	915,479	1,392,332	425,985	965,843
Adjusted R^2	0.217	0.202	0.227	0.210	0.191	0.220

Notes: All denotes all sectors, Agric. denotes the agriculture and food sectors, while Manuf. indicates the Manufacturing sector. Robust standard errors clustered at the origin-destination-product level are in parentheses. ***, ** and * denote significance at 1%, 5%, and 10%. All models include controls for firm-origin-product, firm-product-year and destination-year fixed effects, which are excluded from the table for brevity.