The Impact of Chinese Technical Barriers to Trade on its Manufacturing Imports

FIW, 9-10 November 2017
Vienna, Austria

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Introduction

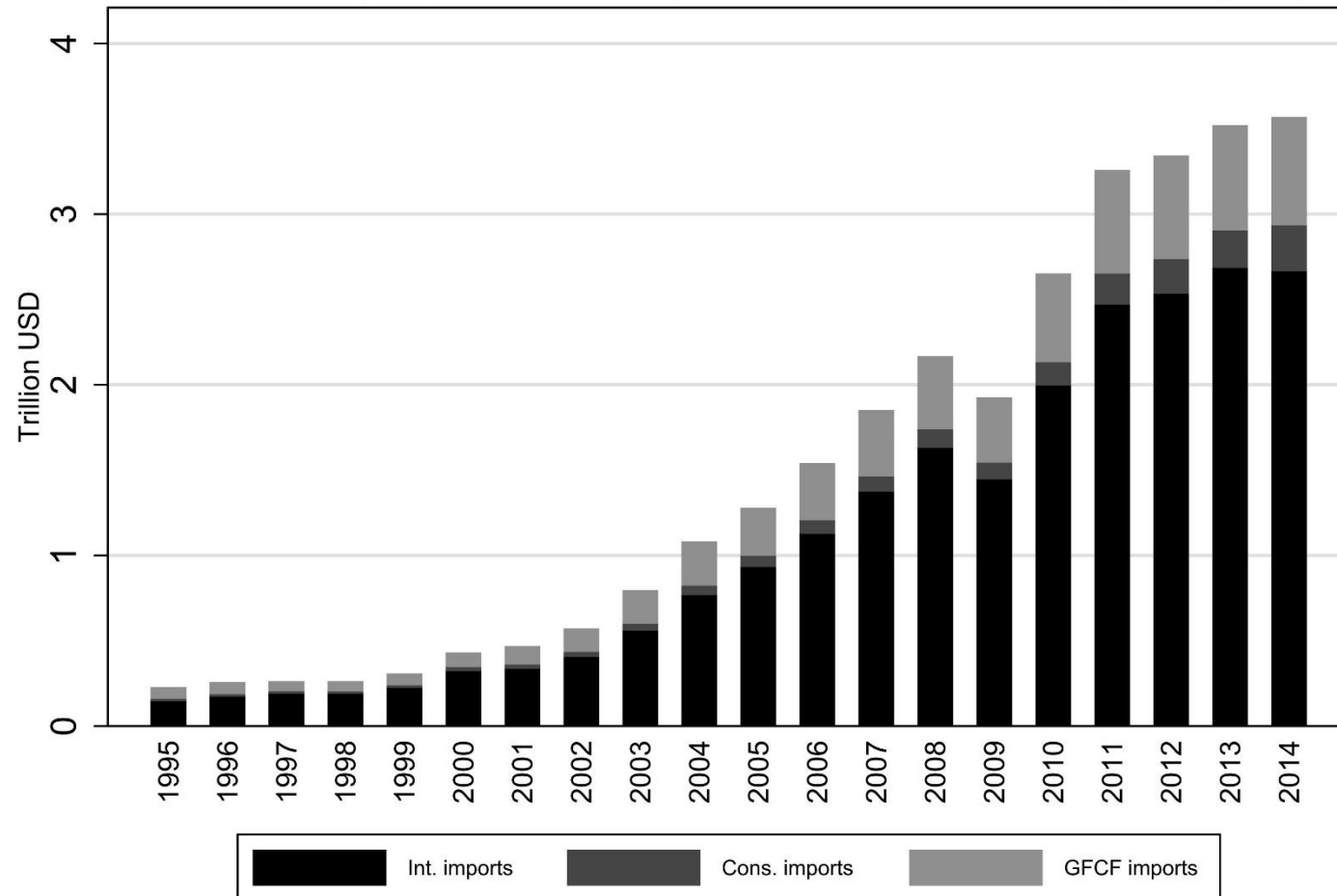- **Few decades of liberalization and sustainable growth**
    - High tariffs in 1980s
    - Creation of Special Economic Zones in 1990s
    - From 12 state-owned traders to 35000 firms
    - WTO accession in December 2001
    - Surge in intermediate inputs and gross fixed capital formation goods trade
    - Large FDI inflows and role in GVCs
    - Large FDI outflows and 'One Belt, One Road' project
    - Market reforms, economic growth, reducing poverty
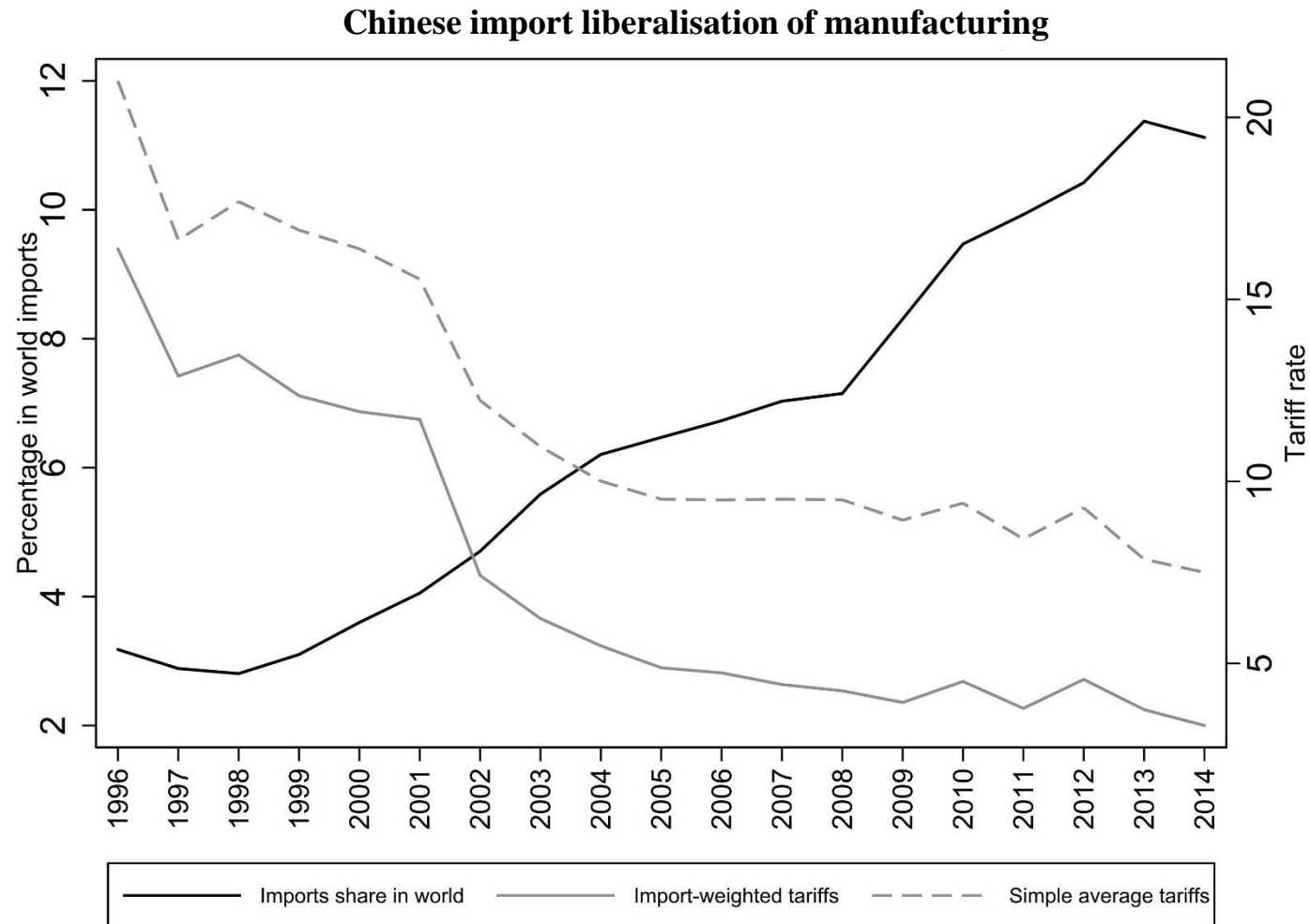
- **WTO commitments**
    - Lowering tariffs and NTBs
    - Legitimate imposition of NTMs concerning protection of human health, environmental quality, national security, etc.
    - TBT vs. TBT STC → no DS case on TBT
    - Second largest number of TBTs

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Introduction

Manufacturing imports to China by Broad Economic Categories (BEC)

Introduction

Chinese import liberalisation of manufacturing

Legend:
- Imports share in world
- Import-weighted tariffs
- Simple average tariffs

Literature Review

- **Gravity:** Anderson (1979) , Eaton and Kortum (2002), Anderson and van Wincoop (2003), Chaney (2008), Helpman et al. (2008), and Melitz and Ottaviano (2008), Head and Mayer (2014)

- **Trade prohibitions by quality NTMs**: Essaji (2008), Disdier et al. (2010), Li and Beghin (2012), Bao and Chen (2013), Bao and Qiu (2012), Yousefi and Liu (2013)

- **Sector analysis of NTMs:**
  - **Agriculture**: Wilson et al. (2003), Wilson and Otsuki (2004), Chen et al. (2008) and Disdier and Fontagné (2010)
  - **Manufacturing**: Blind (2001), Blind and Jungmittag (2005) and Fontagné et al. (2005)

- **Ad-valorem Equivalents:** Kee et al. (2009), Beghin et al. (2015), Bratt (2017), Ghodsi et al. (2016), Cadot and Gourdon (2016)

- **Quality improvement by NTMs**: Wilson and Otsuki (2004), Trienekens and Zuurbier (2008)

- **Chinese trade analysis:** Bingzhan (2011), Gao et al. (2014), Caporale et al. (2015), Chandra (2016)

- **Chinese NTMs:** Bao and Qiu (2010), Park (2009), Imbruno (2016)

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Methodology and data

- **Specification 1**

  $$m_{ijht} = \alpha_{10} + \alpha_{11} \ln(TBT_{ijht} + 1) + \alpha_{12} \ln(T_{ijht} + 1) + \alpha_{13} G_{ijt} + \alpha_{14} D_{ij} + \omega_{ijht} + \varepsilon_{ijht}$$

- m_{ijht} is the import values of 6-digit product h to China i from partner country j at time t

- TBT_{ijht} is the number of TBTs imposed by China on product h imported from country j at time t

- T_{ijht} is the effective tariff rate imposed on the traded product at time t

- G_{ijt} country-pair characteristics that consist of classical gravity variables and factor endowments:

  - $y_{ijt} = \left(\frac{GDPpc_{it}^2}{(GDPpc_{it}+GDPpc_{jt})^2} + \frac{GDPpc_{jt}^2}{(GDPpc_{it}+GDPpc_{jt})^2} \right) - \frac{1}{2}, y_{ijt} \in (0, 0.5)$

  - $f_{kijt} = \ln\left(\frac{F_{kjt}}{GDP_{jt}}\right) - \ln\left(\frac{F_{kit}}{GDP_{it}}\right), F_k \in \{L, K, A\}$

  - (PTA_{ijt}) preferential trade agreement between the two partners at time t

  - WTO_{jt}

  - distance, contiguity, common language, same country, and history of common colony

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Methodology and data

- **Specification 2: zero trade flows**

- Two-stage Heckman (1977) and Helpman, Melitz and Rubinstein (2008)

- First stage using the random effect (RE) probit estimator:

$$\rho_{ijht} = Pr(m_{ijht} > 0)$$
$$= \beta_{10} + \beta_{11} \ln(TBT_{ijht} + 1) + \beta_{12} \ln(T_{ijht} + 1) + \beta_{13} G_{ijt} + \beta_{14} D_{ij} + \omega_t + \epsilon_{ijht}$$

- Second stage

$$m_{ijht}$$
$$= \alpha_{20} + \alpha_{21} \ln(TBT_{ijht} + 1) + \alpha_{22} \ln(T_{ijht} + 1) + \alpha_{23} G_{ijt} + \alpha_{25} \hat{\bar{\eta}}^*_{ijht} + \alpha_{26} \hat{z}^*_{ijht}$$
$$+ \alpha_{27} \hat{z}^{*\,2}_{ijht} + \alpha_{28} \hat{z}^{*\,3}_{ijht} + \omega_{ijht} + \zeta_{ijht}$$

- $\hat{z}^*_{ijht} = \Phi^{-1}(\hat{\rho}_{ijht})$

- $\hat{\bar{\eta}}^*_{ijht} = \varphi(\hat{z}^*_{ijht})/\Phi(\hat{z}^*_{ijht})$

Methodology and data

- **Specification 3: Multilateral resistances**

- Anderson and van Wincoop (2003) and omitted variable bias: $E\left(m_{ijht}\,\zeta_{ijht}\right) \neq 0$

- Including country-sector-time with HS 4-digit sectors H is controlled in the fixed effects ω_{jHt} in addition to country-pair-product fixed effects ω_{ijh}

$$m_{ijht} = \alpha_{30} + \alpha_{31}\ln\left(TBT_{ijht} + 1\right) + \alpha_{32}\ln\left(T_{ijht} + 1\right) + \alpha_{35}\hat{\bar{\eta}}^{*}_{ijht} + \omega_{jHt} + \omega_{ijh} + \vartheta_{ijht}$$

- G_{ijt} and $\hat{z}^{*}_{ijht}$ are dropped out due to collinearity

Methodology and data

- **Specification 4: Simultaneity bias**

- Dual causality: larger trade induces authorities to impose more protectionist measures $E(m_{ijht}\, \vartheta_{ijht}) \neq 0$

- Some scholars (Bao and Qiu, 2012; Imbruno, 2016) employ the lagged variables of trade policy, also used here for tariffs as well as one specification for TBT. Additionally instrumental variable is used:

$$\ln(TBT_{ijht} + 1)$$
$$= \beta_{21} \ln(\overline{TBT}_{wht}^u + 1) + \beta_{22} \ln(\overline{TBT}_{jht}^u + 1) + \beta_{23} \ln(T_{ijht-1} + 1) + \beta_{24}\hat{\hat{\eta}}_{ijht}^* + \beta_{jHt} + \beta_{ijh} + \mu_{ijht},$$
$$i \neq j, \qquad E(m_{ijht}\, \overline{TBT}_{wht}^u) = 0, \qquad E(m_{ijht}\, \overline{TBT}_{jht}^u) = 0$$

$$\overline{TBT}_{jht}^u = \sum_k \frac{u_{jkht}}{\sum_k u_{jkht}} TBT_{jkht}, \qquad k \neq i \neq j$$

$$\overline{TBT}_{wht}^u = \sum_j \sum_k \frac{u_{jkht}}{\sum_k u_{jkht}} TBT_{jkht}, \qquad k \neq i \neq j$$

Methodology and data

- **Specification 4: Simultaneity bias**

- $\ln(TBT_{ijht} + 1)$ is TBTs imposed by China

- $\overline{TBT}_{jht}^{u}$ is the number of TBTs imposed by China's partner country j to all countries other than China, weighted by the unit values across trades to that partner country in the given product h in year t

- $\overline{TBT}_{wht}^{u}$ is the number of TBTs imposed by all countries other than China, weighted by the unit values across trade flows of a given product between countries except China

- **Second Stage**:

$$m_{ijht} = \alpha_{40} + \alpha_{41}\widehat{TBT}_{ijht} + \alpha_{42}\ln(T_{ijht-1} + 1) + \alpha_{45}\hat{\hat{\eta}}_{ijht}^{*} + \omega_{jHt} + \omega_{ijh} + \sigma_{ijht},$$
$$E(m_{ijht}\,\sigma_{ijht}) = 0$$

where $\widehat{TBT}_{ijht} = \ln(\widehat{TBT_{ijht}} + 1)$

Methodology and data

- **Specification 5: Differentiation by partner**

- TBTs can have diverse impacts on bilateral trade flows depending on the type of product and the exporting partner

- Interacting the TBT variable with exporter dummies

$$m_{ijht} = \alpha_{50} + \sum_{j \neq i} \omega_j \alpha_{51} \ln(TBT_{ijht} + 1) + \alpha_{52}(T_{ijht} + 1) + \alpha_{55}\hat{\tilde{\eta}}^*_{ijht} + \omega_{jHt} + \omega_{ijh} + \vartheta_{ijht}$$

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Methodology and data

- **Trade data:** UN Comtrade through WITS

- **Tariffs:** AVEs estimated by UNCTAD
    - **Priority:** AHS, PRF, MFN
    - **Source:** Trains (WITS), WTO IDB (WITS)

- **Gravity:**
    - **PWT, Feenstra et al., (2015):** GDP, real GDP per capita, labour force, capital stock, and exchange rates
    - **CEPII:** distance, contiguity, common language, same country, and colonial history

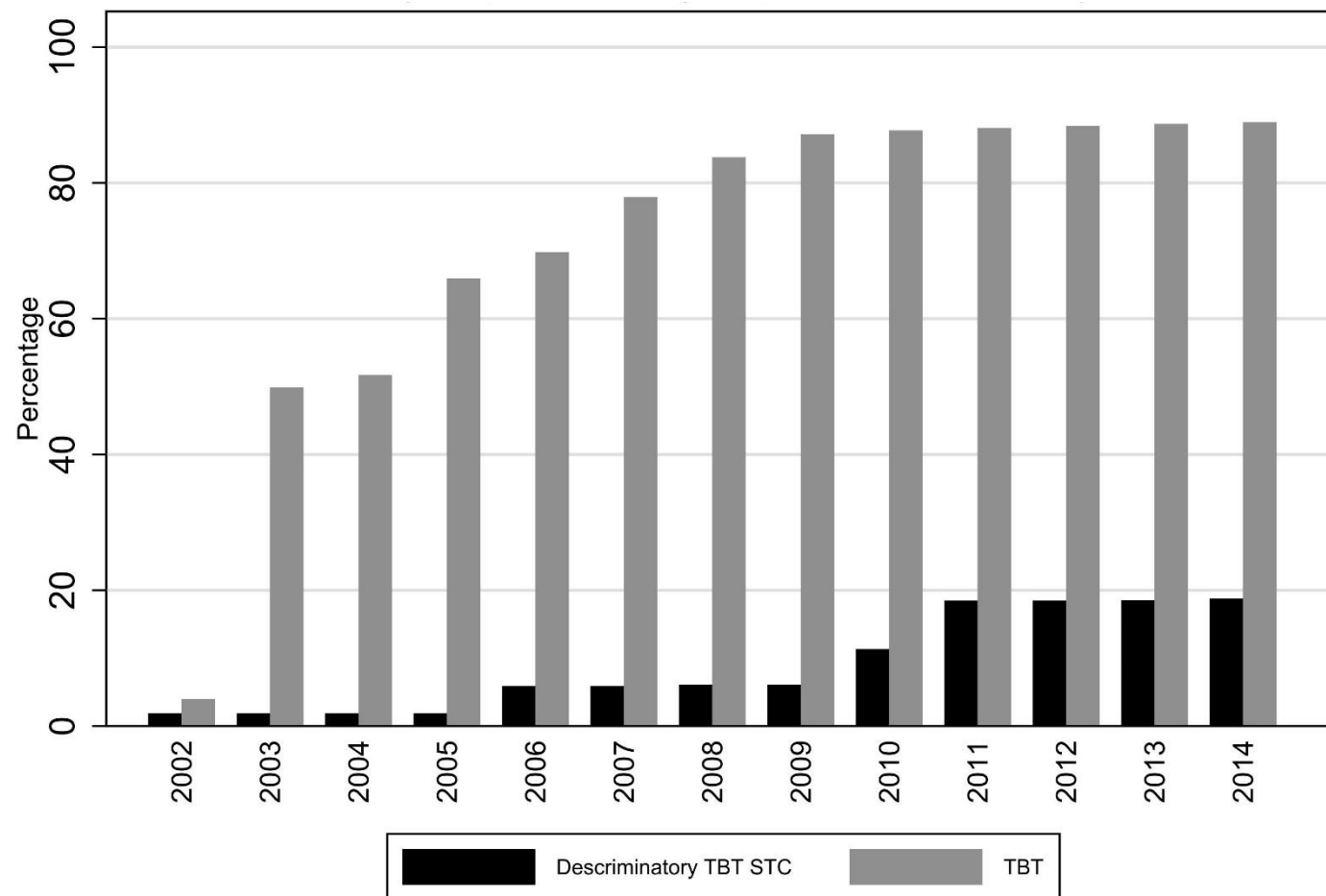- **TBT:** WTO Integrated-Trade Intelligence Portal (I-TIP), Ghodsi et al. (2017)

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Notified TBT by China to the WTO, with imputed HS codes

Year	Non-discriminatory TBT				TBT STC				All TBT
	Original HS	Imputed HS	Missing HS	Notified TBT	Original HS	Imputed HS	Missing HS	Notified TBT STC	
2002	11	0	1	12	0	2	3	5	17
2003	10	11	7	28	0	0	1	1	29
2004	10	7	5	22	0	0	1	1	23
2005	62	17	27	106	0	0	3	3	109
2006	38	17	6	61	0	3	4	7	68
2007	41	15	30	86	0	0	3	3	89
2008	69	95	17	181	0	2	3	5	186
2009	89	69	47	205	0	0	5	5	210
2010	29	24	7	60	0	3	1	4	64
2011	32	47	10	89	2	1	3	6	95
2012	31	35	9	75	0	0	2	2	77
2013	26	39	15	80	0	2	1	3	83
2014	13	27	6	46	0	2	2	4	50
Total	461	403	187	1051	2	15	32	49	1100

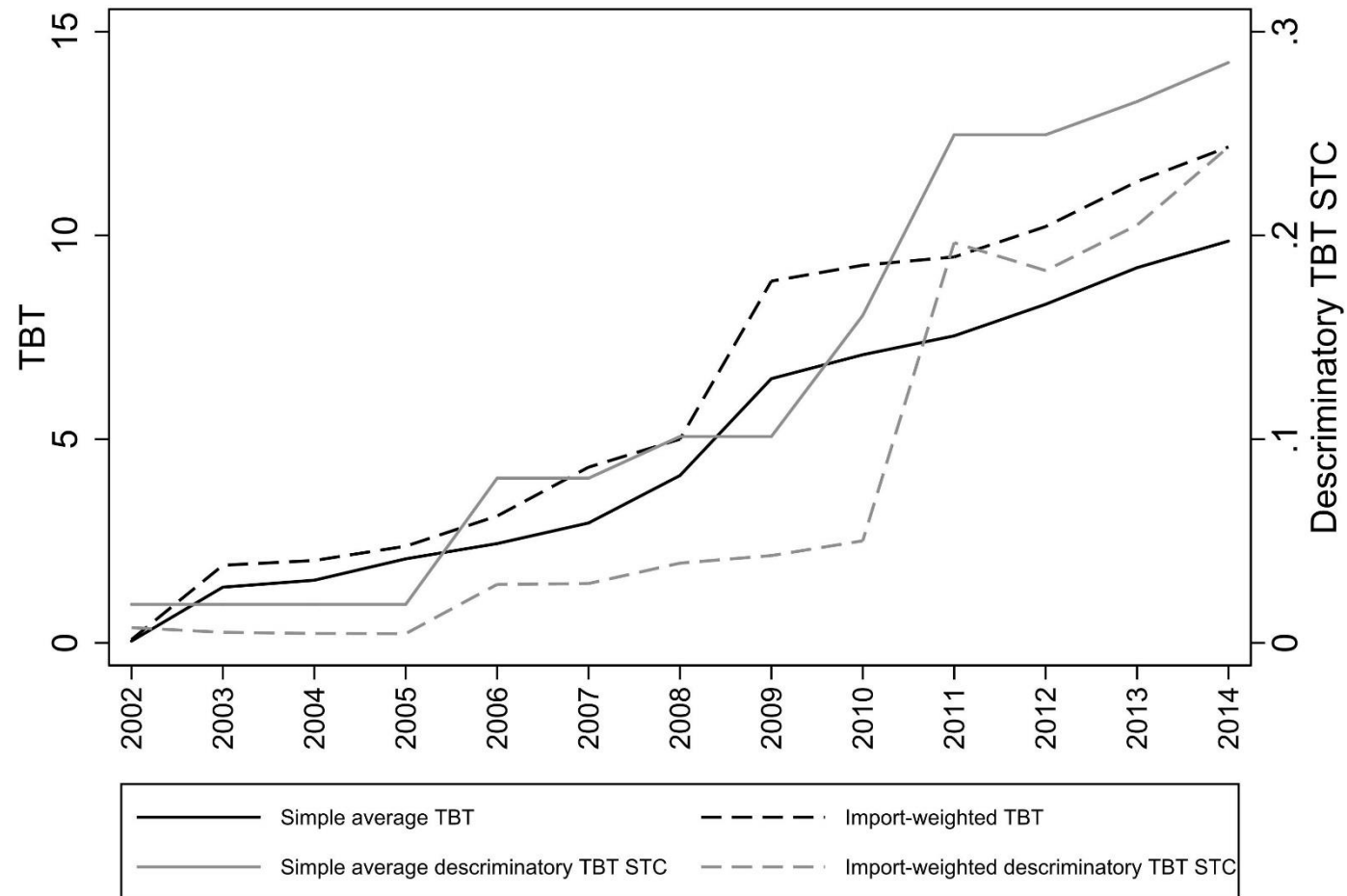Source: Ghodsi et al. (2017), WTO I-TIP.

Data

Percentage of positive 6-digit Chinese manufacturing import flows affected by TBTs

Data

Chinese TBTs averaged over positive manufacturing import flows

	Prob.	Prob.-Lag
T_{ijht}, T_{ijht-1}	-2.40***	-1.31***
	(0.040)	(0.042)
TBT_{ijht}, TBT_{ijht-1}	0.076***	0.073***
	(0.0025)	(0.0025)
g_{ijt}	4.00***	4.04***
	(0.026)	(0.027)
y_{ijt}	1.41***	1.06***
	(0.036)	(0.038)
f_{Lijt}	0.13***	0.14***
	(0.0056)	(0.0059)
f_{Kijt}	-0.024***	-0.032***
	(0.0020)	(0.0021)
f_{Aijt}	0.019***	0.020***
	(0.0022)	(0.0023)
WTO_{jt}	0.39***	0.37***
	(0.0096)	(0.0098)
PTA_{ijt}	-0.24***	-0.19***
	(0.0060)	(0.0065)
Xr_{ijt}	-0.0026**	-0.0033***
	(0.0011)	(0.0012)
$Cont_{ij}$	-0.61***	-0.65***
	(0.013)	(0.013)
$Lang_{ij}$	0.18***	0.081***
	(0.017)	(0.018)
$Colony_{ij}$	-1.20***	-1.34***
	(0.061)	(0.065)
$Same_{ij}$	0.063***	0.040*
	(0.020)	(0.021)
$Dist_{ij}$	-0.73***	-0.74***
	(0.0089)	(0.0093)
$Const.$	-57.3***	-58.1***
	(0.42)	(0.44)
lnsig2u	0.46***	0.55***
	(0.0048)	(0.0049)
N	2261766	2143058
Fixed Effects	RE, ω_t	RE, ω_t

Gravity estimation results of manufacturing 6-digit product imports to China – 2002-2014 – Extensive Margin

Standard errors in parentheses, robust clustered by country-pair-product ijh.
* $p<0.1$, ** $p<0.05$, *** $p<0.01$.

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	M1	M2	M2-Lag
T_{ijht}, T_{ijht-1}	-0.47***	-2.52***	-1.85***
	(0.13)	(0.40)	(0.54)
TBT_{ijht}, TBT_{ijht-1}	0.15***	0.33***	0.16***
	(0.0069)	(0.055)	(0.060)
y_{ijt}	3.80***		
	(0.28)		
f_{Lijt}	1.23***		
	(0.059)		
f_{Kijt}	-0.41***		
	(0.034)		
f_{Aijt}	-0.98***		
	(0.050)		
WTO_{jt}	0.065		
	(0.041)		
PTA_{ijt}	-0.16***		
	(0.017)		
Xr_{ijt}	-0.052***		
	(0.0053)		
$\widehat{\bar{\eta}}^*_{ijht}$	-2.14***	1.03***	0.34
	(0.19)	(0.28)	(0.82)
$\hat{z}^*_{ijht}$	-1.09***		
	(0.12)		
$\hat{z}^{*2}_{ijht}$	0.088***		
	(0.030)		
$\hat{z}^{*3}_{ijht}$	0.0064***		
	(0.0025)		
N	1126325	922564	681760
R-sq	0.803	0.877	0.889
adj. R-sq	0.774	0.803	0.820
Fixed Effects	ω_t, ω_{ijh}	$\omega_{jHt}, \omega_{ijh}$	$\omega_{jHt}, \omega_{ijh}$

Gravity estimation results of manufacturing 6-digit product imports to China – 2002-2014 – Intensive Margin

Standard errors in parentheses, robust clustered by country-pair-product ijh.
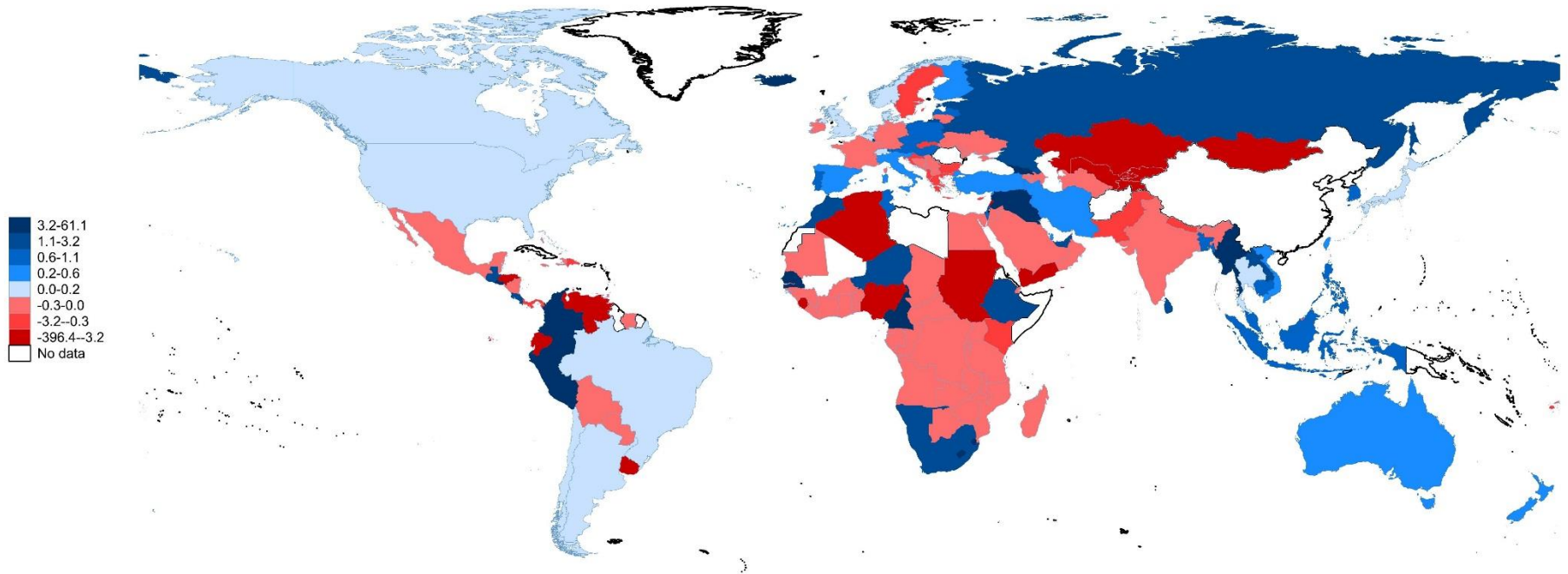* p<0.1, ** p<0.05, *** p<0.01.

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Gravity estimation results of manufacturing 6-digit product imports to China – 2002-2014 – Intensive Margin with IV

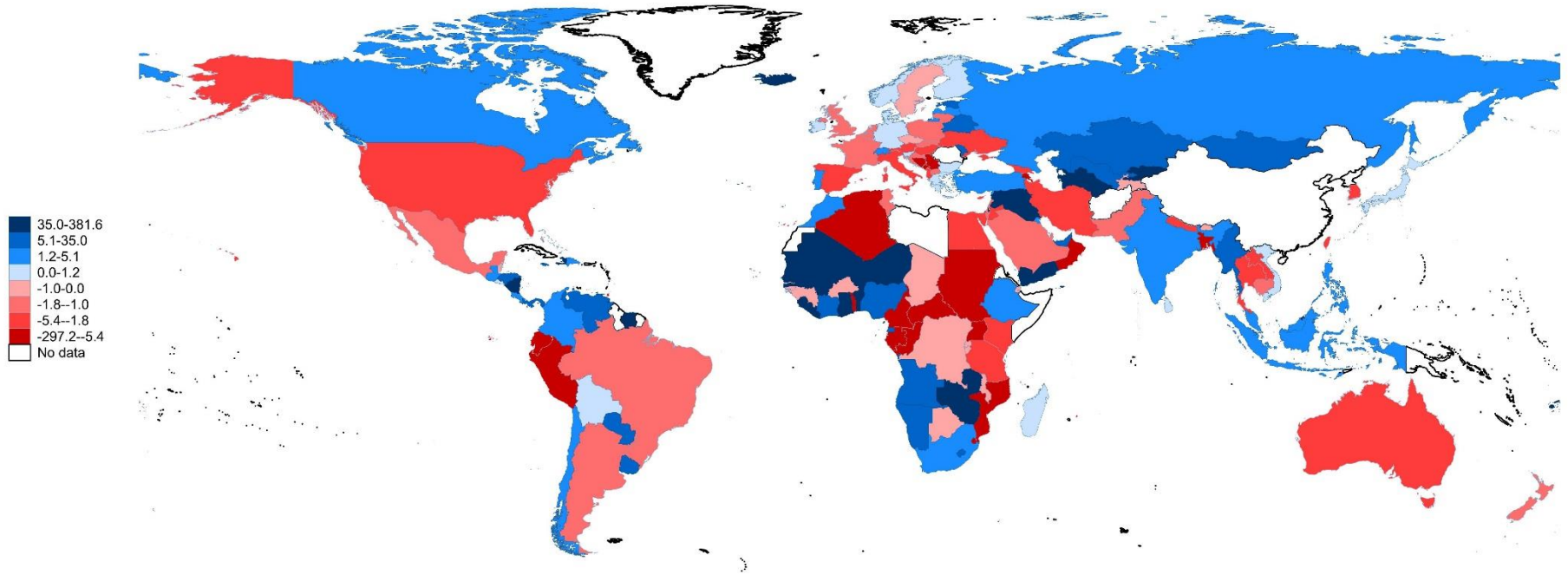|	IV-1st	IV-2nd	IV-1st-Lag	IV-2nd-Lag
T_{ijht}, T_{ijht-1}	0.46***	-2.22***	0.005	-1.60***
	(0.032)	(0.49)	(0.008)	(0.30)
TBT_{ijht}, TBT_{ijht-1}		-0.37		-0.80
		(0.64)		(0.75)
$\overline{TBT}^u_{wht}$	0.017***		0.016***	
	(0.0013)		(0.0013)	
$\overline{TBT}^u_{jht}$	0.007***		0.006***	
	(0.0005)		(0.0005)	
$\hat{\eta}^*_{ijht}$	-0.439***	0.71*	-0.221***	-0.59**
	(0.029)	(0.39)	(0.016)	(0.30)
N	916299	916299	679209	679209
R-sq	0.998	0.877	0.998	0.889
adj. R-sq	0.997	0.803	0.998	0.820
Hansen J p-v		0.63		0.27
Anderson-Rubin F p-v		0.77		0.36
Anderson-Rubin Chi-sq pv		0.71		0.26
Fixed Effects	$\omega_{jHt}, \omega_{ijh}$	$\omega_{jHt}, \omega_{ijh}$	$\omega_{jHt}, \omega_{ijh}$	$\omega_{jHt}, \omega_{ijh}$

Standard errors in parentheses, robust clustered by country-pair-product ijh.
* p<0.1, ** p<0.05, *** p<0.01.

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Estimated impact of Chinese manufacturing TBTs on imports by exporters – Model M2

Legend:
- 3.2-61.1
- 1.1-3.2
- 0.6-1.1
- 0.2-0.6
- 0.0-0.2
- -0.3-0.0
- -3.2--0.3
- -396.4--3.2
- No data

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Estimated impact of Chinese manufacturing TBTs on imports by exporters – Model M2

Summary and conclusions

- China will enjoy sustainable growth:
    - Stable and supportive government for market economy
    - High quality of human capital and life expectancy
    - Openness and trade liberalization

- Trade liberalization
    - Tariff and NTB reduction before and after WTO accession
    - Some econometrics evidence on positive relations between imports and TBTs
    - Proliferation of TBTs by China to liberalize further

- Tackling econometrics issues on TBT assessment
    - Zero trade flows
    - Endogeneity:
        - Omitted variable bias
        - Simulteneity bias
    - Diverse impact of TBT on exporters

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