

Data and methodology for assessing the impacts of non-tariff measures on trade and investment

Estimations are divided into two parts. First, this study identifies whether there are inter-linkages between international trade and foreign direct investment (FDI) using seemingly unrelated regression (SUR) model (Models 1 and 2). As NTMs, by definition, are imposed on trade in goods, it follows that to investigate the impact of NTMs on FDI, trade in goods must be considered. As such, in the second part of this analysis, pseudo-poisson maximum likelihood (PPML) model is used to estimate the overall effect of NTMs on trade and FDI (Model 3), as well as the separate effects technical and non-technical NTMs (Model 4).

In the first part, FDI and imports are both used as endogenous and exogenous variables, with other exogenous variables including natural geographic factors (e.g., distance, landlockedness and contiguity), cultural and historical distance (i.e. common official language, colonial linkage), policy variables (presence of regional trade agreements, tariffs and NTMs), and infrastructure variables (behind-the-border trade facilitation score and quality of maritime connectivity). Control variables in the second part of the analysis are similar to the ones used in the first part. Model specifications are as follows:

Model 1: capturing the simultaneous effect of trade and FDI through FDI instocks

$$(A) \ln(fdi_{ij}) = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{11} (NTM_{ij}) + \beta_{12} (imports_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(B) \ln(imports_{ij}) = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{11} (NTM_{ij}) + \beta_{13} (fdi_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

Model 2: capturing the simultaneous effect of trade and FDI through FDI instocks

$$(A) \ln(fdi_{ij}) = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{14} (tech_NTM_{ij}) + \beta_{15} (nontech_NTM_{ij}) + \beta_{12} (imports_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(B) \ln(imports_{ij}) = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{14} (tech_NTM_{ij}) + \beta_{15} (nontech_NTM_{ij}) + \beta_{14} (fdi_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

Model 3: capturing average effect of NTMs simultaneously from a country and its trading partners

$$(A) m_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{11} (NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(B) fdi_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{11} (NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

Model 4: capturing separated effect of NTMs from a country and its trading partners

$$(A) m_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{12} (tech_NTM_{ij}) + \beta_{13} (nontech_NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(B) \quad m_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{12} (tech_NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(C) \quad m_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{13} (nontech_NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(D) \quad fdi_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{12} (tech_NTM_{ij}) + \beta_{13} (nontech_NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(E) \quad fdi_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{12} (tech_NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

$$(F) \quad fdi_{ij} = \beta_0 + \beta_1 \ln(gdp_{ij}) + \beta_2 \ln(gtarriff_{ij}) + \beta_3 (dist_{ij}) + \beta_4 (contig_{ij}) + \beta_5 (comlang_off_{ij}) + \beta_6 (colony_{ij}) + \beta_7 (landlocked_{ij}) + \beta_8 (rtarr_{ij}) + \beta_9 (doingbiz_{ij}) + \beta_{10} (lsci_{ij}) + \beta_{13} (nontech_NTM_{ij}) + D_i + D_j + D_t + \varepsilon_{ij}$$

Definition, data sources and expected signs of all the factors included in the model are summarized in Table 1. Fixed-effects for reporter, trading partner and year (D_i , D_j and D_t) are included in order to account for country, partner and year heterogeneity as well as to increase estimation efficiency. Robust standard errors are clustered by country pairs with more than 100 reporting economies.

Table 1: Data source, definition, treatment, source and expected sign

Variable	Definition	Data Treatment	Source
m_{ij}	Bilateral imports of reporting country i from exporting country j	Zero is replaced with 0.0001 in natural log form to avoid omission of observation	World Integrated Trade Solution (WITS)
fdi_{ij}	Bilateral FDI instocks of reporting country i from source country j	Truncated at zero i.e. negative FDI are replaced with zero. Zero is replaced with 0.0001 in natural log form to avoid omission of observation	UNCTAD
gdp_i/gdp_j	economic mass of country i and j respectively	N/A	World Development Indicators (WDI)
$gtarriff_{ij}$	Geometric average tariff factor (1+rate) that each reporting country (i) charges to its trade partner (j) and vice versa, which can be expressed by $gtarriff_{ij} = \sqrt{tariff_{ij} \times tariff_{ji}}$	N/A	Author's calculation based on WITS
$dist_{ij}$	Geographical distance between country i and j.	N/A	CEPII
$contig_{ij}$	Dummy variable of contiguity equal to 1 if country i and j share a common border and zero otherwise.	N/A	CEPII
$comlang_off_{ij}$	Dummy variable of common language equal to 1 if country i and j use the same common official language and zero otherwise.	N/A	CEPII

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<https://www.unescap.org/publications/APTIR2019>

Variable	Definition	Data Treatment	Source
$colony_{ij}$	Dummy variable equal to 1 if country i and j were ever in colonial relationship and zero otherwise.	N/A	CEPII
$landlocked_{ij}$	Dummy variable equal to 1 if either country i or j is landlocked and zero otherwise.	N/A	CEPII
rta_{ij}	Dummy variable equal to 1 if country i and j are members of the same regional trade agreement and zero otherwise.	Latest definition in 2015	De Sousa, J. (2012)
$doingbiz_{ij}$	Average doing business score (distance to frontier) of i and j	N/A	Author's calculation based on Doing Business
$lsci_{ij}$	Average liner connectivity index of i and j	N/A	Author's calculation based on UNCTAD
NTM_{ij}	Simple average number of NTM measures of country i to exports of country j. NTMs measures are classified into 2 types as: (a) technical measures ($tech_NTM_{ij}$), and (b) non-technical measures ($nontech_NTM_{ij}$)	N/A	Author's calculation based on UNCTAD

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