Session 6

Analysis of NTMs

Quantitative Assessments

Outline

- Econometric Methods to assess the impact on NTMs
  - Effects on Trade
  - Effect on Prices (AVE)

- Specific studies (Some diagrams on NTMs)
  - Supply and demand curves

- Identify some promising research areas on NTMs

Economic effects of NTMs

- Analyzing the effects of specific NTMs in a supply and demand framework.

- NTMs have different effects depending on their type.

    Some examples:

    – Tariff-like measures (prices and then quantities imported)

    – Quotas, subsidies (quantity imported, or exported and then prices)

    – Standards (cost to producers but also benefits to consumers)

Quantitative Methods for assessing price and trade effects

How to measure the impact of NTM on prices or trade costs?

- Price gaps (specific markets)
  - Relying on detailed price data

- Econometric methods
  - Gravity-type models
  - Ad Valorem equivalents (average effects)

- Once you have prices or quantities you can infer the other by using import demand elasticities.

Price Gap Methods (handicraft methods)

- Identification relies on domestic vs international prices

- Requires good data on price determinants to isolate the effects of NTMs (i.e. how precise is other costs?)

$$AVE_k = \frac{P_k^d}{P_k^w} - (1 + t_k + C_k)$$

	$$$	Tariff	Other costs	
Pd	120	10%	2%	AVE = 8.0%
Pw	100			

- Reference paper: Ferrantino OECD paper, 2006

Econometric methods (mass produced estimates)

- Same principle as price gap method.
  - Control for everything possible.
  - …but through econometric methods
    - Effects on NTMs (as unobserved trade costs) is what is left after all possible controls
    - Or NTMs are captured by a variable (dummy) controlling for other determinants of Trade

Another difference vs price gap methods

- Identification is not based on domestic prices (for which the NTMs is assumed not to have any effect)
- …but on a 3rd country price with no NTMs.

  Advantages:
  - Identification relies on trade data, generally available
    - No need of domestic price data as in price gap
  - But under the assumption that other costs are captured by gravity type variables, or captured by f.e.

Trade effects of NTMs. The general econometric specification:

- $lnX_{ijt}^k = \beta_1 NTM_{ijt}^k + \beta_2 \ln(1 + t_{ij}^k) + \sum_z \gamma_z G_{ij}^k + \epsilon_{ijt}^k$

- Simple gravity model (B1 is the effect on imports)
  - Basically does B1 has a significant effect in distorting trade?
  - Estimation is often constrained by
    - data limitation (cross-section)
    - NTMs are generally not bilateral

  - Identification strategies:
    - Presence of NTMs in imports from C across countries
      - See differences in imports of apples to A and B (no ntm).
    - Presence of NTMs imports of products within a sector
      - See differences in exports of apples vs pears (no ntm) in A

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Methods to address usual problems

Econometrics:

- Trade policy is endogenous
  - Instrumental variables
- Zero trade flows
  - ML estimators / Heckman 2 steps
- Country and/or product specific differences
  - Fixed effects
- Multilateral resistance terms in cross section.
  - Baier Bergstrand Mariutto 2014 RIE.

Distortionary effects of NTMs

In general captured by interaction terms. Eg

- $Tr_{g,k,i} = \alpha + \beta G'_k + \gamma_1 DA_{g,k} + \gamma_2 t_{g,k,i} + \gamma_3\, pm_{g,k,i} + \gamma_4 NTM_{g,i} + \gamma_5 LDC_k + \gamma_6(NTM_{g,i} * LDC_k) + z_g + \omega_{4d} + \varphi_{g,k,i}$

- Run at aggregated level, with HS 6 digit observations and product f.e..
- Identification across sector (4 digit)
  - NTM / no NTM within fruits (apples and pears).
- And/or across importers
- So LDCs trade is less distorted in products or destinations without NTMs?
- Reference paper: Disdier A.-C., Fontagné L., Mimouni M., AJAA (2008), Nicita and Seiermann UNCTAD (2017).

What is the NTM variable in regression models?

- Binary (presence/absence of NTMs (or broad groups))
  - Most papers

- Frequency indices - Essaji (JIE 2008).
  - E.g Percentage of HS8 lines that have NTMs in a sector (HS6).
    - Or HS6 in an HS2 sector (if regression at hs2)

- Discrete/categorical (e.g. # of NTMS, reg distance)
  - Nicita and Murina (WE 2017). Cadot et al. UNCTAD (2015).
    - Need to control for sector specific regulatory differences.
    - Assumption that effects are linear (4ntm double than 2)

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Using Firm level data

- Same basic model (dummies and interactions), but with micro level data, controlling for how much it is possible.

So, the estimated equation is:

$$y_{i,s,j,t} = \alpha + \beta_1 TBT_{s,j,t} + \beta_2 (TBT_{s,j,t}) * I_{i,s,1995}(k_{i,s,1995} > \bar{k}) + \beta_3 I_{i,s,1995}(k_{i,s,1995} > \bar{k})$$
$$+ \beta_4 (TBT_{s,j,t} * ln(size)_{i,1995}) + \beta_5 (TBT_{s,j,t} * Domestic_{i,s,1995}) + \beta_6 Domestic_{i,s,1995}$$
$$+ \beta_7 (TBT_{s,j,t} * Visibility_{i,HS2,j,1995}) + \beta_8 Visibility_{i,HS2,j,1995}$$
$$+ \beta_9 Ln(tariff + 1)_{s,j,t} + \phi_{HS2,t,j} + \mu_i + \varepsilon_{i,s,j,t}, \tag{1}$$

where the subscripts i, s, j, and t respectively denote firm, HS 4-digit product category (or 2-digit sector if HS2), destination country, and year.

- Fontagné and Orefice, (2018). *Let's try next door: Technical Barriers to Trade and multi-destination firms*, EER

Price effects of NTMs, Ad Valorem equivalent

- Econometric models
  - Gravity model on prices (NTMs modeled as trade costs)
  - Factor endowment models (instead of F.E. uses factor endowments). Data is not bilateral (import side).

- To obtain AVE of NTMs
  - Identified across countries (or better across time, if possible)
  - By the presence of absence of NTMs.
  - Controlling for other factors

Reliability of Estimates

- One problem, Estimates are based on cross section!
  - Because NTM data is generally not time series
  - Standards errors are generally large
  - Also Data may have problems, measurement error

- Assumptions may not be realistic for some markets
  - Market for apples may not follow a gravity framework, or a factor endowment model
- Still, Aggregated estimates often reasonable,

- Rule of Thumb. Use of these estimates to infer average costs by sector/country, not by product.

Traditional method of estimating AVEs

- Reference paper: Kee, Nicita, Olarreaga (EJ 2009)

$$\ln m_{n,c} - \varepsilon_{n,c} \ln(1 + t_{n,c}) = \alpha_n + \sum_k \alpha_{n,k} C_c^k + \beta_{n,c}^{\text{Core}} Core_{n,c} + \beta_{n,c}^{\text{DS}} \ln DS_{n,c} + \kappa_{n,c}.$$

- Where the terms of "Core" NTMs and Domestic support are interacted with factor endowments, so as to capture the effect by country

- Once we have the quantity impact, we calculated the AVE using import demand elasticities from another paper.

Newer specifications for bilateral effects

- Based on Gravity models:
  - Bilateral Data
  - Price effect directly from econometric estimation

  Cadot and Gourdon (RWE 2016). Bilateral on prices

$$\ln v_{odp} = \delta_o + \delta_d + \beta_1^A n_{dp}^A + \beta_1^B n_{dp}^B + \beta_1^{other} n_{dp}^{other} + \beta_2 \ln\left(1 + t_{odp}\right) + \mathbf{x}_{od}\gamma + u_{odp}$$

- Disadvantages:
  - price data is not as clean (not recorded but imputed from value and quantities).
  - Gravity models on prices may not be fitting too well

Quantity based estimations, bilateral effects

- $\ln E(Q_{nij}|X) = \beta_n + \beta_{nij}^t \hat{t}_{nij} + \beta_{nij}^{NTM} \widehat{NTM}_{nij} + \gamma Z_{ij} + e_{nji}$

  – where $\qquad\qquad \beta_{nij}^t = \beta_n^t + \beta_1^t share_{ni} + \beta_2^t share_{nj}$

  – and $\qquad \beta_{nij}^{NTM} = \beta_n^{NTM} + \beta_1^{NTM} share_{ni} + \beta_2^{NTM} share_{nj}$

- **In this setup the elasticity of trade with respect to tariff is:**

  – $\hat{\beta}_{nij}^t = \dfrac{\partial \ln(E(Q_{nij}|X)}{\partial t_{nij}}$, **and the AVE**

  – $AVE_{nij}^{NTM} = \dfrac{\exp\left(\hat{\beta}_{nij}^{NTM}\right) - 1}{\exp\left(\hat{\beta}_{nij}^t\right) - 1} \cong \dfrac{\hat{\beta}_{nij}^{NTM}}{\hat{\beta}_{nij}^t}$ **for small** $\hat{\beta}_{nij}^t$ **and** $\hat{\beta}_{nij}^{NTM}$.

In more intuitive terms:

- Two steps:
  - the first step is to construct the proportionate change in quantity imported due to the presence of NTMs
  - and then use the elasticity of trade with respect to one percentage point increase in the tariff to convert the proportionate change in quantity imported due to NTMs in terms of ad valorem equivalents.
- That is, the AVEs are computed as the equivalent tariff that would be necessary to impose in order to obtain the same proportionate change in quantity imported due to the presence of NTMs.
- Reference paper: Kee and Nicita (WB draft)

Details and Assumptions:

Econometric estimation on types of NTMs:

- Two distinct AVEs (technical and non-technical measures), estimated within the same equation. More than that and you likely to incur in a lot of collinearity problems

Bilateral estimates AVE should be different as they capture compliance costs:

- Bilateral variations in the AVE estimates are calculated on some strong assumptions.
    - I.e. NTMs are a function of importers' and exporters' market power.

Caveats:

- AVE of NTMs that results in zero trade flows cannot be estimated
- In general, the estimation strategy does not account for the positive effects of NTMs on international trade. Positive effects may happen when NTMs address information issues, or guarantee quality of products. In these cases the AVE of NTMs is set to zero, rather than to a negative value.

Policy expectations vs econometric constraints

Policymakers may be interested in knowing the very effect on a specific NTMs on a specific product.

E.g. Impact of Labeling requirement on price of pork

- Econometrically impossible
    - Maybe using time series information (pre-post data)
    - Very hard because of collinearity / multistacking
        - E.g. In general cannot reliably distinguish the effect of A1 from A2, or even SPS from TBT

- Very detailed case specific studies may be better suited, but require great knowledge of the economic sector and economic conditions.

Beyond econometrics: More detailed methods, Cost benefit analysis

- Very relevant for standards type of measures where there could be benefits or positive externalities
  - Evolution of Price gap methods
  - Studies are very specific (product countries NTMs).

Reference Paper: van Tongeren, F., J. Beghin and S. Marette (2009), "A Cost-Benefit Framework for the Assessment of Non-Tariff Measures in Agro-Food Trade", OECD Working Paper, No. 21,

"The framework comprises "modules" for calculation of cost and benefits affecting (a) domestic consumers, (b) domestic producers, (c) domestic government, and (d) foreign producers. "

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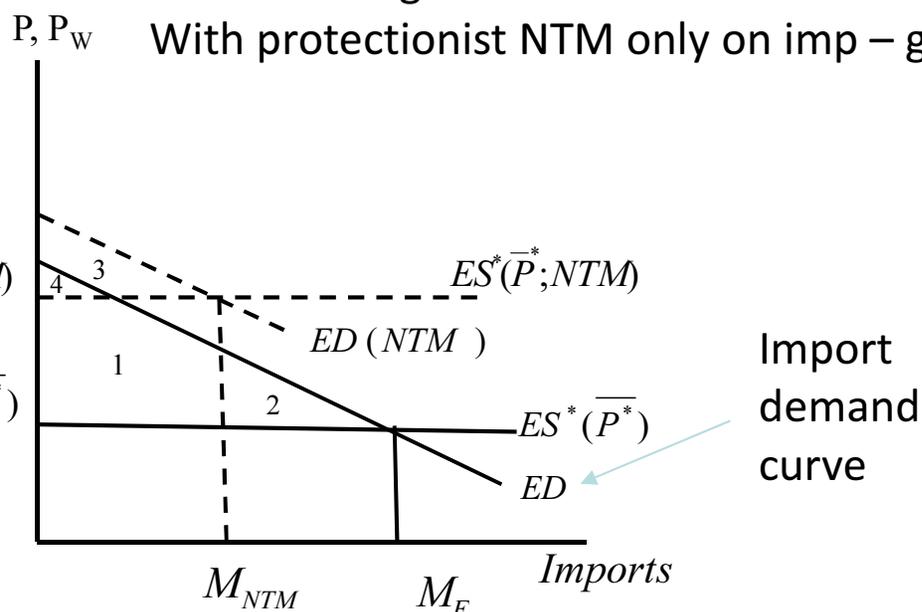
  "The framework comprises "modules" for calculation of cost and benefits affecting (a) domestic consumers, (b) domestic producers, (c) domestic government, and (d) foreign producers. "

Cost raising technical measure. Costs
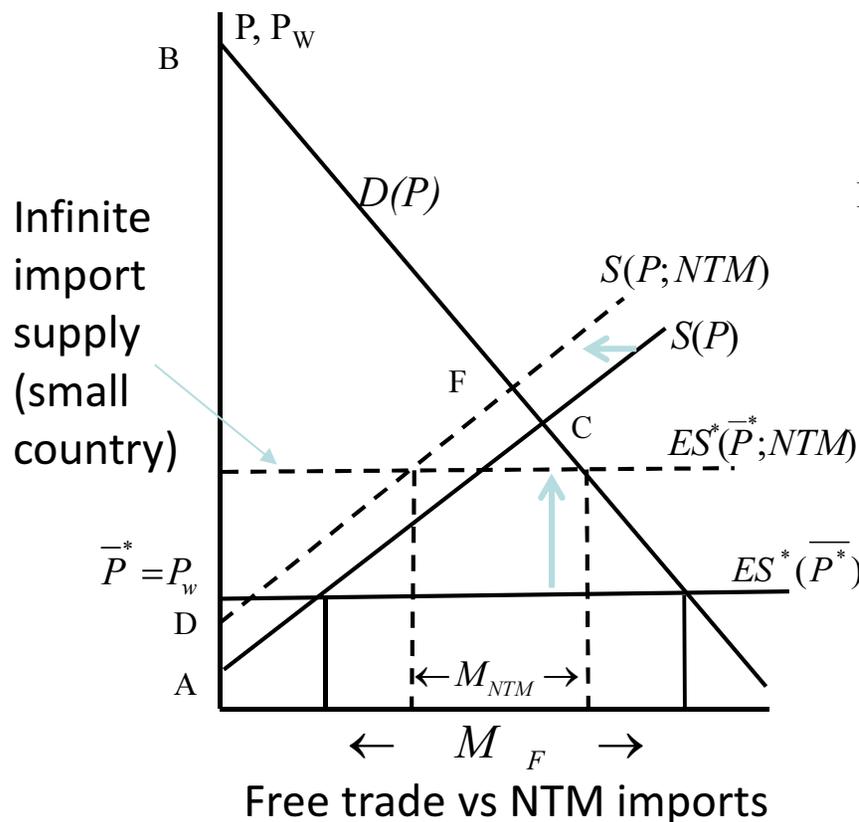
No-NTM – gains from trade 1+2+4
With NTM – gains from trade 3+4
With protectionist NTM only on imp – gains 4

P, P$_W$

B

Infinite import supply (small country)

$D(P)$

$S(P;NTM)$

$S(P)$

F

C

$ES^*(\overline{P}^*;NTM)$

$\overline{P}^* = P_w$

$ES^*(\overline{P}^*)$

D

A

$\leftarrow M_{NTM} \rightarrow$

$\leftarrow M_F \rightarrow$

Free trade vs NTM imports

P, P$_W$

4

3

$ES^*(\overline{P}^*;NTM)$

$ED\,(NTM\,)$

1

2

$ES^*(\overline{P}^*)$
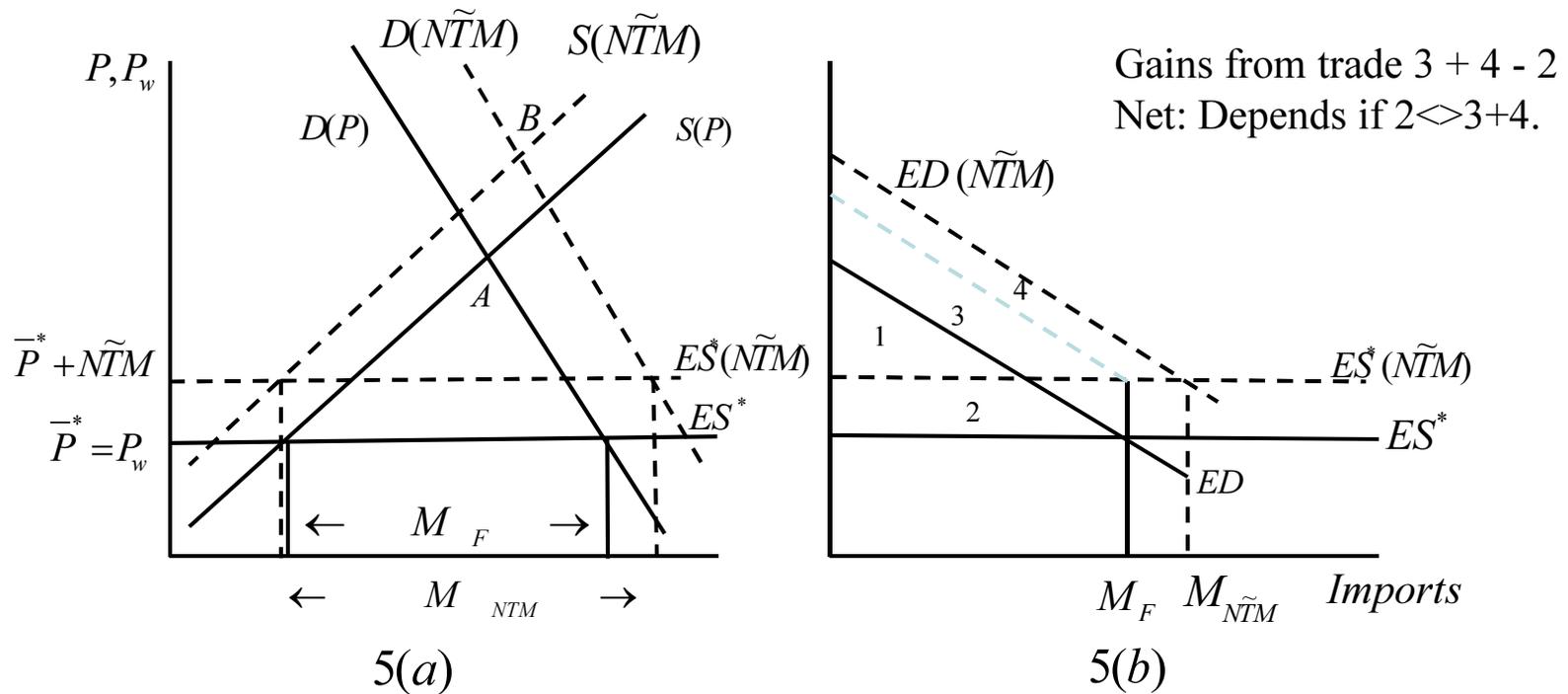
ED

M_{NTM}

M_F

Imports

Import demand curve

NTM affect both domestic and foreigner supply. But costs (shifts) are different. In the figure domestic firms have lower costs of compliance … but could be the opposite, and trade would increase.

Cost raising technical measure. Demand effect

NTM increases prices but also demand, because of information externalities

$D(\widetilde{NTM})$ $S(\widetilde{NTM})$

P, P_w

$D(P)$ B $S(P)$

A

$\overline{P}^* + \widetilde{NTM}$ $E\widetilde{S}^*(\widetilde{NTM})$

ES^*

$\overline{P}^* = P_w$

$\leftarrow$ M_F $\rightarrow$

$\leftarrow$ M_{NTM} $\rightarrow$

5(a)

Gains from trade 3 + 4 - 2
Net: Depends if 2<>3+4.

$ED(\widetilde{NTM})$

1 3 4

2 $E\widetilde{S}^*(\widetilde{NTM})$

ES^*

ED

M_F $M_{\widetilde{NTM}}$ Imports

5(b)

In the figure, imports increase, domestic supply not so
Whether is welfare enhancing depends how much costs (ESntm)
and positive externalities (EDntm).

Effects of NTMs on supply and demands:

- Diagram can be useful to analyze prices and quantity effects of NTMs.
  - But requires a lot of information on how much supply shifts
    - Can be inferred by cost of compliance
      - Foreign vs domestic, foreign vs foreign
    - Information on slopes of supply curves

  - Requires information about demand externalities.
    - Impact of NTMs on demand
      - Can be observed? Maybe but only ex-post imposition.

Some areas of research

- Not in order of importance

- But in order
  - of difficulty (easier 1st),
  - novelty (more novel, last).

1ˢᵗ Research Area. Quantifying costs of NTMs and trade effects

Crowded area, but always useful, now with better data -> better estimates.

- Trade effects on imports and exports
    - Gravity modeling.
- Price effects
    - Ad-Valorem equivalents

- Policy messages from this type of analysis:
    - Overall effects of NTMs, but can still reliably tell which sectors are more distorted because of NTMs. So as to minimize costs.

2nd Research Area. Focus on Distortionary effects (relative effects)

- Distortionary/Discriminatory effects of NTMs
  - Differences in compliance costs (e.g. standards)
    - Find a good way of assessing bilateral AVE
      - Country level costs of NTMs may be different
      - Firm level

  - Policy messages:
    - Impact of NTMs on various countries and firms
    - Relates firms characteristics with ease of compliance.
    - May be more appropriate to direct aid for trade and trade facilitations initiatives

3rd Research Area: Regional integration and NTMs

Harmonization of NTMs (very specific to standards)

- Regional integration
    - Identify particularly relevant types of NTMs that pose uneven burdens on RTAs members
    - Or comparison with international standards
    - Needs good measure of regulatory distance

Policy messages:

can tell whether markets are segmented because of NTMs and whether harmonization could make sense, at least in terms of increasing trade

4th Research Area, distribution of costs

Decomposition of costs (and benefits) of NTMs.

Not many studies on this.

- Identify: who is paying for the compliance with of NTMs.
  - Producers vs consumers, Importers vs exporters
    - Identify costs of NTMs, then…
    - Price pass thru elasticities (estimated separately)
    - Requires good information on market structure
- Effects of NTMs on market structure
  - Fix and variable costs
  - Competition: entry costs

- Policy messages: identify some winners and losers (e.g. small firms, consumers, foreign producers)

5th Research Area: sustainable development

- NTMs and sustainable development

  - Hard to look at all SDGs. But easier to investigate direct impact of some NTMs on some SDGs.
    - Inequality -> NTMs impact on labor markets
    - Environment -> NTMs impact on CO2 emissions

  - Very hard: Economic Costs vs Social Benefits related to SDGs
    - Cost benefit analysis of specific NTMs

  - Even harder: NTMs cross border externalities: do act as enforcement mechanism to support SDGs?