

**Does Gravity Apply to Intangibles?**  
**Measuring openness**  
**in services trade**

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# Preview

- Background: services are a huge part of the economic landscape
- Our contributions
  - New global panel dataset (to be posted)
  - New theoretical estimating framework linking trade and FDI in services in a set of gravity-based estimating equations. This will be fruitful as more data become available.
  - New theoretical framework leading to an “aggregate” estimating equation (general trade resistance based on trade with world), accommodating our severe data limitations
  - Robustness checks with limited bilateral data suggest aggregate approach is consistent
  - We provide estimates of openness to services trade and FDI, and the impact of regulation in this context
  - Back of the envelope calculations suggest trade cost equivalents are large

# Overview

- Background and motivation
- Services barriers: approaches to measurement and related literature
- Estimating framework
- Empirical results
- Summary and conclusions

# Background and motivation

## Services

intangible

non-storable

differentiation

joint production (trade and FDI interaction)

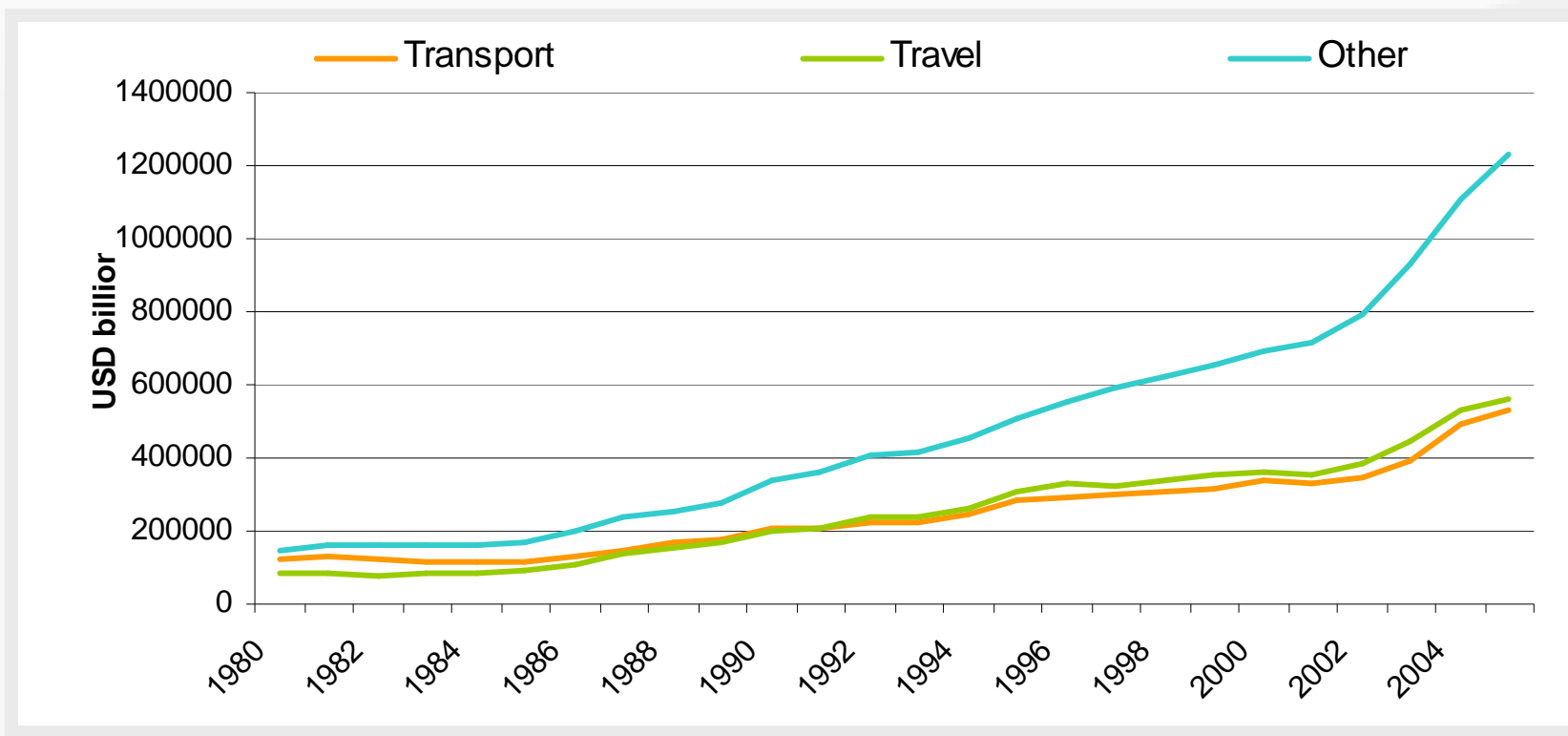
requires producer-consumer interaction

bound versus unbound services (Bhagwati)

technical change has fostered offshoring

## Trade in services

technological progress & splintering have led to a rise in trade in services



Source: IMF BOP.

## Service imports in percent of GDP

	Total Services		Other services	
	1994	2004	1994	2004
<b>all countries</b>	11.0	12.0	4.6	5.1
<b>high income</b>	8.0	12.7	3.3	6.7
<b>upper middle income</b>	11.4	12.8	4.5	5.3
<b>middle income</b>	10.3	11.6	4.2	4.6
<b>lower middle income</b>	13.6	11.4	6.5	4.9
<b>low income</b>	11.7	11.2	4.4	3.8

Source: IMF BOP.

However...

**Balance of payments statistics miss a great part of trade in services;  
4 modes of provision (GATS):**

- ***Mode 1 – Cross-border:*** services supplied from the territory of one country into the territory of another.
- ***Mode 2 – Consumption abroad:*** services supplied in the territory of a nation to the consumers of another.
- ***Mode 3 – Commercial presence:*** services supplied through any type of business or professional establishment of one country in the territory of another (i.e., FDI).
- ***Mode 4 – Presence of natural persons:*** services supplied by nationals of a country in the territory of another.

## Estimates & Guesstimates

Definition		Source	Measurement	1997	2001
				USD billion	
Mode 1	cross-border trade	BOP	ok	890	1000
Mode 2	consumer movement	BOP	partly ok	430	500
Mode 3	commercial presence	FATS	statistics mostly missing	820	2000
Mode 4	producer movement	??	definition not clear	30	50
Total services				2170	3550
Total merchandise exports				5488	6009

Source: World Bank, 2003 and IMF, 2003

# Services Barriers: concepts & related literature

## Types of Barriers to Trade in Services:

services are generally intangible, and so barriers to trade take various, often hidden forms

- prohibitions
- quotas
- government regulations (standards, licenses, procurement)
- price-based instruments
- discriminatory access to distribution networks
- ownership restrictions on FDI

## Approaches to measuring barriers:

- Frequency measures: identify specific policies, count them and use as regressors (often focus on price-cost margins);
  - (--) no information on economic severity of the measure / barrier
- Indirect approaches: calculate price-cost margins or gravity model to obtain “trade potential” and get “tariff equivalent” of barriers from this;
  - (--) cannot attribute this to specific policies without data on policies for use in decomposition

## Existing studies:

Hoekman 1996 (Martin and Winters book on Doha Round)

- market access for services
- frequency ratios
- benchmarks tariff equivalents in the range of 200% (i.e. transport) to 20%- 50%

→ Hardin and Holmes 1997

- weighted index on FDI restrictions

→ Australian Productivity Commission: augmented frequency indexes for a number of sectors and countries

→ Golub 2003 (OECD)

- FDI, 7 sectors, OECD members
- weighted index on FDI restrictions
- electricity, transport, telecomm most restricted

## Existing studies:

- Dihel and Sheperd 2007 (OECD)
  - FDI, 7 sectors, Transition+LA+Asia+ME
  - weighted index on FDI restrictions
  - + estimation of tariff equ. based on price-cost margins
  - Results differ greatly between sectors
  
- UNCTAD 2006
  - FDI, OECD methodology, Transition+LA+Asia+Africa
  - GATS schedules are bad predictor of openness
  - Transition+LA: more open

## Existing studies:

- Francois 1993 (*IEJ*), 1999, 2001 (EC report, CEPR book on Doha/Millennium Round), also 2005 (Francois, van Meijl and van Tongeren, *EP*)
  - gravity model
  - bilateral data on cross border trade
  - HKG+SGP: free trade benchmarks
  - “potential” → “NTB”
  - converts this to tariff equivalents based on assumed demand elasticities

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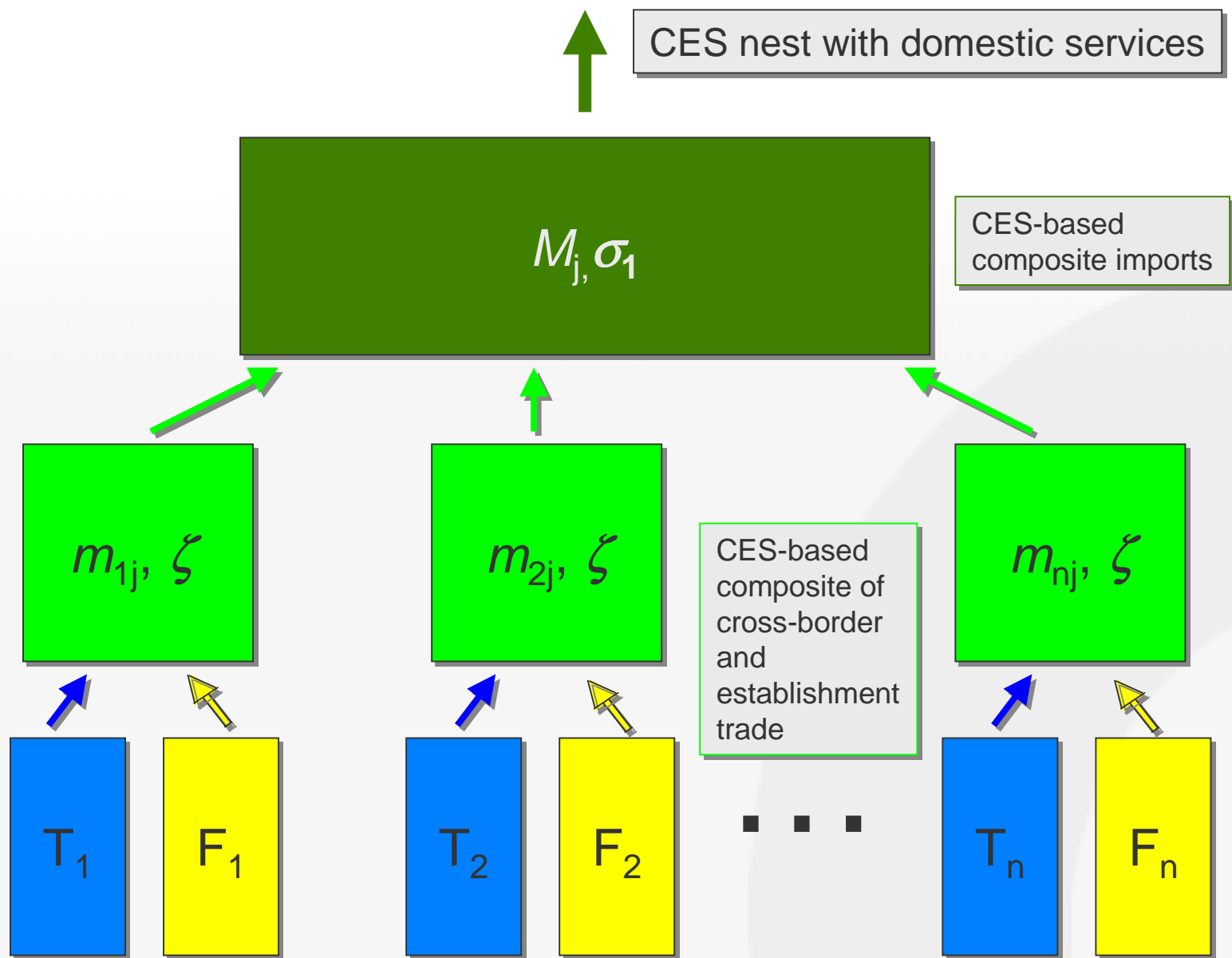
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## **Estimating framework:**

**CES-based estimation of overall  
openness (essentially a multilateral  
resistance measure)**

**A motivation for gravity modeling of FDI**



Demand for services of sector  $j$  is expressed by a CES aggregator over imported and domestic services:

$$(1) \quad Q_j = A \left[ \beta_{mj} M_j^{\rho_{j2}} + \beta_{dj} D_j^{\rho_{j2}} \right]^{1/\rho_{j2}} \quad 1 > \rho_{j2} > 0$$

where 
$$M_j = \left[ \sum_i \alpha_{ij} m_{ij}^{\rho_{j1}} \right]^{1/\rho_{j1}} \quad 1 > \rho_{j1} > 0 .$$

Maximizing  $Q_j$  at given level of expenditure  $E_j$ , total import demand  $V_j$  equals:

$$(2) \quad V_j = Q_j \left( \frac{\beta_{mj}}{\tau_j} \right)^{\sigma_{j2}} P_{Mj}^{1-\sigma_{j2}} P_{Qj}^{\sigma_{j2}}$$

We add distance-related cost factors  $\gamma_{ij}$ :

$$(3) \quad P_{Mj} = \left[ \sum_i \alpha_{ij}^{\sigma_{j1}} \gamma_{ij}^{1-\sigma_{j1}} \right]^{1/(1-\sigma_{j1})}$$

Additionally we assume policy related cost factors  $\tau_j$ .

Normalize so that  $P_{Qj}=1$ , we get:

$$(4) \quad V_j = Q_j \left( \frac{\beta_{mj}}{\tau_j} \right)^{\sigma_{j2}} \left[ \sum_i \alpha_{ij}^{\sigma_{j1}} \gamma_{ij}^{1-\sigma_{j1}} \right]^{(1-\sigma_{j2})/(1-\sigma_{j1})}$$

This gives us our basic estimating equation:

$$(5) \ln(V_j) = \ln(Q_j) + \sigma_{j2} \ln(\beta_{mj}) + (1 - \sigma_{j2}) / (1 - \sigma_{j1}) \ln \left( \sum_i \alpha_{ij}^{\sigma_{j1}} \gamma_{ij}^{1 - \sigma_{j1}} \right) - \sigma_{j2} \tau_j$$

- Total demand for services
- Total import expenditure weight
- Economic distance from sources of service supply
- Policy-based trade costs on service imports

Economic distance  
from sources of  
supply:  
See Baier &  
Bergstrand

HOWEVER, REMEMBER:

SERVICES ARE IMPORTED BY DIFFERENT MODES

We add establishment trade to the inner nest:

$$(6) \ m_{ij} = f_{ij}(F_{ij}, T_{ij}) = A \left( a_F (F_{ij})^\zeta + a_T (T_{ij})^\zeta \right)^{1/\zeta}, \quad 0 \leq \zeta \leq 1$$

where  $z=1/(1-\zeta)$  is the Allen-elasticity of substitution between affiliate sale  $F$  and cross border sales  $T$ .

Note: CES structure allows for net substitutes and gross complements

→ Link demand for  $F$  and  $T$  so that they become a function of changes in the price of cross-border imports and local affiliate imports.

# Empirics

# Estimation Approach

- Detailed “restricted” gravity estimates using trade-with-world at 11 sector level
- Gravity model is applied to cross-border trade & FDI data
- Country-fixed effects used to estimate tariff equivalents (Denmark and Luxembourg as benchmark) -- panel and pooling avoid the Deardorff criticism.
- Estimate contribution of regulatory indicators to our tariff equivalent estimates:
  - WB PMR
  - High Level OECD PMR
  - Medium Level OECD PMR
- Robustness checks with our more limited bilateral sample

## Data

- Data come from a new (and evolving) panel dataset merging trade and FDI data from various sources.
- Trade data (modes 1 and 2) from IMF BOP:
  - 1994-2004
  - 178 countries
  - 11 sectors
- OECD and national FDI data (mode 3):
  - 1994-2004
  - 30 countries
  - 11 sectors
- Distance data from CEPII
- Other data from World Bank WDI

We are beginning the process of supplementing bilateral data with national source, and constructing missing imports from mirror flows where available. Will be posted at <http://www.i4ide.org/>

# Gravity Results

Cross-Border	All sectors		Producer Services	
	All countries	OECD members	All countries	OECD members
Population	0.591 <i>7.87</i>	0.6696 <i>0.53</i>	0.6078 <i>4.86</i>	2.758 <i>1.41</i>
GDP p.c.	0.619 <i>8.91</i>	0.7796 <i>3.59</i>	0.6059 <i>6.49</i>	0.7357 <i>2.29</i>
Weighted Dist.	-1.1733 <i>-1.93</i>	-0.4212 <i>-0.3</i>	-1.8218 <i>-2.24</i>	-1.4824 <i>-0.7</i>
FDI	0.1606 <i>7.71</i>	0.0834 <i>4.06</i>	0.1849 <i>6.57</i>	0.0231 <i>0.77</i>
PMR	-0.008 <i>-0.29</i>	-0.1377 <i>-1.49</i>	-0.0212 <i>-0.59</i>	-0.1454 <i>-1.07</i>
Constant	9.3781 <i>1.68</i>	2.5894 <i>0.18</i>	15.1249 <i>2.02</i>	9.2215 <i>0.43</i>
R <sup>2</sup>	0.8706	0.9024	0.8685	0.8412
adj. R <sup>2</sup>	0.8686	0.8985	0.8651	0.8329
F-Stat	436.6	231.8	261.1	101.5
Obs.	13563	913	6611	666
Sector dummies	yes	yes	yes	yes

Note: iterative robust regressions; t-values below.

# Gravity Results

## FDI

	All sectors	Producer Serv
Population	3.3058 1.82	5.6059 2.5
GDP p.c.	0.9786 3.11	0.9133 2.49
Weighted Dist.	-3.4495 -1.66	-3.1268 -1.29
Cross-Border Trade	0.1364 4.98	0.1167 4.12
OECD-PMR	-1.001 -7.59	-1.1703 -7.73
Constant	21.2889 1.02	15.1766 0.61
R <sup>2</sup>	0.8545	0.8657
adj. R <sup>2</sup>	0.8487	0.8586
F-Stat	147.2	123.4
Obs.	913	666
Sector dummies	yes	yes

Note: iterative robust regressions; t-values below.

## Trade costs as a % of delivered service prices

### Cross-Border

	All Sectors		Producer Services	
	w/o control	PMR	w/o control	PMR
low inc.	20.33	22.90	23.52	27.09
med.-low inc.	16.69	17.72	25.72	28.49
middle inc.	19.46	18.79	16.97	20.86
med.-high inc.	16.54	15.94	17.20	19.45
high inc.	11.90	12.84	13.82	16.15

Based on an assumed trade substitution elasticity of 3.6

## Trade costs as a % of delivered service prices

(OECD only, controlling for product market regulation)

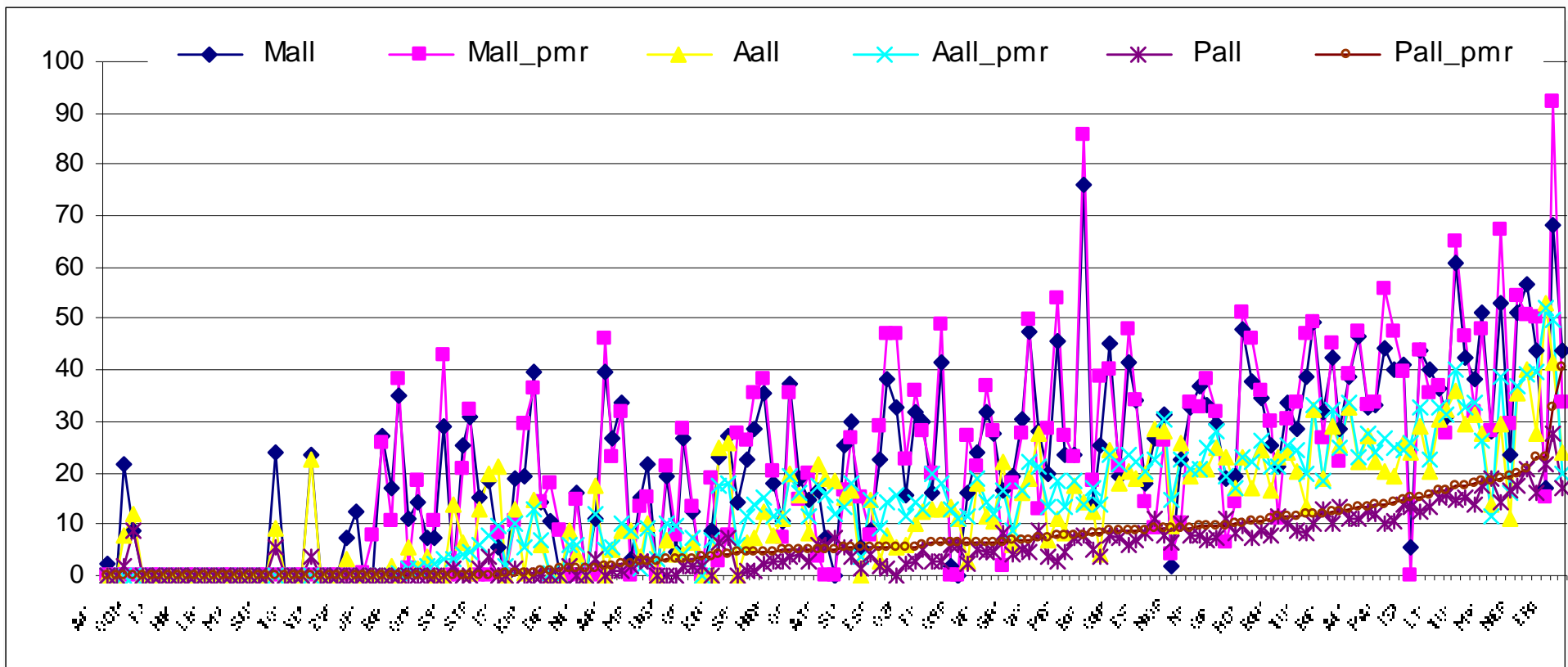
	All Sectors	Producer Services
AUT	§	16.79
FIN	9.39	4.17
FRA	10.19	76.85
IRL	§	§
JPN	15.46	86.06
KOR	9.15	76.37
MEX	23.36	84.92
SVK	9.74	9.87
USA	27.28	92.57

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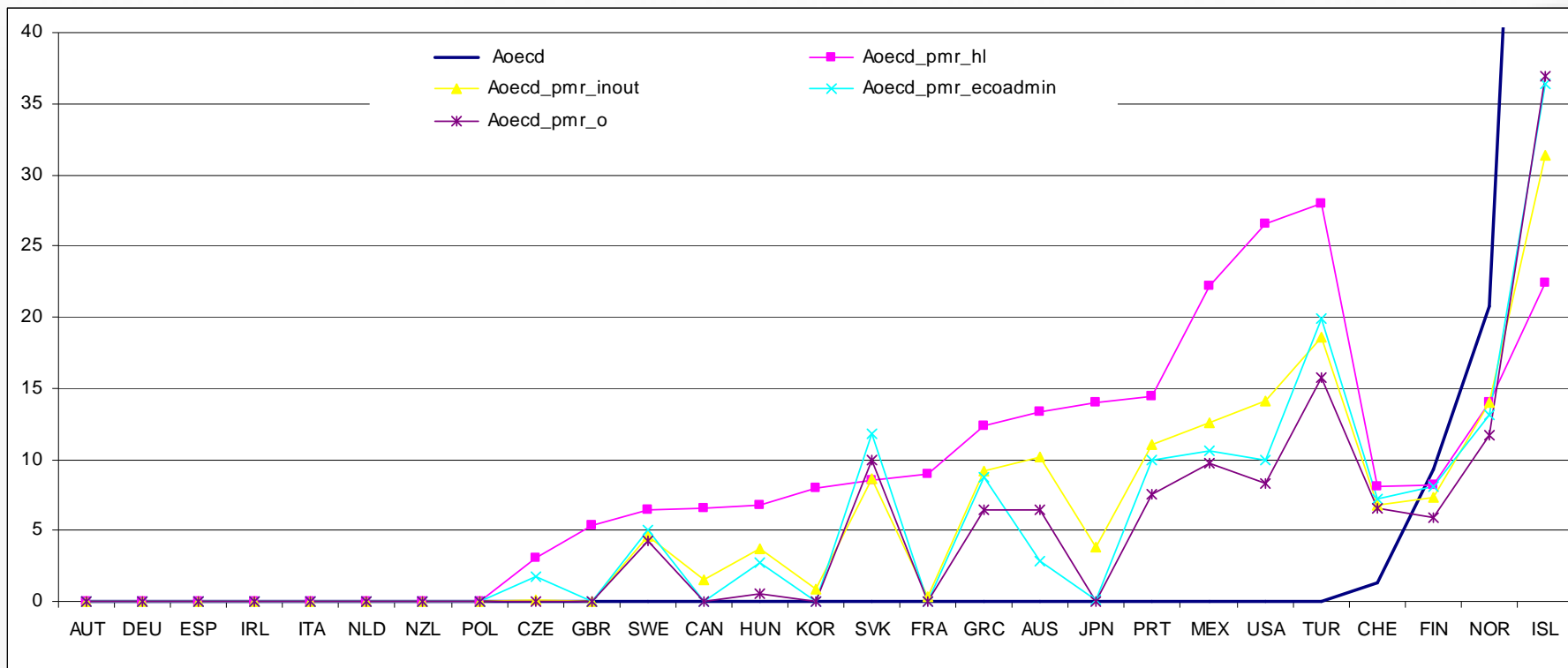
Note: iterative robust regressions; " § " indicates not significantly greater than zero at the .1 level

# Index of Protection in Cross-Border Trade

## (Sensitivity Analysis)

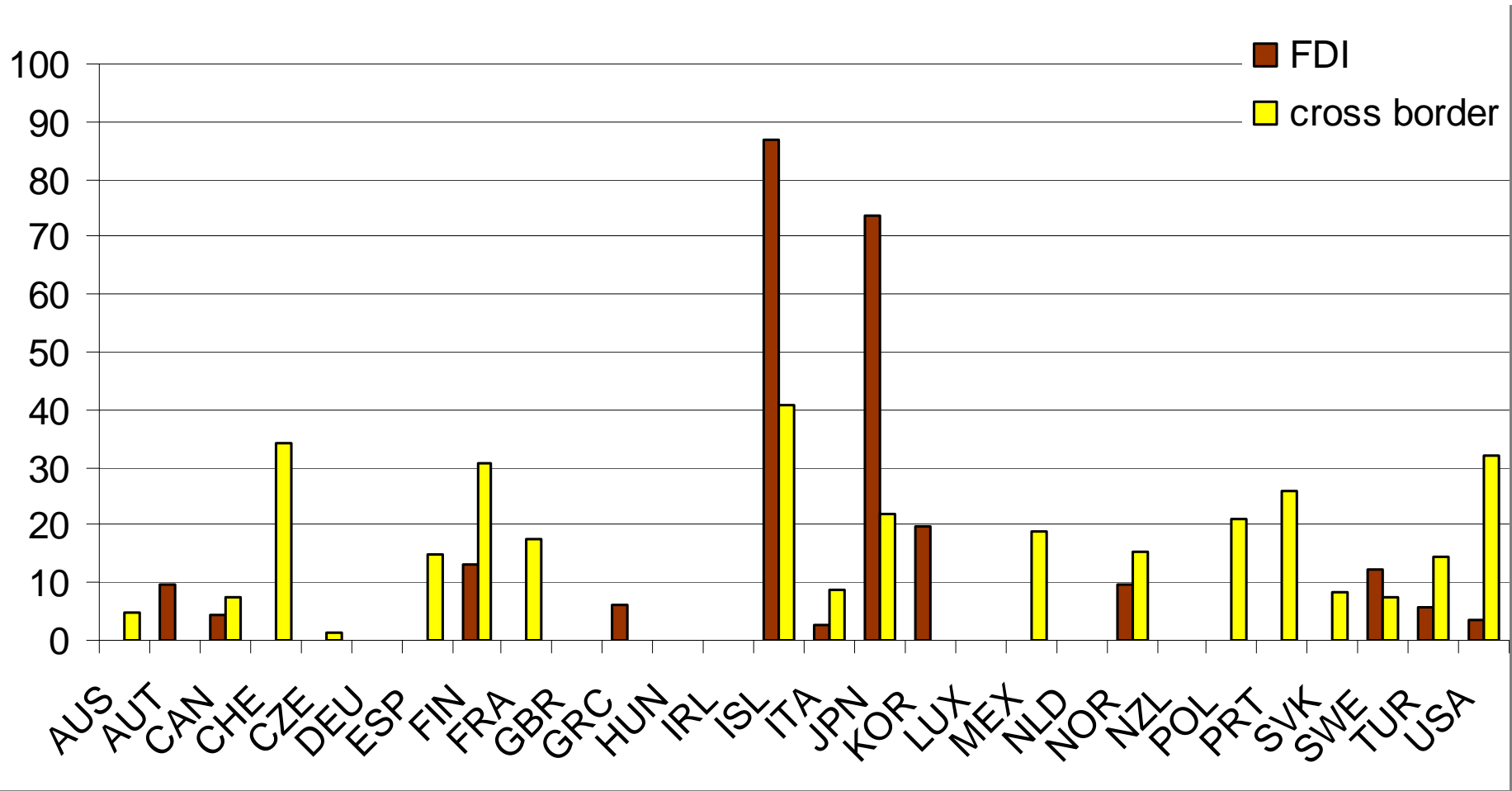


# Index of Protection in Cross-Border Trade (OECD only)

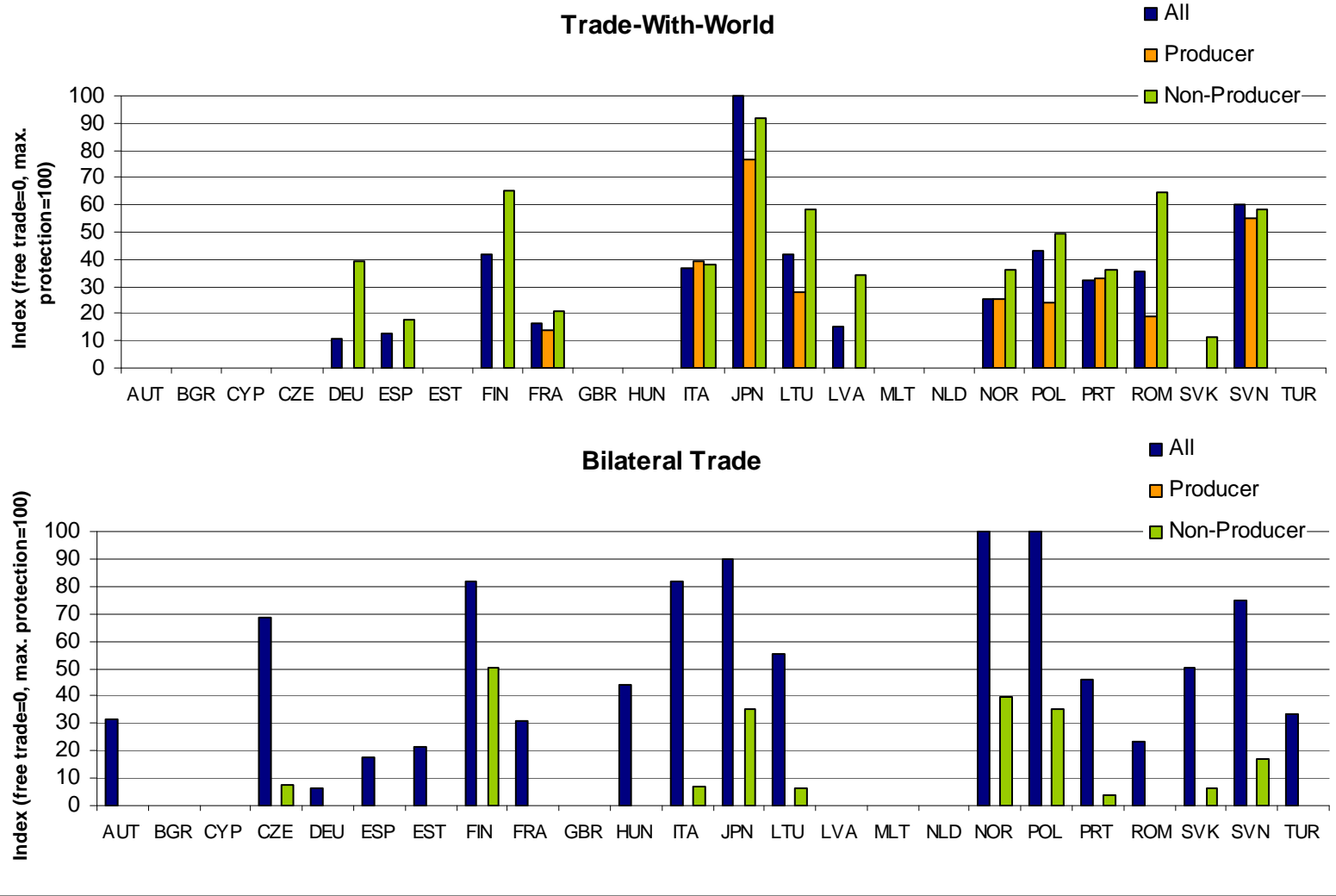


- Openness appears robust to regulatory regime: we seem to be identifying cross-border barriers that are broadly separable from domestic regulation
- Barriers are higher than remaining barriers on average for trade in goods
- Data limitations are severe

## Index of Relative Protection FDI vs Cross Border



# Robustness



Bilateral data source: Eurostat

# Conclusions and Summary

## Conclusions – Summary

- We believe trade in services is subject to severe barriers
- However, there is great difficulty in defining trade and barriers in services
- Even greater difficulty to estimate magnitude of trade barriers in services
- Existing studies mostly based on frequency ratios and for one mode only (often FDI)
- Important to view services trade as a composite of cross-border and through local affiliates

## Conclusions – Summary

- Countries that are restrictive in cross-border are often restrictive towards FDI as well
- Impact of regulatory measures on trade in services only significant in few countries -- this means there may not be much from regulatory scoring approaches
- Restrictions appear to be large -- results support expectations
- We still need to sort out conceptually the linkages between modes, regulation, discriminatory barriers, and gains from openness