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Trade impact of EU preferential policies: a meta-analysis of the literature

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‘THE TRADE IMPACT OF EUROPEAN UNION PREFERENTIAL POLICIES: AN ANALYSIS THROUGH GRAVITY MODELS’

Contents of the book

The book will consist of **eleven** chapters.

- **Foreword** – Giovanni Anania
- **Introduction** – Luca De Benedictis and Luca Salvatici

EU preferential policies and gravity model.

- **Evolution of the EU preferential trade policies** – Lars Nilsson
- **EU preferential margins: measurement and aggregation issues** – Maria Cipollina and Luca Salvatici
- **Gravity model** – Luca De Benedictis and Daria Taglioni
- **Trade impact of EU preferential policies: a meta-analysis of the literature** – Maria Cipollina and Filomena Pietrovito

Empirical analysis

- **Trade impact of EU preferences** – Maria Cipollina and Luca Salvatici
- **Agricultural trade impact of EU Generalized System of Preferences** – Francesco Aiello and Federica Demaria
- **Trade impact of Everything But Arms: 5 case studies** – Francesco Aiello and Paola Cardamone
- **Trade impact of EU preferences: an analysis with monthly data** – Paola Cardamone
- **Impact of preference erosion in the EU rice sector** – Alessandro Olper, Valentina Raimondi and Margherita Scoppola
- **Trade impact of EU preferences: the role of compliance costs** – Mariarosaria Agostino, Federica Demaria and Francesco Trivieri

Object : *UE trade preferences*

why preferential policies?

Because over the time a large number of preferential trade arrangements has been concluded between EU and developing countries in order to integrate them in world trade and to promote their economic growth.

The EU is part of a web of preferential trade relations with other countries and regional groupings, AND provides tariff reductions/eliminations to developing countries.

The gravity model has been regularly used to estimate the impact of EU preferential policies on trade flows.

Motivations (1/2)

- It is generally asserted that PTAs positively affect the trade growth between countries or group of countries involved in them

- However, the empirical literature has not been successful in finding clear evidence

- The results of these studies show disconcerting variance: the coefficients of PTAs are not stable, with widely varying estimates across studies

Motivations (2/2)

The studies report very different estimates since there is a significant difference in datasets, sample sizes, and independent variables.

The aim of this chapter is:

- *to provide a survey of a range of empirical studies using gravitation approach to estimate the impact of EU's PTAs on trade;*
- *to combine, explain, and summarize a large number of results using a meta-analysis approach.*

We cannot pretend to identify a clear and uncontroversial approach to the evaluation of PTAs impact using MA: our goal is (only) to provide an assessment of the methodological choices and possible (relative) biases induced by model specifications within the large and growing field of the literature using the gravity model!

The standard equation

- The standard gravity equation used to estimate the impact of EU's PTAs on trade is:

$$\ln T_{ij} = \beta_0 + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(Dist_{ij}) + \beta_4 X_{ij} + \gamma PTA_{ij} + \varepsilon_{ij}$$

T_{ij}: trade flow between EU and country j

$Y_{i(j)}$: GDP of EU or country j

$Dist_{ij}$: distance between EU and country j

X_{ij}: control variables

PTA_{ij}: variable for preferential trade agreements between EU and j

ε_{ij}: error term

PTAs can be measured by:

- dummy variables
- quantitative variables (preferential margins)

Different estimates of γ

Most studies typically assume a *dummy variable* to represent the preferential treatment effect and use aggregate trade data. As far as the EU is concerned, these studies report positive coefficients ranging between **4% and around 400%,**

BUT some specifications even find significant negative coefficients between **3% and more than 50%** (Caporale et al., 2009; Peridy, 2005; Ruiz and Villarubia, 2007; Nilsson, 2002; Martìnez-Zarzoso et al., 2009).

Recent works in empirical international trade call attention to the importance of the actual *preferential margin*(s) and the need to work on highly disaggregated data as in the case of Cardamone (2009), Emlingeret al. (2008), and Cipollina and Salvatici (2010).

Focusing on these literature (quantitative variable for preferential policy and disaggregated data), we survey an elasticity coefficient ranging between **0.67 and 15.9** (Cipollina and Salvatici, 2010; Francois et al., 2006; Manchin, 2006).

Sample selection

Our dataset includes papers:

- written in English
- embedding the relationship between PTAs and trade in a gravity framework
- considering the EU's trade

Papers were selected via extensive research in Google Scholar, EconLint, Web of Science, Scopus and cross-references

We used the following keywords to select papers:

- "preferential trade agreements"
- "gravity equation" or "gravity model"

in the title, abstract and in the text

Sample description

The dataset includes *36 papers*:

- 10 published in academic journals
- 26 working papers and unpublished studies

The dataset includes 1026 *estimates*:

- 638 obtained from *dummy variables* for PTAs

(for example, Oguledo and MacPhee, 1994; Nilsson, 2002; Peridy 2005; Persson and Wilhelmsson, 2005, 2006; Caporale et al., 2009; Martìnez-Zarzoso et al., 2009)

- 388 obtained from *quantitative variables* for PTAs

(for example, Francois et al., 2006; Manchin, 2006; Demaria, 2009; Nilsson and Matsson, 2009; Aiello and Cardamone, 2010; Aiello and Demaria, 2010; Cipollina and Salvatici, 2010)

Meta estimates of γ pooled across different studies (1)

Sample	Pooled Estimate (FIXED EFFECT)	Lower Bound of 95% CI	Upper Bound of 95% CI	p-value for H_0: no effect	Q-test (p-value)
Dummy for PTAs	0.02	-0.01	0.02	0.00	0.00
Preference margin	0.06	0.06	0.06	0.00	0.00

The null hypothesis is easily rejected, confirming the existence of an impact of PTAs on EU bilateral trade.

Looking at the fixed effects estimate, in the case of coefficients obtained by papers using a dummy variable as proxy for trade policy, we get that PTAs increase trade by around **2%** ,
while in the case of estimates associated to papers adopting quantitative variables for the measure of preferences, results indicate that an increase of 10% in preference margins implies an increase in trade of around **0.6%**.

Meta estimates of γ pooled across different studies (2)

Sample	Pooled Estimate (RANDOM EFFECT)	Lower Bound of 95% CI	Upper Bound of 95% CI	p-value for H_0: no effect	Q-test (p-value)
Dummy for PTAs	0.20	0.17	0.23	0.00	0.00
Preference margin	0.07	0.06	0.07	0.00	0.00

The random effects estimate indicates an increase up to **22%** when the dummy variable is used in the analysis, and an elasticity coefficient of **0.7%** if the preference margin increase of 10%, when an explicit measure for the preferential policy is used.

However, considering the high heterogeneity in our sample of estimates, we should look at the more appropriate random effects results.

Meta estimates of γ pooled across different studies (3)

Sample	Random effects				
	ACP	EBA	Euro-Med	GSP	GSP-Plus
Dummy for PTAs	0.66***	-0.33**	0.05	0.14***	1.32
Preference margin	0.03***	0.02**	0.01	0.02***	-0.01

The results in literature differ also among preferential schemes: ACP, EBA, Euro-Med, GSP, GSP-Plus.

PTAs have an effect on trade which is statistically significant, except for **GSP-Plus and Euro-Med**.

-dummy for the presence of PTAs: the smaller random effect in the case of **EBA** indicates that such scheme **decrease trade by 28%,** whereas the largest effect estimate of the Cotonou agreement for **ACP** countries indicates an **increase in trade of more than 90%.**

-explicit measure for margin of preference: there is evidence of an impact of **GSP, ACP and EBA** on bilateral trade with an elasticity coefficient ranging between **0.02 and 0.03**, implying that a 10% increase in the preference margin increases trade by around 2-3%.

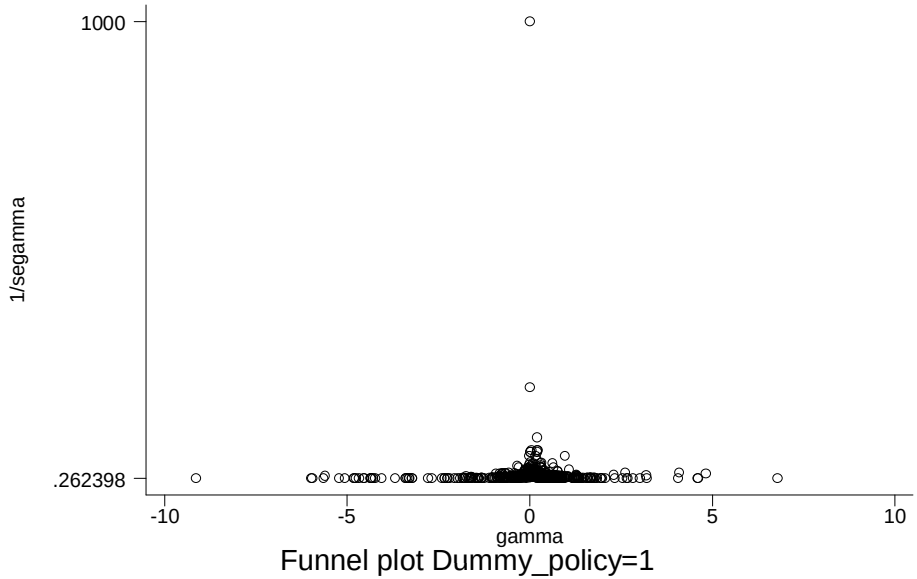
Selection problems

One of the criticisms of meta-analysis is that the quality of studies included in the dataset can vary considerably and thus papers that have strong methodological or empirical analysis are lumped together with studies that have serious methodological or empirical limitations (the "garbage in, garbage out criticism").

- Any alternative selection schemes might be considered arbitrary and subjective.
- However, the more substantial reason provided by the proponents of MA for the inclusion in the meta-database of both published and unpublished studies is the reduction in the so-called "publication bias": "… it is the result of selection for statistical significance. Researchers, reviewers, and editors are predisposed to treat 'statistically significant' results more favorably; hence, they are more likely to be published. Studies that find relatively small and 'insignificant' effects tend to remain in the 'file drawer'" (Stanley, 2005)

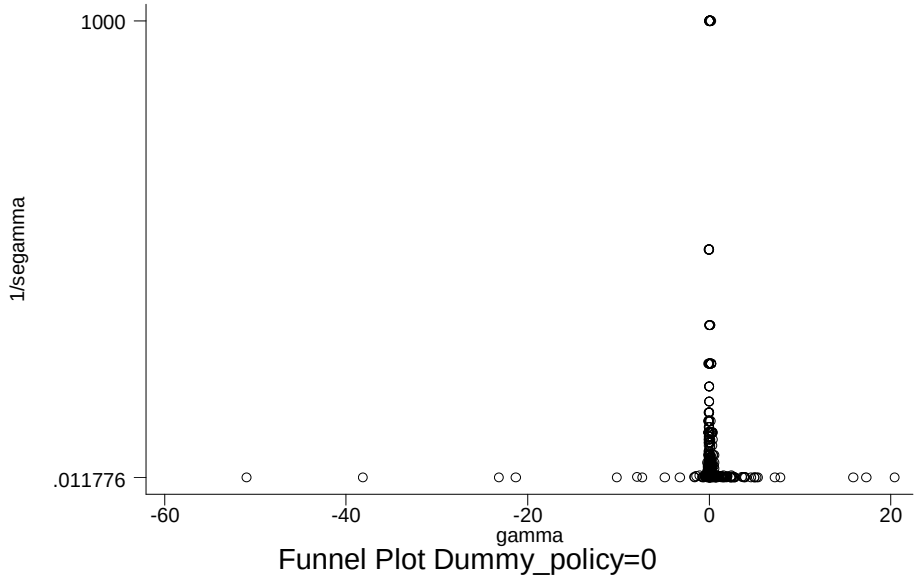
Since in a meta-analysis, notwithstanding the wide variation in the quality of the point estimates included in the study, each estimate in the sample is weighted equally, it may be argued that there is a *non-publication bias* due to the lower quality of unpublished research.

Funnel plots



When the trade policy is proxied by a dummy variable, the mean PTAs effect is 0.02 and the median is 0.18. Even though the graph in panel *a* slightly resembles a funnel, it does not present the symmetry that is crucial to exclude the presence of a bias.

Panel *b* represents the funnel graph of individual estimates obtained by using preference margins for PTAs. It clearly shows that the plot is overweighted on the right side, with a mean equal to 0.08 and a median equal to 0.4.



As far as we consider graphical test, the publication selection assumes a particular path for estimates obtained both by using dummy variables and preference margins for preferences.

Meta-Regression Analysis (1)

$$\gamma_i = \beta_1 + \beta_0 Se_i + e_i \qquad \frac{\gamma_i}{Se_i} = t_i = \beta_0 + \beta_1 \frac{1}{Se_i} + e_i$$

- *1/Se:* precision of estimates
- In the absence of publication selection the magnitude of the reported effect will be independent of its standard error: β_0 will be zero

	Coefficient	
Variables	*Dummy for PTAs*	*Preference Margins*
β_0: Intercept	0.36 ***	1.00 ***
β_1: 1/Se	0.13 ***	0.04 ***
N. of studies	638	388

We explore the publication bias more rigorously:

Columns 1 and 2 show the results for the sample of estimates based on dummy variable and those based on preference margins, respectively.

In both cases, the estimated intercept, β_0, is significantly positive confirming the apparent asymmetry of the funnel graphs. Considering the magnitude of the reported effect (the parameter β_1), results are lower than pooled estimates obtained by the random-effects model.

Meta-Regression Analysis (2)

Empirical research suggests the following meta regression model including a set of explanatory variables (X) to integrate and explain its diverse findings:

$$\frac{\gamma_{ji}}{Se_{ji}} = t_{ji} = \beta_0 + \beta_1 \frac{1}{Se_i} + \sum_{k=1}^{K} \frac{\alpha_k X_{jik}}{Se_{ji}} + e_{ji}$$

In the empirical analysis we use two groups of independent variables:

(1) The first includes dummies explaining the diversity in the results from a methodological point of view: based on a recent survey of the errors in the empirical literature applying gravity equations carried out by Baldwin and Taglioni (2006)

(2) The second includes dummies regarding structural features of the studies considered.

Methodological Problems: Dependence of study results

- We adopt a "robust with cluster" procedure, adjusting standard errors for intra-study correlation:

  - each cluster identifies the study the estimate belongs to

  - this changes the variance-covariance matrix and the standard errors of the estimators but not the estimated coefficients themselves.

Methodological differences

We follow Baldwin and Taglioni (2006), as in Cipollina and Salvatici (2010)

- The "Gold medal" of classic gravity model mistakes arises from the correlation between the omitted variables and the trade-cost terms (estimation bias)
  - *No-country effects*

- The "Silver medal" mistake arises from the fact that the most frequently used measure of bilateral trade flows is the average of bilateral trade and models are usually estimated in log (overestimation)
  - *Is not an issue in our sample*

- The "Bronze medal" mistake refers to a common practice in the literature of deflating the nominal trade values by some aggregate price indexes: such a procedure probably creates biases via spurious correlations
  - *No-time effects*

Specific features

- Different dummies in order to collect studies using data only related to a specific time period
  - *1970s, 1980s, 1990s, 2000s*
- Aggregation of data in terms of product and in terms of countries
  - *Aggregated data* (Aiello et al., 2006)
  - *Aggregated EU* (Engel, 2002)
  - *Agriculture*
- Zero trade flows
  - *No-zero treatment (OLS)*
  - *GMM* (Martínez-Zarzoso et al., 2009)
  - *Hausman-Taylor* (Egger, 2005)
  - *Tobit* (Linders and De Groot, 2006)
  - *Heckman* (Helpman et al., 2008; Martin and Pham, 2008)
  - *Poisson* (Santos-Silva and Tenreyro 2006)
  - *ZIP/Negative Binomial* (Burger et al., 2009)
- Unpublication bias
  - *Unpublished*
- Influential observations
  - *Outlier*

MRA for papers using dummies	*Model 1*	*Model 2*
β_0: *Intercept*	0.53*	0.51
β_1: *1/Se*	0.17*	0.53***
No-country effects	-0.04	0.13
No-time effects	-0.28**	-0.41***
Cross-section	0.06	-0.01
1970s	0.19	0.21
1980s	0.27	0.20
1990s	0.28	0.20
2000s	-0.39**	0.11
Aggregated data	-0.55***	-0.67***
Aggregated EU	0.31*	0.25
Agriculture	-0.49***	-0.43***
No-zero Treatment	0.37***	0.35***
GMM	-0.08*	-0.06
Hausman-Taylor	0.16	0.29*
Heckman	-0.01	-0.02
Poisson	0.69*	0.98
Tobit	-1.67***	-1.97***
ZIP/Negative Binomial	0.61	6.35**
Unpublished	0.02	-0.07
Outliers	3.67***	4.87***
PTAs	0.23***	
ACP		0.05
EBA		-0.90***
Euro-Med		-0.24***
GSP		-0.12*
GSP-Plus		-7.01**
Adjusted R^2	0.46	0.61

There is evidence of a significant general PTAs effect on trade of 0.17 (model 1) and 0.53 (model 2), indicating a **positive impact of preferences on trade of around 20% and 70%, respectively.**

•"No-country effects": the omitted variable bias does not seriously affect the estimation of the PTAs trade impact.

• The negative sign associated with the dummy "No-time effects" shows that uncorrected studies tend to underestimate the PTAs impact on trade.

•the effect size tends to be smaller in the studies focusing on recent preferential schemes (*period 2000s*).

• the product aggregation bias leads to a serious underestimation of the PTAs trade impact. (*Aggregated data*)

•The coefficient of dummy "Aggregated EU" confirms the overestimation consequences of the geographical aggregation bias.

•Estimates that refer to the impact on trade of EU preferences in the agricultural sector tend to be lower.

•As far as the estimation methods are concerned, the treatment of "zeros" seems to be a problem: studies that do not deal with the problem of zeros in the trade matrix get higher coefficients for the PTA effect.

•Looking at the coefficient of the dummy "Unpublished", it is statistically insignificant implying that the peer-review process does not play any role in affecting the magnitude of the estimated effect.

•The dummy "Outliers": The estimated coefficient of this variable is clearly positive, since most outliers indicate a positive and very high effect size of PTAs. In any case, the removal of this dummy does not significantly affect the results.

MRA for papers using dummies

- Finally, we find a positive and highly significant coefficient for the "PTAs" dummy taking the value 1 if the original estimates do not focus on a specific type of preferential scheme, implying a general effect on trade of 0.40 (0.23+0.17); that is preferences raise trade by 50%.

- Studies focusing on specific PTAs tend to estimate much lower impacts on trade.
- In particular, the dummies for the "EBA" and "GSP-Plus" regimes imply a negative overall impact on trade.
- Conversely, studies focusing on "Euro-Med" and the "GSP" preferential agreements get lower but still positive impact on trade.

MRA for papers using quantitative variables	*Model 1*	*Model 2*
β_0: *Intercept*	-0.24	-0.24
β_1: *1/Se*	0.42*	0.41*
No-country effects	0.03	0.03
No-time effects	-3.48***	-3.47***
Cross-section	4.25***	4.23***
2000s	-0.47**	-0.46**
Aggregated EU	-0.44**	-0.44**
Heckman	-0.25***	-0.25***
Poisson	-0.01	-0.01
ZIP/Negative Binomial	-0.01	-0.01
Unpublished	0.07***	0.06***
Outliers	6.16***	16.16***
PTAs	-0.01***	
ACP		-0.00
EBA		0.01**
Euro-Med		0.00
GSP		0.02***
GSP-Plus		-0.03***
Adjusted R^2	0.68	0.69

There is not evidence of asymmetry in distribution of econometric results. Conversely, the coefficient β_1 suggests that **an increase of preferences by 10% fosters trade by about 4%.**

With respect of the previous table, coefficients of control variables used are quite consistent.

•The dummy "Cross-section" confirms that results from cross-section and pooled models may be affected by the exclusion or mismeasurement of trading pair-specific variables (Baldwin 2006).

•Results suggest the existence of a "geographical aggregation bias" that can lead to an underestimation of the preference impact

•Among the possible approaches used to deal with the zero-value in trade flows, the Heckman two step procedure tends to halve the estimated impact of PTAs.

•The positive coefficient for the dummy "Unpublished" may be a good news, suggesting that editors do a pretty good job in excluding the highest (and possibly less realistic) results.

•Usually, papers that compute a measure for the preference margin, in order to estimate its potential impact on trade flows, are particularly interested at this issue.

•However, the negative coefficient of the "PTAs" dummy says when the original estimates do not focus on a specific type of preferential scheme their size is slightly lower. Conversely, the estimated impact of EBA and GSP is higher, while the impact of the GSP-Plus is lower but still positive. This result hints to the existence of a "psychological bias", since authors interested in estimating the effect of preferential trade policy tend to report larger results.

Summing up

- In conclusion, all combined estimates of PTAs imply a substantial increase in trade, but they vary a lot depending on the estimation method.

- It should be emphasized that the MA is a methodology for reviewing the literature, not an alternative approach to studying the trade effects of PTAs. The goal is not to discover the "true" value of the parameter under investigation, but rather to explain why there is so much variation in the empirical results reported in the economic studies that supposedly investigate the same phenomenon. Our results shed some light on the role played by some research characteristics in explaining the variation in reported estimates.

THANK YOU FOR YOUR ATTENTION

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