Do RTAs Really Affect Agri-Food Trade? Evidence from a Meta-Analysis

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Outline

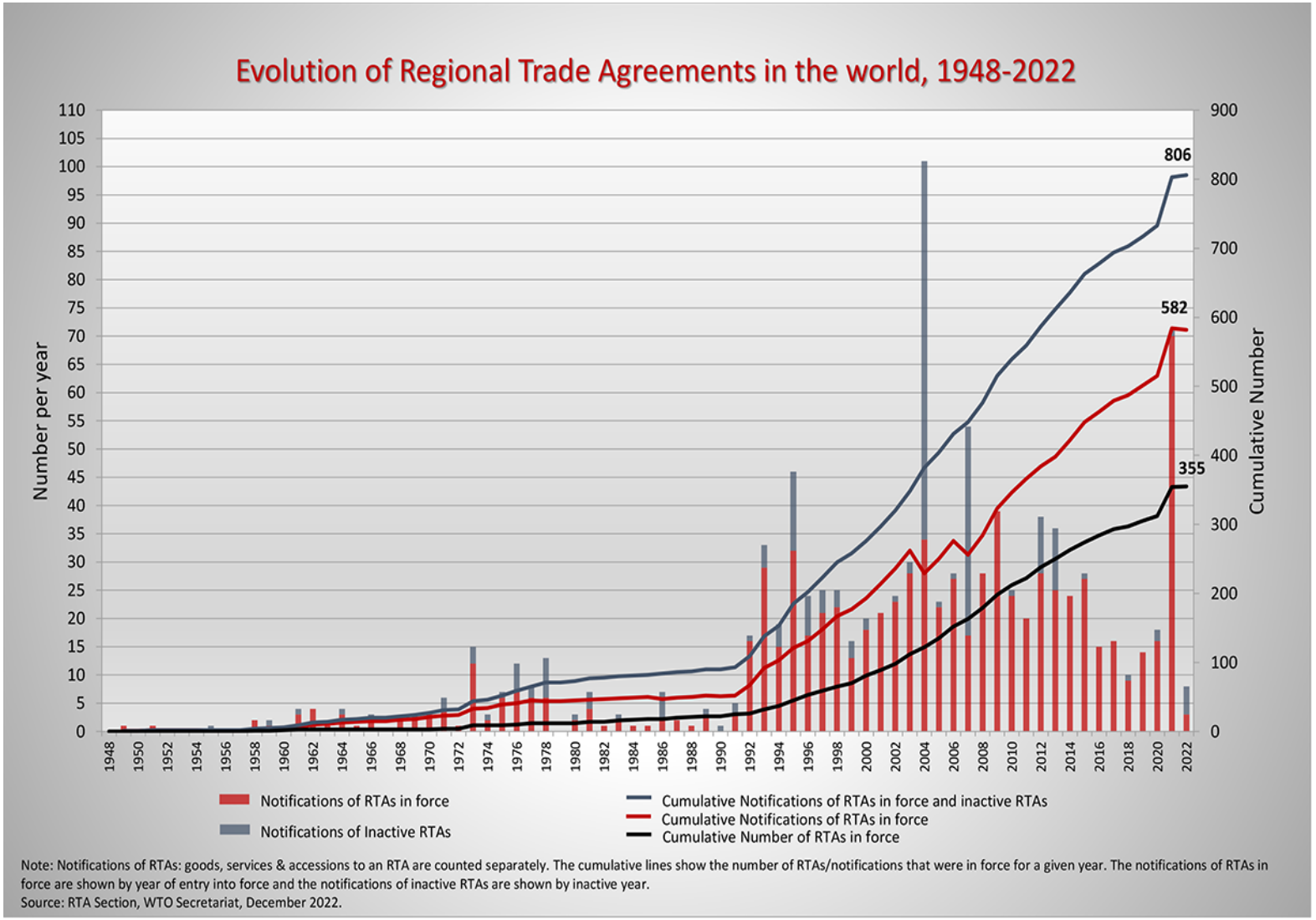
Motivation (1)

Growing number of RTAs

- Regional trade agreements (RTAs) remain one of the most important trade policy tools in the global trading system
  - 354 cumulative number of RTAs were in force in 2022
- At the multilateral level, agricultural trade liberalization remains one of the most contentious issues
- SPS measures within the agricultural sector are more significant and restrictive compared to those in non-agricultural sectors
- The average bound tariff for agricultural products, as of 2013, was 36.5% compared to 11% for industrial products
- For agricultural trade, RTAs are critical as trade barriers are higher and protectionist policies are more commonly applied on agri-food products than on manufacturing products.

Evolution of RTAs

WTO database



Motivation (2)

Trade disputes

- Agri-food disputes at the WTO are substantial due to the numerous barriers to agriculture trade (Santana and Jackson, 2012)
- RTAs are expected to address these disputes and barriers, and thus, have a greater impact on agricultural than on non-agricultural trade
- RTAs have a greater impact on agricultural than on non-agricultural trade flows (Grant and Lambert, 2008).
- The results on the effectiveness of RTAs in promoting agri-food trade has been heterogeneous
- Generally, RTAs have been recognized as having widely differing effects on bilateral trade
  - due to their differences in aim, breadth, and scope (Baier et al., 2019).

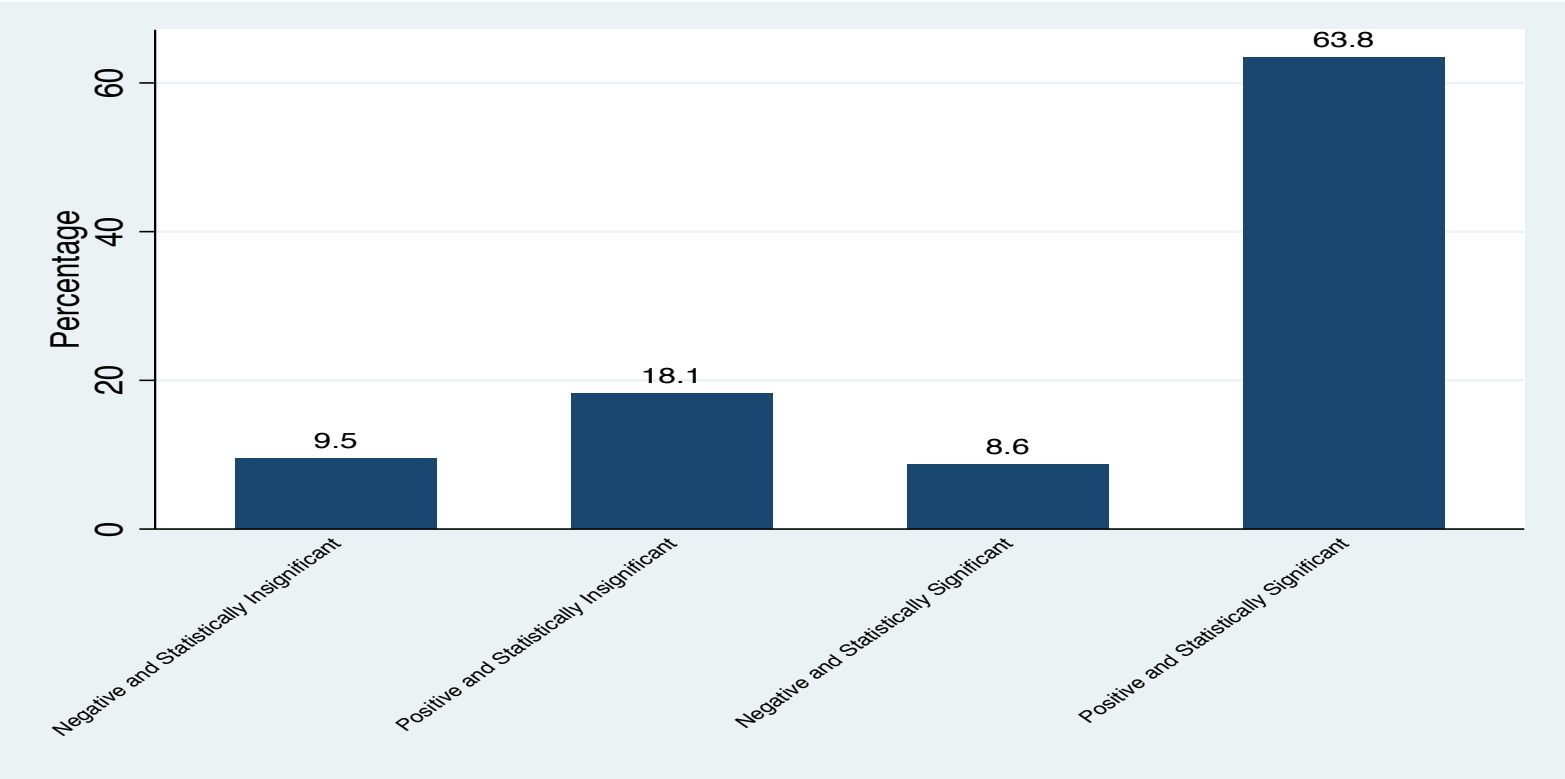
Growing number of studies

Impacts of RTAs on agri-food trade

- There has been an increase in the number of literature on the impact of RTAs on agri-food trade
  - but the results are highly variable due to increasing heterogeneity in empirical studies
- RTAs are not effective since most RTAs fail to include agri-food products in their product coverage
  - classifying most agricultural products as sensitive products
- For the NAFTA, following five years of trade liberalization,
  - agricultural trade between the US and Mexico was limited to only nine minor agricultural commodities (Hufbauer and Schott, 2005)
  - because of the long phase-out terms for sensitive agricultural products

Impact of RTAs

Heterogeneity of RTA effect on agri-food trade



- This variation in the literature can be seen from three perspectives
  1. whether the effect of RTAs on agri-food trade are positive or negative
  2. the size (magnitude) of coefficients
  3. the statistical significance of the coefficients

Impact of RTA-agri-food effect

Categorization of the effect sizes

Range of effect sizes	Freq.	Perc.
$E \leq -1$	61	3.20
$-1 < E < 0$	321	16.85
$0 < E < 1$	1137	59.69
$E \geq 1$	386	20.26
Total	1897	100

- The sign of coefficients is important $\Rightarrow$ major source of publication bias
- Researchers may be reluctant to report a negative RTA effect on trade because this is theoretically implausible

Sources of heterogeneity

In the empirical literature

- Studies employ data at different levels of disaggregation
  - different agri-food products
- Considerable differences across the effect of RTAs on different categories of agricultural products
  - NAFTA significantly increased the trade flow of meat, vegetables, grains, and sugar within the regional bloc, while there was no significant effect for the fruits and oilseeds (Jayasinghe and Sarker, 2008; Ghazalian, 2017)
  - Positive and significant effect for only poultry and corn and a non-significant effect for other products for pork, fruits, vegetables, soy, nuts,and wheat (Arita et al. 2017)
- Studies evaluate the effect of different types and depths of RTAs on agri-food trade
  - RTAs that are FTAs, trade liberalization is limited to the removal or reduction of tariffs (NAFTA, ASEAN, APEC, SADC)
  - RTAs that are CUs have FTA plus common external tariff (e.g., ANDEAN, MERCOSUR, COMESA)

What are our contributions?

Main research questions

- The main objective of the paper is to revisit the effect of RTAs on agri-food trade using the tool of meta-analysis
  1. Do RTAs really promote agri-food trade (what is the average effect)?
  2. Is there publications bias in the agri-food and RTA empirical literature?
  3. Does the effect of RTA differ
     - for different product categories?
     - different depth or level of economic integration?
  4. What explains the heterogeneity in the literature?

Literature review (1)

High trade barriers in the agric sector

- Even though economists disagree about many things, the superiority of free trade over protection is not controversial (Rodrik, 2018)
  - growing discontent about the adverse distribution effects of globalization
- Trade barriers produce more pronounced effects within sectors where the elasticity of substitution is high (Chaney, 2008)
  - agricultural products are homogeneous $\Rightarrow$ sector with higher elasticity of substitution
- RTAs may create a competitive advantage that can affect the market share of trading partners in different markets

Literature review (2)

Sanitary and phytosanitary measures

- The agri-food sector remains the most regulated by SPS measures (Santeramo and Lamonaca, 2021)
- SPS measures may constitute a pervasive barrier to international trade if used as protectionist policies
- The use of SPS measures has been argued to be a subtle way of erecting protectionist policies (Swinnen and Vandemoortele, 2009).
  - using food safety concerns as an excuse
- RTAs are critical and expected to facilitate market access for agri-food products among RTA member countries
  - RTAs allow regulatory cooperation through the harmonization or mutual recognition of standards that can promote market access for agri-food products

Data

Meta-analysis

- We follow the Meta-Analysis of Economic Research Network (MEAR-Net) guidelines as in Stanley et al. (2013) and Havranek et al. (2020)
  - searching, collecting, and coding of the relevant empirical studies
  - the search for relevant studies was conducted between March 2019 and January 2020
- We use the Google Scholar as our main search engine to identify the relevant studies
  - complement the number of studies using the Web of Science (WoS), AgEcon, and Scopus bibliographic databases
- Through the screening of the studies, we identified 60 studies that met our selection criteria.
  - selected studies consisted of 53 number of journal articles and 7 non-journal papers
  - generating of a total of 1893 total number of effect sizes

Empirical strategy

Gravity model

- We restricted the RTA effect to only studies that used the gravity model
  - this makes our RTA effect sizes across studies comparable
  - Gravity equation

$$\ln X_{ijt} = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln T_{ijt} + \delta RTA_{ijt} + \alpha_{ij} + \alpha_i + \alpha_j + \alpha_t + \epsilon_{ijt} \quad (1)$$

  - The gravity model indicates that agri-food trade, X_{ijt}, between countries i and j at time t is
    - determined by the market supply potential of i, represented by the GDP (Y_i) of the exporting country
    - the market demand potential of country j, represented by GDP (Y_j) of the importing country
    - the trade cost (T_{ij}) between country i and j
  - Country and time fixed effects are captured by α_{ij}, α_i, α_j and α_t
  - We extract the δ coefficients and their standard errors from the individual studies

Meta-analysis

FAT-PET analysis

- Meta-analysis is already a familiar and conventional tool used in medical research to determine the efficacy on drugs used in randomized clinical trials
- FAT-PET analysis

$$\delta_{ks} = \beta_0 + \beta_1 SE_{ks} + \epsilon_{ks} \tag{2}$$

  - FAT is used to test the presence or absence of publication bias in the literature
  - PET indicates the underlying effect from the empirical studies after accounting for publication bias
  - Accounting for heteroskedasticity requires the use weighted least squares

$$t_{ks} = \beta_0 \frac{1}{SE_{ks}} + \beta_1 \tag{3}$$

- Dealing with dependence (within and between dependence)
  - use the multi-level mixed (MLM) model (Doucouliagos and Laroche, 2009)

Moderator analysis

Explaining the heterogeneity

- Multivariate meta-analysis can be used to explain the variation in the studies
  - potential sources of heterogeneity include data, estimation techniques, and publication characteristics

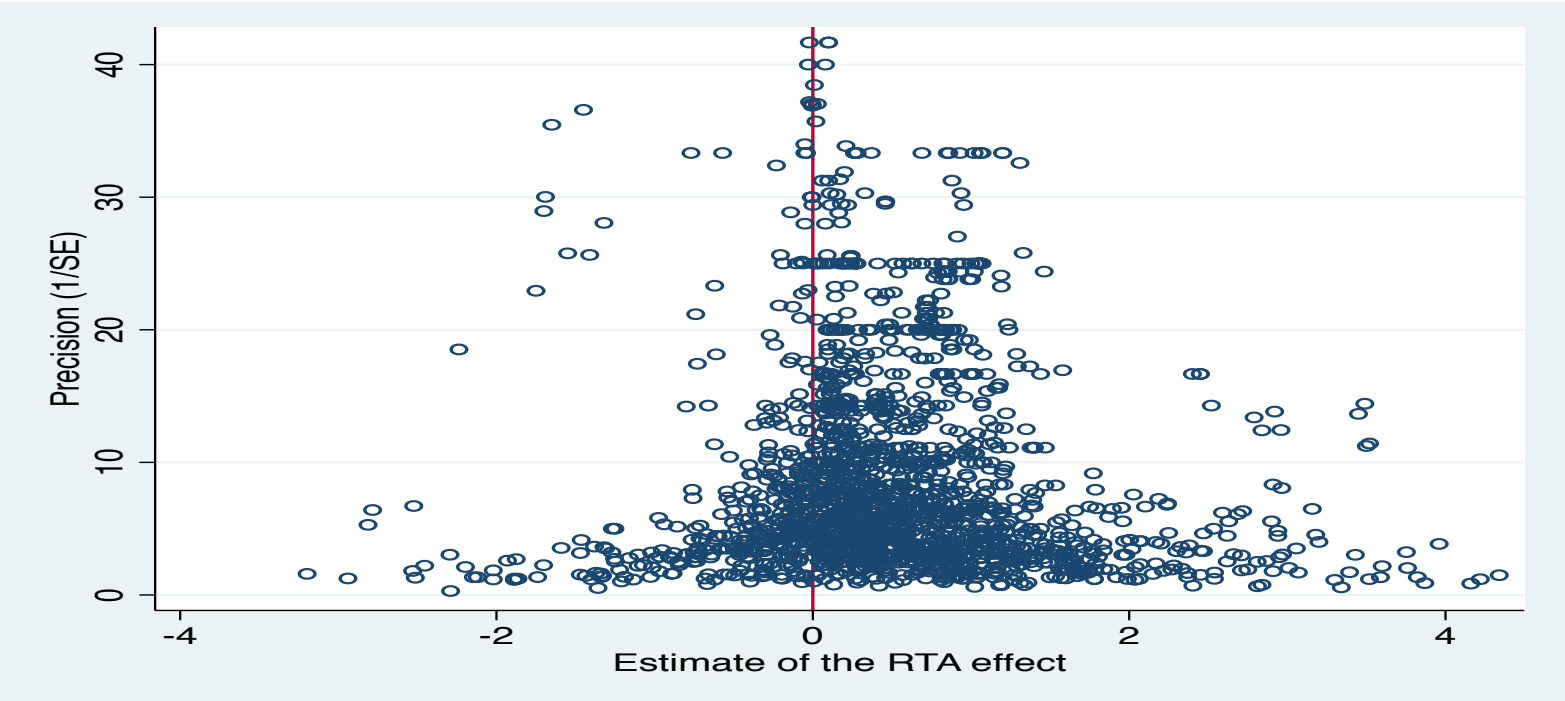
$$t_{ks} = \beta_0 \frac{1}{SE_{ks}} + \beta_1 + \beta_k \sum_{h=1}^{n} \frac{1}{SE_{ks}} \times Z_{hks} + \epsilon_{ks} \frac{1}{SE_{ks}} \tag{4}$$

- Our moderator analysis considers 39 potential explanatory variables.
  - could lead to over-specification bias and a multicollinearity problem
  - use the general-to-specific (G-S) approach (Stanley et al., 2013)
  - use Bayesian model averaging (BMA) (Cazachevici et al., 2020)

- BMA uses a Markov chain Monte Carlo algorithm that approximates the model space
  - uses the subset of the model space that has the highest posterior model probabilities (PMPs)
  - classify a moderator variable as decisive (PIP$>$0.99), strong (0.95$<$PIP$<$0.99), positive (0.75$<$PIP$<$0.95), weak (0.5$<$PIP$<$0.75), or irrelevant (PIP$<$0.5)

Funnel plot

Publication bias



- The funnel plot is a scatter plot which shows the relationship between effect sizes (δ_{ks}) and their precision ($\frac{1}{SE(\delta_{ks})}$)
- if the pictorial view of the funnel plot is not symmetric, then it is a signal that there is publication bias

Bivariate FAT-PET analysis

Underlying effect and publication bias

VARIABLES	(1) OLS	(2) FE	(3) MLM
PET (underlying effect)	0.318**	0.190	0.211***
	(0.128)	(0.141)	(0.0254)
FAT(publication bias)	1.077	2.181*	1.940***
	(0.860)	(1.214)	(0.500)
Observations	1,893	1,893	1,893
R-square	0.099	0.027	

Bivariate FAT-PET for different products

Underlying effect and publication bias

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Products Categories			Specific Products					
Variables	Primary	Processed	Mixed	Aggregate	Animal	Cash Crops	Fruits & Vegetables	Grains & Oilseeds	Prepared Foodstuffs
PET (underlying effect)	0.219***	0.536***	0.0535	0.213***	0.241***	-0.0240	0.312***	1.192***	0.107**
	(0.0246)	(0.0519)	(0.0480)	(0.0389)	(0.0447)	(0.0391)	(0.0505)	(0.150)	(0.0439)
FAT (Publication bias)	1.913***	-1.158	2.791***	1.775**	1.583***	3.000**	1.009	-2.139*	1.021
	(0.580)	(1.432)	(0.675)	(0.845)	(0.586)	(1.296)	(0.833)	(1.124)	(0.749)
Observations	805	363	725	1,041	352	62	185	67	186
Number of groups	39	17	28	33	24	8	20	11	13

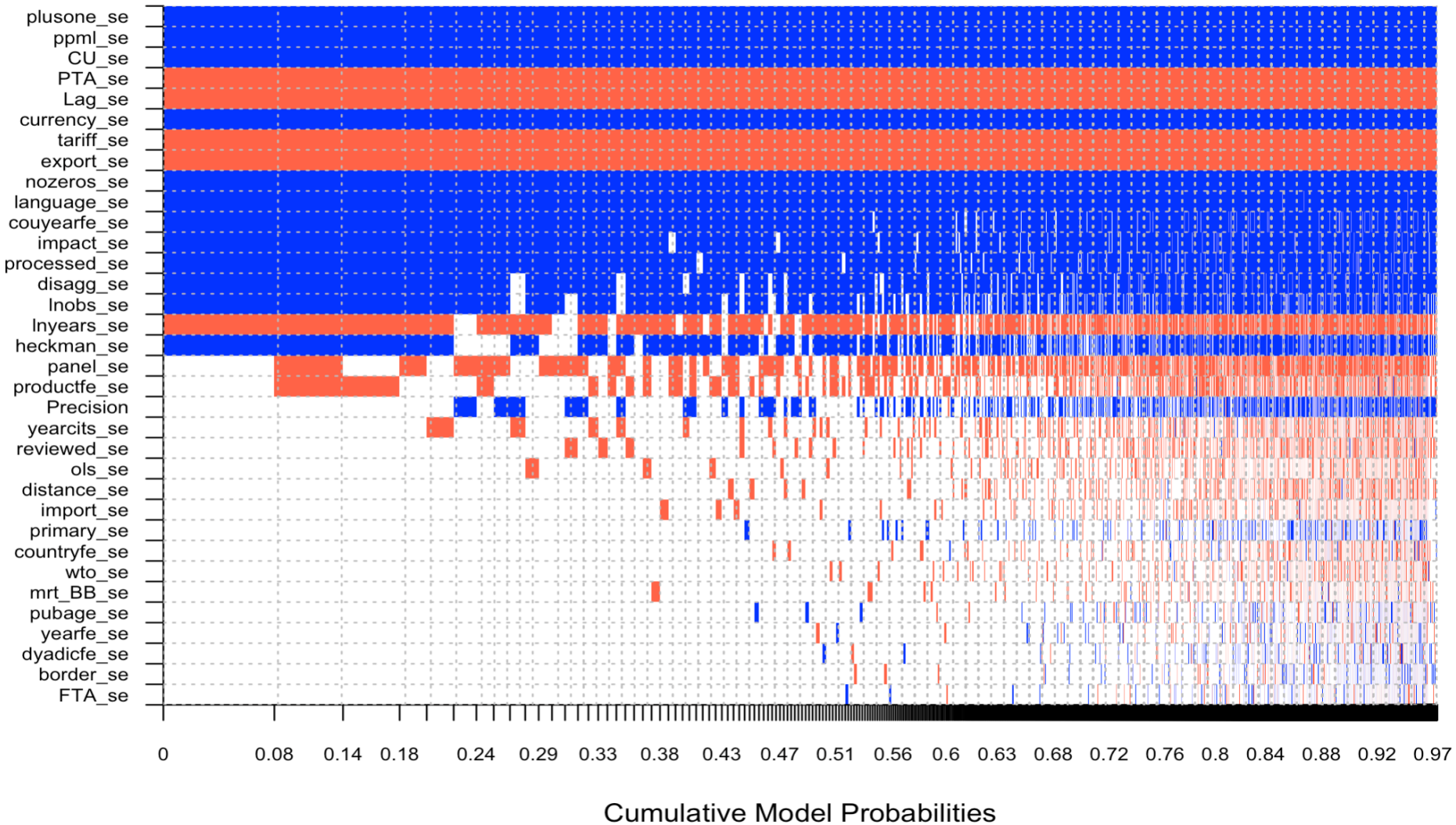
Bivariate FAT-PET for the depth of RTA

Underlying effect and publication bias

VARIABLES	(1) PTA	(2) FTA	(3) CU	(4)) Others
PET (underlying effect)	-0.149**	0.148***	1.711***	0.289***
	(0.0580)	(0.0336)	(0.111)	(0.0355)
FAT (Publication bias)	4.789***	2.121***	-8.094***	1.581
	(1.663)	(0.537)	(2.171)	(0.962)
Observations	164	1,249	116	373
Number of groups	10	36	12	25

Explaining the heterogeneity

BMA approach



Explaining the heterogeneity

BMA regression results

	PIP	Post Mean	Post SD	Cond.Pos.Sign
Precision	0.3316299	0.1590548	0.2573691	0.9928166
Panel	0.5613118	-0.1672232	0.1769073	0.0000000
ln(obsevations)	0.8439379	0.0291019	0.0153988	1.0000000
ln(years)	0.8026270	-0.0682181	0.0420591	0.0000000
Disaggregated	0.9131423	0.1449689	0.0607502	1.0000000
Primary product	0.0614643	0.0020674	0.0138089	0.8902386
Processed product	0.9543933	0.0902016	0.0333407	1.0000000
OLS	0.0925575	-0.0044998	0.0168780	0.0005071
Dyadic FE	0.0314910	0.0004333	0.0089124	0.6392642
Country FE	0.0587893	-0.0024920	0.0142387	0.0983610
Product FE	0.3820290	-0.0345762	0.0496342	0.0046809
Year FE	0.0366199	-0.0000223	0.0083245	0.4680502
MRT	0.0439779	-0.0029406	0.0214322	0.0687160
Country year FE	0.9658890	0.1009226	0.0333234	1.0000000
Plusone	1.0000000	0.4326736	0.0848698	1.0000000
PPML	1.0000000	0.2545272	0.0478178	1.0000000
Heckman selection	0.7460304	0.1231293	0.0852667	1.0000000
Nozeros	0.9999195	0.2564226	0.0565946	1.0000000
CU	1.0000000	0.3721680	0.0636168	1.0000000
PTA	1.0000000	-0.2469757	0.0369244	0.0000000
Lag RTA	1.0000000	-0.3174475	0.0459920	0.0000000
Currency	1.0000000	0.4514564	0.0560678	1.0000000
Distance	0.0882266	-0.0072083	0.0286262	0.0116515
Language	0.9990941	0.1952305	0.0305380	1.0000000
Border	0.0285104	0.0003286	0.0112680	0.5030535
Tariff	1.0000000	-0.3408186	0.0436770	0.0000000
WTO	0.0523931	-0.0022361	0.0143104	0.0635439
Publication age	0.0432655	0.0000253	0.0014742	0.6140795
Reviewed	0.1443472	-0.0139352	0.0397723	0.0038835
Study citation	0.1784849	-0.0015617	0.0039246	0.0162477
Impact factor	0.9623324	0.4110310	0.1451819	1.0000000
Export	1.0000000	-0.3290755	0.0322742	0.0000000
Import	0.0700464	-0.0029530	0.0135635	0.0173806
FTA	0.0268060	0.0000272	0.0043352	0.6075563
Constant	1.0000000	0.3945506	NA	NA
Observations	1801	1801	1801	1801

Conclusion

- The study provides the first meta-analysis on the impact of RTAs on agri-food trade
  - meta-analysis is suitable tool because of the increasing variation in the existing studies
  - the heterogeneity across studies makes a meta-analysis a policy-relevant study
- RTAs generally have a positive and significant effect on agri-food trade
  - The ex-post effect of an RTA averages between 23-60%
- The effects of RTAs on agri-food trade depend on the depth to which economic integration has been achieved,
  - CUs tend to have more pronounced effects than RTAs with lower levels of economic integration, such as PTAs and FTAs
- Disaggregating the effect between primary and processed agri-food products
  - we find a greater effect for processed products compared to primary products
  - the RTA effect is most pronounced for grains and oilseeds, followed by fruits and vegetables, animal products, and prepared foodstuffs.

Thank you

- Questions are welcome