A Meta-Analysis of the Effect of Common Currencies on International Trade

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Data Set

- 34 studies estimate currency union effect on trade
- 754 point estimates of γ

Estimates (of γ and standard error) taken from

$$\ln(\text{Trade}) = \gamma \text{CurrencyUnion} + \text{controls} + \text{error}$$

where CurrencyUnion a dummy (1 for countries in currency union)

34 Estimates of Effect of Currency Union on Trade

Author	Year	g	s.e. of g
Rose	2000	1.21	0.14
Engel-Rose	2002	1.21	0.37
Frankel-Rose	2002	1.36	0.18
Rose-van Wincoop	2001	0.91	0.18
Glick-Rose	2002	0.65	0.05
Persson	2001	0.506	0.257
Rose	2001	0.74	0.05
Honohan	2001	0.921	0.4
Nitsch	2002b	0.82	0.27
Pakko and Wall	2001	-0.38	0.529
Walsh and Thom	2002	0.098	0.2
Melitz	2001	0.7	0.23
López-Córdova, Meissner	2003	0.716	0.186
Tenreyro	2001	0.471	0.316
Levy Yeyati	2003	0.5	0.25
Nitsch	2002a	0.62	0.17
Flandreau and Maurel	2001	1.16	0.07
Klein	2002	0.50	0.27
Estevadeoral, et al	2003	0.293	0.145
Alesina, Barro, Tenreyro	2003	1.56	0.44
Smith	2002	0.38	0.1
Bomberger	2002	0.08	0.05
Melitz	2002	1.38	0.16
Saiki	2002	0.56	0.16
Micco, Stein, Ordonez	2003	0.089	0.025
Kenen	2002	1.222	0.305
Bun and Klaassen	2002	0.33	0.1
de Souza	2002	0.17	0.24
de Sousa and Lochard	2003	1.21	0.12
Flam and Nordström	2003	0.139	0.02
Barr, Breedon and Miles	2003	0.25	0.033
de Nardis and Vicarelli	2003	0.061	0.027
Rose	2004	1.12	0.12
Subramanian-Wei	2003	0.732	0.08

Meta Analysis

- Set of quantitative techniques for evaluating and combining empirical results from different studies.
- Different point estimates (one per study) of given coefficient treated as individual observations
- Can use this vector of estimates to:
    - estimate underlying coefficient of interest
    - test hypothesis that coefficient is zero
    - link estimates to features of the underlying studies
- Each study weighted equally

Test of Zero Effect

- Test null hypothesis $\gamma=0$, pooling 34 point estimates (and standard errors)
- Test due to Fisher (1932), uses p-values from 34 underlying γ estimates
- Under null hypothesis, p-values are independently and randomly drawn from a normal [0,1] distribution, -2 Sum[$\ln(p_i)$] is chi-squared
- Test statistic: 1272 ~ chi-squared(68) under Ho.
  - Clear rejection of null hypothesis of no effect!

Meta-Estimate of g Pooled across Different Studies

	Pooled Estimate of g	Lower Bound of 95% CI	Upper Bound of 95% CI	P-value for test of no effect
Fixed	.29	.27	.31	.00
Random	.64	.51	.77	.00
Fixed without Rose	.22	.19	.24	.00
Random without Rose	.53	.40	.66	.00

Table 1: Meta-Analysis of Currency Union Effect on Trade (g)

Findings

- Considerable heterogeneity
- Fixed and random effect estimators dissimilar
- *Economically big*; currency union increases trade > 25%
- No conclusions change if my six studies are dropped
    - Test-statistic rejects the hypothesis of no effect: 721 ~ chi-squared(54) under Ho

Influential Studies?

- No single study is especially influential (studies omitted one by one):

Study Omitted:	Coefficient	95% CI, lower	95% CI, upper
Rose	.28	.26	.30
Engel-Rose	.29	.26	.31
Frankel-Rose	.28	.26	.30
Rose-van Wincoop	.28	.26	.31
Glick-Rose	.27	.25	.29
Persson	.29	.26	.31
Rose	.26	.24	.29
Honohan	.29	.26	.31
Nitsch	.29	.26	.31
Pakko-Wall	.29	.27	.31
Walsh-Thom	.29	.27	.31
Melitz	.29	.26	.31
Lopez-Cordova, Meissner	.29	.26	.31
Tenreyro	.29	.26	.31
Levy Yeyati	.29	.26	.31
Nitsch	.29	.26	.31
Flandreau and Maurel	.26	.24	.29
Klein	.29	.26	.31
Estevadeoral et al	.29	.27	.31
Alesina, Barro and Tenreyro	.29	.26	.31
Smith	.29	.26	.31
Bomberger	.30	.28	.32
Melitz	.28	.26	.30
Saiki	.29	.26	.31
Micco, Stein, Ordonez	.34	.31	.36
Kenen	.29	.26	.31
Bun and Klaassen	.29	.26	.31
de Souza	.29	.27	.31
de Sousa and Lochard	.28	.26	.30
Flam and Nordström	.35	.33	.38
Barr, Breedon and Miles	.29	.27	.32
de Nardis and Vicarelli	.30	.28	.33
Rose	.28	.26	.30
Subramanian-Wei	.28	.26	.30
Combined	.29	.27	.31

Table 2: Sensitivity of Meta-Analysis of g to Individual Studies

Does Choice of "Preferred" Estimate Matter Much?

- Can use different estimates from (31) underlying studies (3 too small)
- All are economically large, economically significant

		Pooled g Estimate	Lower 95% CI	Upper 95% CI	P-value of no effect
"Preferred"	**Fixed**	.27	.25	.29	.00
"Preferred"	**Random**	.64	.51	.76	.00
Median	**Fixed**	.34	.31	.38	.00
Median	**Random**	.82	.62	1.01	.00
25th-Percentile	**Fixed**	.18	.15	.20	.00
25th-Percentile	**Random**	.52	.38	.67	.00
10th-Percentile	**Fixed**	.12	.10	.14	.00
10th-Percentile	**Random**	.37	.24	.51	.00
5th-Percentile	**Fixed**	.11	.10	.13	.00
5th-Percentile	**Random**	.38	.27	.49	.00

Table 3: Sensitivity of Meta-Analysis of γ to Choice of "Preferred" Estimate

Which Study Characteristics drive Outcomes?

- Hard to do multivariate regression with 34 observations

Study Characteristic	Slope Coefficient (|z-statistic|)	Intercept (|z-statistic|)
Number of Observations in study	8.0 e-7 (.9)	.60 (6.7)
Focus on EMU Observations	-.55 (3.9)	.79 (10.6)
Short-Run Focus	-.42 (2.6)	.74 (9.3)
Standard Error of ?	.98 (1.4)	.49 (3.8)
Dummy for Rose as Author	.46 (2.8)	.54 (6.9)
Dummy for mainly cross-section or panel study	.46 (2.2)	.25 (1.2)
Number of Countries in study	.001 (1.6)	.46 (3.5)
Number of Years in study	.002 (0.4)	.59 (3.9)
Dummy for post-WWII study	-.10 (0.4)	.74 (3.0)

Table 4a: Meta-Analysis: Bivariate Determination of g **Across Studies**

Focus on EMU Observations	-.57 (2.8)	-.50 (4.0)
Dummy for Rose as Author	.40 (2.6)	.39 (2.8)
Dummy for mainly cross-section or panel study	.19 (1.0)	
Short-Run Focus	.14 (0.7)	
Intercept	.50 (2.9)	.69 (9.0)

Table 4b: Meta-Analysis: Multivariate Determination of g **Across Studies**

Results

1. No positive relation between the number of observations and γ
    - Worrying!
2. Papers that I co-author have higher point estimates
3. Euro studies have lower point estimates (too soon to tell? Smaller effect?)

Different Estimates of g

- 34 studies but 754 estimates of γ (626 with standard errors)
  - Mean is .86
  - Mean t-ratio is 5.3
- Histograms of all estimates and t-statistics
- Vast majority are positive
  - Only 60 of the 754 (<8%) are negative
  - 325 (43%) exceed .69 (doubling)

- Vast majority of γ estimates are statistically significant
  - Median t-statistic = 4.2
  - 479 (77%) exceed 2
  - Also true without Rose's estimates

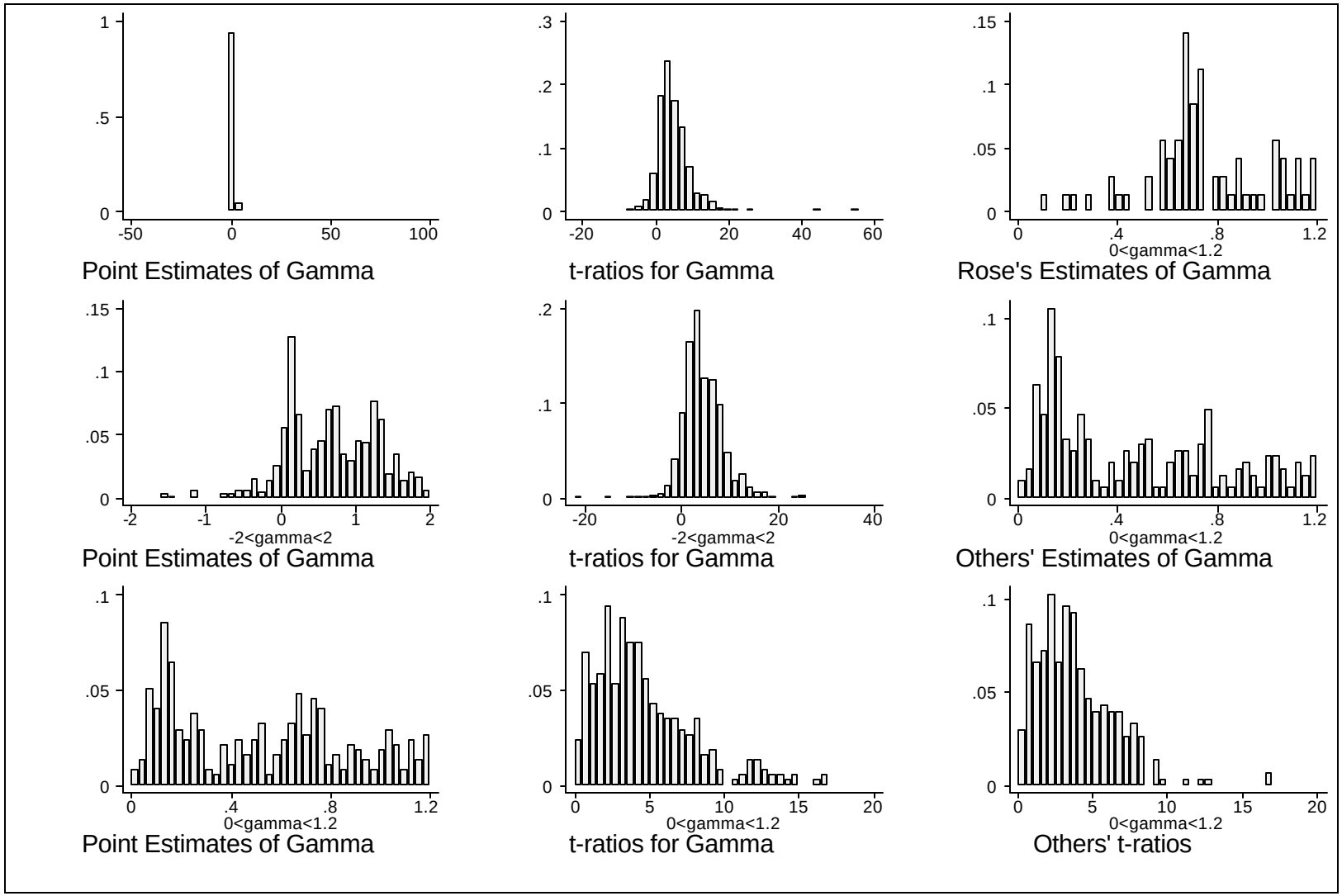

Figure 1: The Estimated Effect of Currency Union on Trade

Publication Bias

- "Funnel Plots" of γ against standard error seem asymmetric
  - Informal evidence of publication bias
  - "Galbraith Plot" of t-ratio for γ against standard error has many estimates outside confidence interval
  - Pervasive evidence of heterogeneity
- Begg and Mazumdar test (γ uncorrelated with its variance across studies) => publication bias
- Egger et al test: regress γ against precision (inverse s.e.) and bias also shows bias

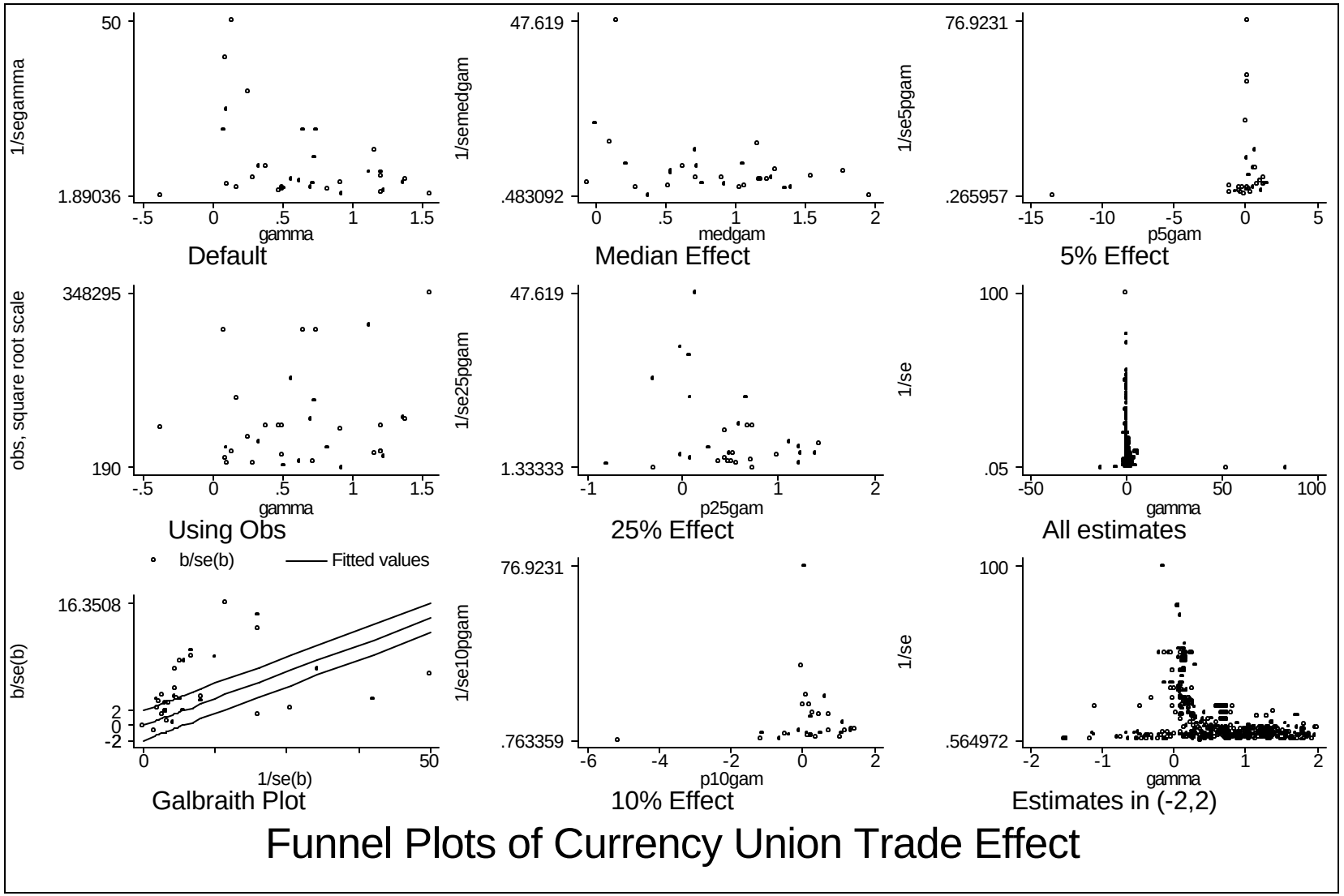

Figure 2: Funnel Plots for Publication Bias

Study		Coefficients	Coeff=0 (p-val.)	No. of Estimates	Heterogeneity (p-value)
	Fixed	1.289	0.000	52	0.00
Rose	Random	1.311	0.000		
Engel-	Fixed	1.350	0.000	5	0.78
Rose	Random	1.350	0.000		
	Fixed	1.631	0.000	5	0.02
Frankel-Rose	Random	1.634	0.000		
Rose-van	Fixed	0.230	0.000	18	0.00
Wincoop	Random	0.649	0.000		
Glick-	Fixed	0.697	0.000	37	0.00
Rose	Random	0.772	0.000		
	Fixed	0.647	0.000	6	0.11
Persson	Random	0.586	0.000		
	Fixed	0.824	0.000	17	0.00
Rose	Random	1.060	0.000		
	Fixed	0.352	0.000	12	0.00
Honohan	Random	0.356	0.052		
	Fixed	3.003	0.000	83	0.00
Nitsch	Random	1.551	0.000		
	Fixed	0.874	0.000	6	0.00
Pakko-Wall	Random	0.332	0.350		
	Fixed	-0.008	0.574	7	0.00
Walsh-Thom	Random	0.020	0.542		
	Fixed	1.888	0.000	6	0.00
Melitz	Random	1.906	0.000		
Lopez-Cordova	Fixed	0.723	0.000	47	0.38
and Meissner	Random	0.722	0.000		
Silvana	Fixed	0.803	0.000	4	0.03
Tenreyro	Random	0.714	0.000		
Levy	Fixed	1.014	0.000	19	0.02
Yeyati	Random	1.055	0.000		
	Fixed	0.464	0.000	8	0.00
Nitsch	Random	0.429	0.009		
Flandreau	Fixed	0.941	0.000	8	0.00
and Maurel	Random	0.903	0.000		

Klein	Fixed Random	0.090 0.370	0.013 0.047	25	0.00
Estevadeoral, Frantz, and Taylor	Fixed Random	0.433 0.450	0.000 0.000	18	0.01
Alesina, Barro and Tenreyro	Fixed Random	1.159 1.649	0.000 0.000	8	0.00
Smith	Fixed Random	1.007 1.118	0.000 0.000	17	0.00
Bomberger	Fixed Random	0.205 0.315	0.000 0.006	6	0.00
Melitz	Fixed Random	1.312 1.312	0.000 0.000	13	0.99
Saiki	Fixed Random	1.162 0.520	0.000 0.008	16	0.00
Micco, Stein, Ordonez	Fixed Random	0.098 0.130	0.000 0.000	54	0.00
Kenen	Fixed Random	1.081 0.988	0.000 0.000	10	0.01
Bun and Klaassen	Fixed Random	0.330 0.330	0.000 0.001	1	n/a
de Souza	Fixed Random	-0.143 -0.018	0.000 0.714	30	0.00
de Sousa and Lochard	Fixed Random	1.706 1.698	0.000 0.000	14	0.00
Flam and Nordström	Fixed Random	0.150 0.149	0.000 0.000	49	0.00
Barr, Breedon and Miles	Fixed Random	0.234 0.234	0.000 0.000	2	0.44
de Nardis and Vicarelli	Fixed Random	0.090 0.090	0.000 0.001	2	0.90
Rose	Fixed Random	0.905 0.988	0.000 0.000	10	0.00
Subramanian-Wei	Fixed Random	1.142 1.142	0.000 0.000	11	1.0

Table 5: Within-Study meta-estimation of g

Trade Diversion

- Does increased trade *inside* monetary unions divert trade away from non-members?

Theory

- *Not analogous* to customs unions in welfare
- Trade diversion can be harmful because trade gains are less than lost tariff revenue
  - Ex: import goods at $10, sell at $15=$10+$5tariff
    - Can lose if eliminate tariffs from exporter with costs of $12
  - But monetary union is simply a reduction in transactions costs; no lost tariff revenue (better bridges, not lower tolls)

Practice

- Four Different Studies have searched for trade diversion
- *All* find evidence of *trade creation* between CU members & outsiders
  - Rose (2000): .29 (33%; se=.03)
  - Frankel and Rose (2002): .37 (45%; se=.04)
  - Micco et al: many EMU estimates in Tables 3-7: .086 (9%; se=.015)
  - Flam and Nordström: corroboration in Tables 3-7, .077 (8%; se=.017), growing over time and dis-aggregated too!

Conclusion

- Too early to claim much
  - Studies are dependent and not all of equal interest
  - Estimates of γ are heterogeneous, cannot be linked to study features (especially precision/observations!)
- Publication Bias!
  - Intensely political issue (especially in Europe) => bias?
- Still, substantial evidence currency union has a positive effect on trade
- Effect is large economically, statistically
  - Currency union associated with trade effect in (30%, 90%)