One Money, One Market: Estimating the Effect of Common Currencies on Trade

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The Question

- What is the effect of a common currency on international trade?

The Answer

- Large.

Summary

- With large cross-country panel data set, show two countries with the same currency trade more than comparable countries with their own currencies.
- Big effect: >300%.
- Reducing exchange rate volatility also increases trade, but much less.

Motivation

- Trade gains of common currency are unambiguous gain of monetary unification (e.g., EMU).
- How big? Most believe gains are small.
- But much uncertainty.
- Currency union may have a very different effect than even radical reduction in exchange rate volatility.

A big increase in trade would have many repercussions:

1) increase in trade disputes;

2) pressure for labor market security;

3) effects on business cycle synchronization;

4) further entry into common currencies;

5) big gains from trade.

Empirical Strategy

- Effects of reduced exchange rate volatility on trade can't be detected clearly with time-series techniques.
- A long literature of weak results.
- (Perhaps because of theoretical ambiguities, low-cost hedging, inappropriate techniques or data.)
- This may not be the relevant question anyway if common currency $\neq$ fixed exchange rates.

Home Bias

- Trade *inside* countries is much more intense than *between* countries; “home bias” in trade.
- McCallum (1995): this effect is over twenty to one.
- Part of home bias effect may stem from single currency.

My Approach

- Use cross-sectional strategy
- Currently 102 “countries” are members of official common currency schemes (32 are official dependencies or territories).
- Empirical work hinges on exploiting these linkages.
- I do this using “gravity” model of trade

Currency Unions, 1970-1990

Australia
Christmas Island (territory)
Cocos (Keeling) Islands (territory)
Norfolk Island (territory)
Kiribati
Nauru
Tuvalu
Tonga (pre ’75)

Denmark
Faroe Islands (part of Denmark)
Greenland (part of Denmark)

ECCA
Anguilla (territory of UK)
Antigua and Barbuda
Dominica
Grenada
Montserrat (territory of UK)
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines

France
French Guiana (overseas department)
French Polynesia (overseas territory)
Guadeloupe (OD)
Martinique (OD)
Mayotte (territorial collectivity)
New Caledonia (OT)
Reunion (OD)
Saint Pierre and Miquelon (TC)
Wallis and Futuna Islands (OT)
Monaco

France and Spain
Andorra

Belgium
Luxembourg

CFA
Benin
Burkina Faso
Cameroon
Central African Republic
Chad
Comoros
(Republic of) Congo
Cote d’Ivoire
Equatorial Guinea (post '84)
Gabon
Guinea-Bissau
Mali (post '84)
Niger
Senegal
Togo

Italy
San Marino
Vatican

Morocco
Western Sahara

Norway
Svalbard (territory)

South Africa
Lesotho
Namibia
Swaziland

Switzerland
Liechtenstein

New Zealand
Cook Islands (self-governing, associated with NZ)
Niue (self-governing, associated with NZ)
Pitcairn Islands (territory of UK)
Tokelau (territory of NZ)

Turkey
Northern Cyprus

UK
Falkland Islands (territory)
Gibraltar (territory)
Guernsey (dependency)
Jersey (dependency)
Man, Isle of (dependency)
Saint Helena (territory)
Scotland (?)
Ireland (pre '79)

USA
American Samoa (territory)
Guam (territory)
US Virgin Islands (territory)
Puerto Rico (commonwealth associated with US)
Northern Mariana Islands (commonwealth in political union with US)
British Virgin Islands (territory of UK)
Turks and Caicos islands (territory of UK)
Bahamas
Bermuda (colony of UK)
Liberia
Marshall Islands
Micronesia
Palau
Panama
Barbados (? 2:1)
Belize (? 2:1)

Singapore
Brunei

Tangent:
Of 182 current IMF members, 50 are currently involved in Common Currencies:

- Australia and Kiribati
- Brunei and Singapore
- CFA Franc members: Benin; Burkina Faso; Cameroon; Central African Republic; Chad; (Republic of) Congo; Comoros; Cote d'Ivoire; Equatorial Guinea; Gabon; Guinea-Bissau; Mali; Niger; Senegal; and Togo
- ECCA members: Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines
- EMU members: Austria, (Belgium and Luxembourg in economic union), Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, and Spain
- Italy and San Marino
- South Africa and Lesotho, Namibia, and Swaziland
- US and Bahamas, Barbados, Belize, Liberia, Marshall Islands, Micronesia, Palau, and Panama

Empirical Framework

- My strategy: link cross-country variation in currency arrangements to cross-country variation in international trade.
- Need to control for other influences on trade.
- Do this with gravity model, simple empirical model of size of international trade.

Gravity Model

- Models trade between country-pair as proportional to economic "weight" (income) and inversely proportional to their distance.
- A model of international trade with a long history of empirical success stretching back to Tinbergen (1962).
- Income and Distance elasticities are consistently signed correctly, economically large, and statistically significant: goodness of fit is high.

- Originally an entirely empirical model, but now an embarrassing number of theoretical foundations.
- Much used of late in the areas of: regionalism; trade and growth; pricing.

My equation:

$$\ln(X_{ijt}) = \beta_0 + \beta_1 \ln(Y_i Y_j)_t + \beta_2 \ln(Y_i Y_j/Pop_i Pop_j)_t + \beta_3 \ln D_{ij}$$

$$+ \beta_4 Cont_{ij} + \beta_5 Lang_{ij} + \beta_6 FTA_{ijt}$$

$$+ \beta_7 ComCtry_{ij} + \beta_8 ComCol_{ij} + \beta_9 Colony_{ij}$$

$$+ \gamma CU_{ijt} + \delta V(e_{ij})_t + \varepsilon_{ijt}$$

i, j: countries, t: time

- X_{ij} denotes the value of bilateral trade between i and j,
- Y is real GDP,
- Pop is population,
- D_{ij} is distance between i and j,
- $Cont_{ij}$ is land contiguity dummy,
- $Lang_{ij}$ is common language dummy,
- FTA_{ij} is regional trade agreement dummy,
- $ComCtry_{ij}$ is common country dummy,
- $ComCol_{ij}$ is same colonizer dummy,
- $Colony_{ij}$ is colonizer/colony dummy,
- CU_{ijt} is common currency dummy,
- $V(e_{ij})_t$ is volatility of bilateral nominal exchange rate,
- β is a vector of nuisance coefficients, and
- ε_{ij} is leftovers.

- Coefficients of interest are γ (effect of currency union on trade), and δ (response of bilateral trade to bilateral nominal exchange rate volatility).

Data Set

- 33,903 bilateral trade observations
- Five different years (1970, 1975, 1980, 1985, and 1990)
- Includes all 186 countries, dependencies, territories, overseas departments, colonies, and so forth (“countries”) for which the UN collects trade data.
- 330 observations where two countries trade and use the same currency.

- Trade values are real American dollars.
- *Penn World Table* 5.6 for population and real GDP per capita data.
- CIA World Factbook for other information.
- Use standard deviation of first-difference of monthly log of bilateral nominal exchange rate (using *IFS* line ae) in the five years preceding period t.

Countries

Antigua and Barbuda	Afghanistan	Albania	Algeria
American Samoa	Angola	Anguilla	Argentina
Aruba	Australia	Austria	Bahamas
Bahrain	Bangladesh	Barbados	Belgium/Luxembourg
Belize	Benin	Bermuda	Bhutan
Bolivia	Brazil	Brit. Ind. Oc. Terr.	British Virgin Islands
Brunei Darussalam	Bulgaria	Burkina Faso	Burundi
Cambodia	Cameroon	Canada	Cayman Islands
C.A.R.	Chad	Chile	China
Colombia	Comoros	Congo	Cook Islands
Costa Rica	Cuba	Cyprus	Czechoslovakia
Denmark	Djibouti	Dominica	Dominican Republic.
Ecuador	Egypt	El Salvador	Eq. Guinea
Ethiopia	Falkland Islands	Fiji	Finland
Fr. Guiana	France	Gabon	Gambia
Germany, East	Germany, West	Ghana	Gibraltar
Greece	Greenland	Grenada	Guadeloupe
Guam	Guatemala	Guinea	Guinea-Bissau
Guyana	Haiti	Honduras	Hong Kong
Hungary	Iceland	India	Indonesia
Iran	Iraq	Ireland	Israel
Italy	Ivory Coast	Jamaica	Japan
Jordan	Kenya	Kiribati	Korea, Rep.
Kuwait	Laos	Lebanon	Liberia
Libya	Madagascar	Malawi	Malaysia
Maldives	Mali	Malta	Martinique
Mauritania	Mauritius	Mexico	Mongolia
Montserrat	Morocco	Mozambique	Myanmar
North Korea	Nauru	Nepal	Netherlands
Netherlands Antilles	New Caledonia	New Zealand	Nicaragua
Niger	Nigeria	Niue	Norway
Oman	Pacific Isl.	Pakistan	Panama
Papua New Guinea	Paraguay	Peru	Philippines
Poland	Portugal	Qatar	Reunion
Romania	Rwanda	S Yemen	Saudi Arabia
Senegal	Seychelles	Sierra Leone	Singapore
Solomon Islands	Somalia	South Africa	Sp. Mqel.
Spain	Sri Lanka	St. Helena	St. Kitts & Nevis
St. Lucia	St. Vin. & Grenadines	Sudan	Suriname
Sweden	Switzerland	Syria	Taiwan
Tanzania	Thailand	Togo	Tonga
Trinidad & Tobago	Tunisia	Turkey	Turks & Caicos Islands
Tuvalu	U.K.	U.S.A.	U.S.S.R.
Uganda	United Arab Emirates	Uruguay	US Virgin Islands
Venezuela	Vietnam	(Western) Samoa	Western Sahara
Yemen	Former N. Yemen	Yugoslavia	Zaire
Zambia	Zimbabwe		

Descriptive Statistics

	Obs.	Mean	Std. Dev.	Min	Max
Trade	33,903	9.10	3.33	.13	19.37
Currency Union	33,903	.009	.098	0	1
Exchange Rate Volatility	27,628	4.72	6.90	0	93.57
Output	26,608	34.4	2.7	20.0	43.5
Output/Capita	26,635	16.2	1.4	11.7	20.8
Distance	30,515	8.18	.82	2.97	9.42
Contiguity	33,903	.02	.15	0	1
Language	33,903	.12	.33	0	1
FTA	33,903	.02	.13	0	1
Same Country	33,903	.003	.06	0	1
Same Colonizer	33,903	.08	.26	0	1
Colonial Relationship	33,903	.01	.11	0	1

Simple Correlations

	Trade	Currency Union	Exchange Rate Volatility	Distance	Output	Output per Capita	Language	Contiguity	FTA	Same Colonizer	Same Country
Currency Union	-0.03										
Exchange Rate Volatility	-0.08	-0.07									
Distance	-0.17	-0.22	0.09								
Output	0.65	-0.21	0.09	0.20							
Output per Capita	0.46	-0.07	-0.07	0.05	0.36						
Language	0.02	0.19	-0.01	-0.19	-0.18	-0.04					
Contiguity	0.13	0.06	0.01	-0.37	0.01	-0.07	0.13				
FTA	0.09	0.20	-0.03	-0.31	-0.11	0.08	0.14	0.11			
Same Colonizer	-0.15	0.22	-0.06	-0.16	-0.33	-0.23	0.32	0.06	0.13		
Same Country	-0.00	0.28	-0.03	-0.05	-0.11	0.00	0.08	-0.01	0.10	0.05	
Colonial Relationship	0.13	0.01	-0.03	-0.00	0.05	0.03	0.17	-0.01	-0.01	-0.04	.16

Number of observations = 22,948; standard error ≈ .007.

Results

- Table 1: OLS estimates, year by year and pooled.
- Standard features of gravity model work well.
- Higher GDP and higher GDP per capita (for the country pairing) increase trade; distance reduces it.
- Coefficients are statistically significant, economically reasonable.

- Common land border, language, or regional trade agreement increase trade (economically and statistically significant).
- Ex-colonies and their colonizers, countries with same colonizer, and geographically disparate areas of the same state (e.g., France and overseas departments) all have disproportionately intense trade.
- Equations explain over half of the variation in trade.
- Few effects vary much over time => pooling is reasonable.

Table 1: Benchmark Results

	1970	1975	1980	1985	1990	Pooled
Currency Union γ	.87	1.28	1.09	1.40	1.51	1.21
	(.43)	(.41)	(.26)	(.27)	(.27)	(.14)
Exchange Rate Volatility δ	-.062	.001	-.060	-.028	-.009	-.017
	(.012)	(.008)	(.010)	(.005)	(.002)	(.002)
Output β_1	.77	.81	.81	.80	.83	.80
	(.02)	(.01)	(.01)	(.01)	(.01)	(.01)
Output/Capita β_2	.65	.66	.61	.66	.73	.66
	(.03)	(.03)	(.02)	(.02)	(.02)	(.01)
Distance β_3	-1.09	-1.15	-1.03	-1.05	-1.12	-1.09
	(.05)	(.04)	(.04)	(.04)	(.04)	(.02)
Contiguity β_4	.48	.36	.73	.52	.63	.53
	(.21)	(.19)	(.18)	(.18)	(.18)	(.08)
Language β_5	.56	.36	.28	.36	.50	.40
	(.10)	(.10)	(.09)	(.08)	(.08)	(.04)
FTA β_6	.87	1.02	1.26	1.21	.67	.99
	(.16)	(.21)	(.16)	(.17)	(.14)	(.08)
Same Country β_7	1.02	1.37	1.12	1.36	.88	1.29
	(.74)	(.59)	(.38)	(.64)	(.52)	(.26)
Same Colonizer β_8	.91	.73	.52	.48	.59	.63
	(.15)	(.14)	(.12)	(.12)	(.12)	(.06)
Colonial Relationship β_9	2.52	2.40	2.28	2.05	1.75	2.20
	(.23)	(.19)	(.14)	(.14)	(.15)	(.07)
Number of Observations	4052	4474	5092	5091	4239	22,948
R^2	.57	.59	.62	.65	.72	.63
RMSE	2.18	2.18	2.03	1.94	1.75	2.02

Note: OLS estimation; robust standard errors in parentheses.

Constant term (and year controls for pooled regression) not reported.

The International Monetary Regime matters!

- Countries using same currency trade disproportionately *ceteris paribus*.
- Effect is large: exp.(1.21) ≈ 3.35, so *countries with the same currency trade over three times as much with each other as countries with different currencies*!
- Countries with volatile exchange rates also trade less.
- Both effects have t-statistics >8!

Does Common Currency equal no Exchange Rate Volatility?

- Effects of currency unions and exchange rate volatility are economically distinguishable.
- Common currency coefficient (γ) $\approx$ 1.2. Big effect: >300%.
- Somewhat more important than the effect of being in a common regional free trade agreement (β_6)!

- Hypothetically reducing exchange rate volatility around mean (5%) by 1σ (7%) from 7% to 0%, increases trade by ($\delta \approx$ -.017)(-7) = .12 or 13% (since exp.(.12 $\approx$ .13).
- That is, *entering a currency union delivers an effect that is over an order of magnitude larger than the impact of reducing exchange rate volatility from one standard deviation to zero.*

Findings

1. Intuitive but heretofore hidden (in time-series analysis) strong negative effect of exchange rate volatility on trade.
2. More novel: large positive effect of a common currency on trade.
3. Effect of common currency is much larger than the hypothetical effect of reducing exchange rate volatility to zero.

Sensitivity Analysis

Table 2: *sample*. Exclude:

1. purely intra-LDC trade;
2. Australia, France, New Zealand, UK, US, (key currencies);
3. All African trade;
4. Europe, Antipodes and Pacific;
5. Americas and Caribbean;
6. Observations where Bilateral Trade > 10% total trade;
7. Observations where GDP per capita varies more than 2x;
8. Observations where GDP varies more than 4x.
9. Observations where GDP per capita < $1k
10. Observations where population < 1 million

Table 2: Sample Sensitivity

Observations Excluded:	Intra-LDC	Australia, France, NZ, UK, and US	African	Europe, Australia, NZ and Pacific	The Americas and Caribb.
Currency Union γ	1.85 (.30)	1.04 (.15)	1.46 (.40)	.96 (.15)	1.23 (.19)
Exchange Rate Volatility δ	-.014 (.003)	-.016 (.002)	-.013 (.002)	-.018 (.003)	-.037 (.005)
Output β_1	.88 (.01)	.78 (.01)	.82 (.01)	.78 (.01)	.74 (.01)
Output/Capita β_2	.50 (.02)	.64 (.01)	.80 (.02)	.61 (.02)	.68 (.02)
Distance β_3	-1.01 (.02)	-1.09 (.02)	-1.03 (.02)	-1.05 (.03)	-.88 (.03)
Contiguity β_4	-.50 (.10)	.66 (.09)	.24 (.09)	1.04 (.10)	.78 (.12)
Language β_5	.52 (.04)	.27 (.05)	.59 (.05)	.37 (.06)	.33 (.09)
FTA β_6	.53 (.07)	1.10 (.09)	1.00 (.09)	1.41 (.13)	.75 (.09)
Same Nation β_7	1.37 (.26)	1.20 (.35)	1.45 (.38)	1.06 (.48)	3.56 (.49)
Same Coloniser β_8	.39 (.15)	.65 (.06)	.74 (.09)	.83 (.07)	.53 (.09)
Colonial Relationship β_9	1.60 (.07)	2.95 (.30)	1.74 (.10)	1.67 (.28)	1.65 (.11)
Currency Unions Obs.	36	252	41	228	130
Number of Observations	10,977	20,084	12,677	11,354	7,352
R^2	.75	.58	.69	.51	.69
RMSE	1.50	2.09	1.87	2.29	1.89

Note: OLS estimation; robust standard errors in parentheses.

Intercept and year controls unreported.

Table 2b

Observations Excluded:	**(Bilateral /Total Trade) > .1**	**GDP per capita Disparity > 2**	**GDP Disparity > 4**	**GDP per capita < $1000**	**Population < 1 million**
Currency Union γ	1.04 (.19)	1.19 (.17)	1.26 (.19)	1.48 (.24)	1.31 (.17)
Exchange Rate Volatility δ	-.016 (.002)	-.018 (.003)	-.014 (.003)	-.010 (.003)	-.013 (.002)
Output β_1	.79 (.01)	.83 (.01)	.84 (.01)	.88 (.01)	.84 (.01)
Output/Capita β_2	.66 (.01)	.70 (.01)	.67 (.01)	.83 (.02)	.73 (.01)
Distance β_3	-1.04 (.02)	-1.12 (.02)	-1.14 (.02)	-1.07 (.02)	-1.15 (.02)
Contiguity β_4	.23 (.11)	.63 (.09)	.58 (.09)	.25 (.10)	.48 (.09)
Language β_5	.30 (.04)	.42 (.05)	.42 (.05)	.43 (.05)	.40 (.04)
FTA β_6	1.26 (.10)	.73 (.08)	.75 (.08)	.80 (.08)	.43 (.08)
Same Nation β_7	1.31 (.58)	1.46 (.43)	1.63 (.81)	1.25 (.43)	3.93 (.22)
Same Coloniser β_8	.58 (.06)	.93 (.07)	.80 (.07)	.94 (.09)	.78 (.08)
Colonial Relationship β_9	1.32 (.15)	2.22 (.05)	1.90 (.05)	2.01 (.09)	1.91 (.08)
Currency Unions Obs.	159	129	121	51	100
Number of Observations	20,419	16,035	16,865	13,969	16,848
R^2	.58	.65	.64	.68	.64
RMSE	2.02	2.01	2.02	1.88	1.95

Note: OLS estimation; robust standard errors in parentheses.

Intercept and year controls unreported.

Table 3: *measurement of the monetary regime*.

Use different measures of exchange rate volatility:

a) absolute value of *maximal* monthly percentage change;

b) *ninetieth percentile* in the univariate distribution;

c) standard deviation of *level*;

d) standard deviation for year t (rather than from t-5 through t-1).

Also use 2 different measures of the currency union dummy.

Table 3: Exchange Rate Volatility Sensitivity

Currency Union γ				1.22 (.14)	1.26 (.14)	1.27 (.14)	1.27 (.18)
Stricter Currency Union Definition γ		1.17 (.14)					
Currency Unions between Countries			1.28 (.14)				
Dependency/Territory Currency Unions			1.11 (.47)				
Volatility: Maximal				-.0026 (.0003)			
Volatility: 90th percentile					-.006 (.002)		
Volatility: Level						10 e-15 (4 e-15)	
Volatility: Within Year							-.014 (.002)
Exchange Rate Volatility δ		-.017 (.002)	-.017 (.002)				
Output β_1	.80 (.01)	.80 (.01)	.80 (.01)	.80 (.01)	.80 (.01)	.80 (.01)	.81 (.01)
Output/Capita β_2	.67 (.01)	.66 (.01)	.66 (.01)	.65 (.01)	.67 (.01)	.67 (.01)	.67 (.01)
Distance β_3	-1.12 (.02)	-1.09 (.02)	-1.09 (.02)	-1.09 (.02)	-1.10 (.02)	-1.10 (.02)	-1.10 (.02)
Contiguity β_4	.50 (.09)	.54 (.08)	.53 (.08)	.53 (.08)	.53 (.08)	.52 (.08)	.52 (.09)
Language β_5	.42 (.04)	.41 (.04)	.40 (.04)	.40 (.04)	.40 (.04)	.39 (.04)	.35 (.04)
FTA β_6	1.07 (.08)	.98 (.08)	1.02 (.08)	1.00 (.08)	.99 (.08)	.98 (.08)	1.09 (.08)
Same Country β_7	1.90 (.26)	1.63 (.27)	1.47 (.29)	1.30 (.26)	1.30 (.27)	1.29 (.27)	1.47 (.36)
Same Coloniser β_8	.71 (.06)	.63 (.06)	.63 (.06)	.64 (.06)	.65 (.06)	.66 (.06)	.59 (.06)
Colonial Relationship β_9	2.20 (.07)	2.19 (.07)	2.19 (.07)	2.20 (.07)	2.23 (.07)	2.24 (.07)	2.15 (.06)
Number of Observations	22,948	22,948	22,948	23,033	23,033	22,948	18,753
R^2	.63	.63	.63	.63	.63	.63	.64
RMSE	2.03	2.02	2.02	2.02	2.03	2.03	1.99

Note: OLS estimation; robust standard errors in parentheses.
All regressions pooled across years; intercept and year controls unreported.

Table 4: *measurement of distance*.

Use different measures of physical and linguistic difference:

a) Hirschberg centroid measure of distance;

b) Fitzpatrick-Modlin great circle distance between most populous cities; and

c) Boisso-Ferrantino (1997) continuous measure of linguistic similarity.

Table 4: Distance Sensitivity

Currency Union γ	1.80 (.24)	1.79 (.24)	1.53 (.24)
Exchange Rate Volatility δ	-.010 (.002)	-.012 (.003)	-.011 (.002)
Output β_1	.83 (.01)	.83 (.01)	.84 (.01)
Output/Capita β_2	.71 (.01)	.69 (.01)	.69 (.01)
Hirschberg Centroid Distance β_3	-1.11 (.03)		
Fitzpatrick/Modlin Distance* β_3		-.02 (.0004)	
Distance β_3			-1.16 (.02)
Contiguity β_4	1.47 (.10)	1.48 (.10)	.54 (.11)
Language β_5	.59 (.05)	.58 (.05)	
Boisso-Ferrantino Measure of Linguistic Similarity* β_5			.005 (.0009)
FTA β_6	1.48 (.09)	1.54 (.09)	.78 (.09)
Same Nation β_7	1.06 (.42)	1.01 (.42)	1.14 (.44)
Same Coloniser β_8	.74 (.07)	.73 (.07)	.85 (.07)
Colonial Relationship β_9	2.00 (.08)	2.03 (.07)	2.34 (.08)
Number of Observations	16,028	16,263	16,263
R^2	.62	.62	.63
RMSE	2.00	2.01	2.00

Note: OLS estimation; robust standard errors in parentheses.
All regressions pooled across years; intercept and year controls unreported.
* indicates statistics multiplied by 100.

Table 5: *omitted variables*. Add:

a) remoteness and the *product* of the tariffs;

b) *sum* of two tariffs and square of distance;

c) *product* of land areas and dummy for at least 1 landlocked;

d) *sum* of land areas, and dummies for 1 or 2 countries landlocked;

e) quadratic terms for output and output per capita;

f) dummy variables for current account and export controls;

g) island national controls;

h) measures of bureaucratic efficiency and political stability;

i) common head of state;

j) interactions between currency union and 3 gravity regressors;

k) currency board control;

l) sum of indices of “Economic Freedom”;

m) dummy for currency union members and non-members; and

n) dummy for long-term (post-1700) historical relationship.

Tables 5: Specification Sensitivity

Currency Union γ	1.83 (.26)	1.95 (.28)	1.33 (.14)	1.22 (.14)	.67 (.15)
Exchange Rate Volatility δ	-.019 (.003)	-.019 (.003)	-.014 (.002)	-.016 (.002)	-.014 (.002)
Output β_1	.85 (.01)	.85 (.01)	.93 (.01)	.87 (.01)	-.83 (.08)
Output/Capita β_2	.50 (.02)	.51 (.02)	.49 (.01)	.57 (.01)	-.72 (.18)
Distance β_3	-1.20 (.03)	.71 (.36)	-1.07 (.02)	-1.05 (.02)	-1.03 (.02)
Contiguity β_4	.59 (.13)	.82 (.13)	.75 (.09)	.70 (.09)	.56 (.09)
Language β_5	.53 (.06)	.55 (.06)	.50 (.04)	.52 (.04)	.41 (.04)
FTA β_6	.48 (.10)	.63 (.11)	.89 (.08)	.84 (.08)	.58 (.08)
Same Nation β_7	-.21 (.99)	-.28 (.99)	1.16 (.27)	1.17 (.27)	.73 (.28)
Same Coloniser β_8	.92 (.08)	.90 (.08)	.41 (.06)	.47 (.06)	.47 (.06)
Colonial Relationship β_9	1.89 (.09)	1.87 (.09)	2.01 (.08)	2.03 (.08)	2.32 (.08)
Remoteness	9.4 (12.)				
Tariff Rate Product	-.037 (.002)				
Tariff Rate Sum		-.041 (.002)			
Distance Squared		-.12 (.02)			
Product of Land Area			-.14 (.01)		
At least one Landlocked			-.35 (.03)		
Sum of Land Area				-.19 (.01)	
One Country Landlocked				-.40 (.04)	
Both Landlocked				-.62 (.13)	
Output Squared					.024 (.001)
Output /Capita Squared					.042 (.005)
Number of Observations	9008	9008	22,948	22,948	22,948
R^2	.69	.69	.64	.64	.64
RMSE	1.84	1.84	2.00	2.01	2.00

Note: OLS estimation; robust standard errors in parentheses.
All regressions pooled across years; intercept and year controls unreported. Last regression is only for 1980.

Table 5b

Currency Union γ	1.71 (.13)	1.11 (.15)	1.18 (.14)	2.51 (1.18)	1.33 (.53)
Exchange Rate Volatility δ	-.044 (.002)	-.007 (.002)	-.017 (.002)	-.017 (.002)	-.048 (.012)
Output β_1	.77 (.01)	.85 (.01)	.82 (.01)	.80 (.01)	.84 (.02)
Output/Capita β_2	.58 (.01)	.52 (.01)	.64 (.01)	.66 (.01)	.81 (.04)
Distance β_3	-1.21 (.02)	-1.21 (.02)	-1.10 (.02)	-1.10 (.02)	-1.08 (.06)
Contiguity β_4		.40 (.09)	.56 (.09)	.52 (.09)	-.16 (.23)
Language β_5		.28 (.04)	.39 (.04)	.40 (.04)	.34 (.14)
FTA β_6		.89 (.09)	.88 (.08)	1.05 (.08)	.45 (.17)
Same Nation β_7		1.00 (.32)	1.19 (.27)	1.21 (.29)	3.82 (.30)
Same Coloniser β_8		.82 (.06)	.59 (.06)	.63 (.06)	.49 (.30)
Colonial Relationship β_9		2.15 (.08)	2.09 (.08)	2.20 (.07)	1.66 (.27)
Current Account Controls		-.43 (.03)			
Surrender of Export Proceeds		-.34 (.03)			
One Island Nation			.03 (.03)		
Two Island Nations			.59 (.07)		
Currency Union*Output				-.06 (.04)	
Currency Union* Output/Capita				-.16 (.07)	
Currency Union*Distance				.44 (.14)	
Absolute Difference in Bureaucratic Efficiency					.13 (.04)
Absolute Difference in Political Stability					.11 (.04)
Number of Observations	22,948	19,581	22,948	22,948	1852
R^2	.59	.66	.63	.63	.66
RMSE	2.13	1.93	2.02	2.02	1.81

Note: OLS estimation; robust standard errors in parentheses.
First four regressions pooled across years; intercept and year controls unreported. Last regression is only for 1980.

Table 5c

Currency Union γ	1.18 (.14)	1.34 (.20)	1.21 (.14)	1.35 (.14)	1.22 (.14)
Exchange Rate Volatility δ	-.017 (.002)	.005 (.002)	-.017 (.002)	-.015 (.002)	-.017 (.002)
Output β_1	.81 (.01)	.91 (.01)	.80 (.01)	.81 (.01)	.80 (.01)
Output/Capita β_2	.65 (.01)	.62 (.01)	.66 (.01)	.65 (.01)	.67 (.01)
Distance β_3	-1.10 (.02)	-1.27 (.02)	-1.09 (.02)	-1.11 (.02)	-1.09 (.02)
Contiguity β_4	.54 (.08)	.33 (.11)	.53 (.08)	.54 (.08)	.52 (.08)
Language β_5	.37 (.04)	.19 (.05)	.40 (.04)	.38 (.04)	.26 (.04)
FTA β_6	.92 (.08)	.41 (.08)	.99 (.08)	.97 (.08)	.99 (.07)
Same Nation β_7	.53 (.28)	n/a	1.30 (.26)	1.36 (.26)	1.24 (.26)
Same Coloniser β_8	.61 (.06)	.81 (.07)	.63 (.06)	.63 (.06)	.44 (.06)
Colonial Relationship β_9	2.13 (.08)	1.98 (.09)	2.19 (.07)	2.05 (.08)	2.03 (.08)
Common Head of State	.87 (.11)				
Sum of Economic Freedom Indices		.22 (.01)			
Currency Board Control			1.14 (.36)		
Currency Union/Non-Currency Union Control				.29 (.03)	
Post-1700 Historical Relationship					.36 (.03)
Number of Observations	22,948	13,104	22,948	22,948	22,948
R^2	.63	.70	.63	.63	.63
					2.02

Note: OLS estimation; robust standard errors in parentheses.
All regressions pooled across years; intercept and year controls unreported.

Table 6: *estimation* technique. Use:

a) Tobit;

b) Heckit;

c) Weighted Least Squares;

d) Random Effects;

e) Maximum Likelihood;

f) Generalized linear Gaussian estimator;

g) Quantile (median);

h) Robust (iterative Huber/biweight) estimators; and

l) OLS with country-specific fixed effect

Table 6a: Estimation Sensitivity

	Tobit	WLS	Heckit	Random Effects	MLE
Currency Union γ	1.57 (.18)	1.30 (.14)	1.52 (.14)	1.23 (.20)	1.23 (.20)
Exchange Rate Volatility δ	-.018 (.003)	-.017 (.002)	-.021 (.002)	-.005 (.002)	-.006 (.002)
Output β_1	.89 (.01)	.81 (.01)	.82 (.01)	.80 (.01)	.80 (.01)
Output/Capita β_2	.71 (.01)	.67 (.01)	.67 (.01)	.60 (.02)	.60 (.02)
Distance β_3	-1.21 (.02)	-1.10 (.02)	-1.13 (.02)	-1.16 (.03)	-1.16 (.03)
Contiguity β_4	.52 (.12)	.47 (.08)	.41 (.09)	.69 (.17)	.68 (.16)
Language β_5	.48 (.05)	.40 (.04)	.75 (.04)	.39 (.07)	.39 (.07)
FTA β_6	1.06 (.13)	.91 (.07)	1.11 (.10)	.41 (.11)	.43 (.11)
Same Nation β_7	1.50 (.34)	1.35 (.25)		1.15 (.28)	1.16 (.28)
Same Coloniser β_8	.65 (.07)	.64 (.06)		.55 (.09)	.55 (.08)
Colonial Relationship β_9	2.28 (.14)	2.15 (.07)		2.41 (.21)	2.40 (.21)
R^2	.15	.64		.63	

Note: All regressions pooled across years; intercept and year controls unreported.

Number of observations = 22,948, except for Heckit (35,998). Quasi-R^2 reported for Tobit.

Table 6b: Estimation Sensitivity

	GLM	Quantile	Robust	OLS with Fixed Effects
Currency Union γ	1.25 (.19)	1.45 (.15)	1.29 (.13)	.77 (.16)
Exchange Rate Volatility δ	-.007 (.002)	-.015 (.002)	-.017 (.002)	-.002 (.002)
Output β_1	.79 (.01)	.83 (.01)	.84 (.01)	1.30 (.12)
Output/Capita β_2	.62 (.02)	.66 (.01)	.66 (.01)	-.30 (.12)
Distance β_3	-1.15 (.03)	-.99 (.02)	-1.05 (.02)	-1.30 (.02)
Contiguity β_4	.67 (.14)	.45 (.10)	.48 (.09)	.40 (.09)
Language β_5	.39 (.06)	.44 (.04)	.41 (.04)	.48 (.04)
FTA β_6	.56 (.11)	.76 (.11)	.94 (.09)	.47 (.08)
Same Nation β_7	1.22 (.29)	1.28 (.27)	1.39 (.25)	1.02 (.26)
Same Coloniser β_8	.57 (.08)	.72 (.05)	.75 (.05)	.70 (.06)
Colonial Relationship β_9	2.37 (.19)	1.98 (.12)	2.01 (.11)	1.74 (.07)
R^2		.44		.73

Note: All regressions pooled across years; intercept and year controls unreported.

Number of observations = 22,948, except for Heckit (35,998). Quasi-R^2 reported for quantile regression.

Trade Growth

$$\Delta\ln(X_{ij}) = .001 + .75\Delta(Y_i Y_j) + .90\Delta\ln(Y_i Y_j/Pop_i Pop_j) + 1.44\Delta FTA_{ij}$$

$$\qquad (.002) \quad (.02) \qquad\qquad (.05) \qquad\qquad\qquad\qquad (.23)$$

$$+ .16CU_{ij} + \text{error}$$

$$(.03)$$

$N = 2989 \quad R^2 = .47 \quad RMSE = .104$

Endogeneity

- Countries may lower exchange rate volatility to raise trade.
- Indeterminate sign of simultaneity bias: δ not biased one way.
- Use as instrumental variables (product, sum, and absolute difference) of inflation rates for exchange rate volatility.
- Adding money growth rates makes little difference.

Table 7: IV results (both stages).

- IV for δ makes no difference.
- IV for δ and γ *does* make a difference: hard to get good IVs for currency unions (first stages).
- γ stays positive and significant; but implausible size and problems with nuisance coefficients.

Table 7: Instrumental Variables

	IV for d	**IV for** d **and** g	**V(e): 1st Stage**	**CU: 1st Stage**	**IV for** d	**IV for** d **and** g
Instrumental Variables	Inflation	Inflation			Inflation, M2 growth	Inflation, M2 growth
Currency Union γ	1.69 (.21)	83. (20.)			1.58 (.21)	52. (14.)
Exchange Rate Volatility δ	-.009 (.003)	.014 (.006)			-.007 (.003)	.008 (.005)
Output β_1	.85 (.01)	1.00 (.04)	.09 (.02)	-.002 (.0002)	.85 (.01)	.96 (.03)
Output/Capita β_2	.74 (.01)	.84 (.04)	-.62 (.03)	-.001 (.0005)	.77 (.01)	.87 (.04)
Distance β_3	-1.19 (.02)	-.52 (.17)	.36 (.05)	-.008 (.001)	-1.21 (.02)	-.71 (.14)
Contiguity β_4	.27 (.10)	.14 (.78)	-.25 (.25)	.003 (.004)	.35 (.11)	.53 (.58)
Language β_5	.33 (.04)	-1.26 (.42)	.42 (.10)	.020 (.002)	.29 (.05)	-.57 (.27)
FTA β_6	.79 (.08)	-.97 (.96)	-.54 (.24)	.022 (.004)	.93 (.09)	-.38 (.80)
Same Country β_7	.85 (.36)	1.24 (.41)	-.77 (1.34)	-.004 (.022)	1.05 (.49)	1.25 (.50)
Same Colonizer β_8	.65 (.07)	-1.98 (.71)	-.56 (.14)	.032 (.002)	.71 (.08)	-1.20 (.58)
Colonial Relationship β_9	2.14 (.08)	3.07 (.26)	-1.10 (.29)	-.011 (.005)	2.26 (.14)	2.90 (.24)
Inflation Difference			-.059 (.002)	.0001 (.00003)		
Inflation Product			-.00003 (1 e-6)	5 e-8 (2 e-8)		
Inflation Sum			.078 (.002)	-.0001 (.00003)		
R^2	.67		.60	.06	.67	
RMSE	1.91	6.11	4.41	.071	1.89	4.19
Number of Observations	16,855	16,855	16,855	16,855	12,468	12,468

Note: IV estimation; robust standard errors in parentheses.

Intercept and year controls unreported.

Is Simultaneity Bias a problem for γ?

- Decisions to enroll in or depart from a currency union are infrequent,
- Political (not economic) considerations usually paramount.
- Among economic arguments, trade usually small.

Why Does A Common Currency Have Such A Big Effect?

- Currency union a more serious commitment to integration?
- Does common currency induce greater financial integration?
- Is hedging more difficult than imagined?
- Don’t know.
- But … plausible that common currency is important, since home bias is so huge.

Gains from Increased Trade

- Increased gains from trade.
- Frankel and Romer (1999) estimate that increasing trade/GDP by 1% raises GDP/capita by (.5%, 2%).
- Dynamics gains?
- More entry into currency unions (since benefits underestimated)?
- Still, this is all reduced-form, so welfare gains are uncertain.

Other Potential Consequences

- Some trade diversion.
- More protectionist pressures.
- More pleas for social safety net.
- More power of the European bloc vis-à-vis RoW.
- More synchronized business cycles?