Session I:
Trade integration

Leading paper:

Richard E. Baldwin
Graduate Institute of International Studies, Geneva

EUROPEAN CENTRAL BANK

The euro's trade effects

Richard E. Baldwin
Graduate Institute of International Studies, Geneva
Presentation to ECB Conference
Frankfurt, June 2005

Empirical literature: "Rose effect"

- Two branches:
  - Rose (2000) inspired studies on pre-euro currency unions
 - Micco, Stein and Ordenez (2003) inspired studies on Eurozone.

Pre-euro studies

◉ Bottom line judgement: no relevance to Eurozone

• Two reasons:

◉ #1: Pre-euro CUs are highly idiosyncratic.

◉ #2: Severe econometric problems.

  – Rose (2000) estimate of 3 times more trade should be ignored for policy purposes.

    • See my paper for details

Eurozone studies

◉ MSO (2003), Flam and Nordstrom (2004), many others.

◉ Most contain seriously flawed econometrics.

  – See paper for a details.

◉ Best study: Flam-Nordstrom (2004) using only EU nations.

  – 8% more imports by Eurozone nations

  – Euro seems to be acting like a unilateral liberalisation, not a preferential liberalisation as OCA theory assumes.

    • (This result needs to be checked further.)
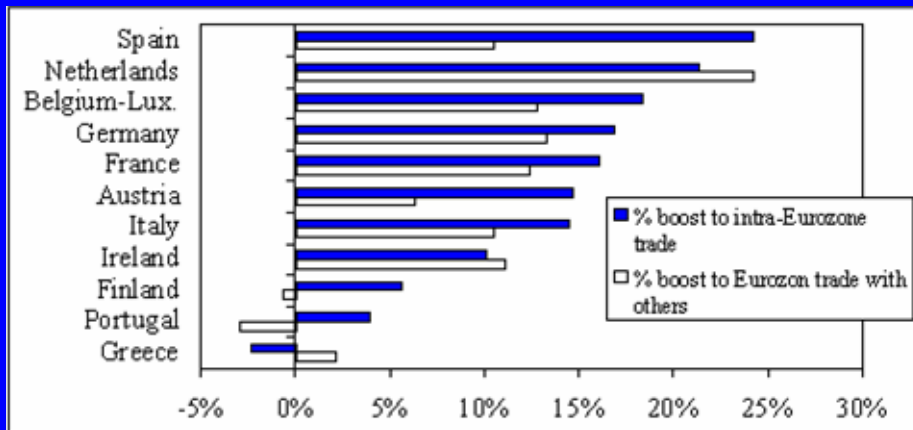
Eurozone experience
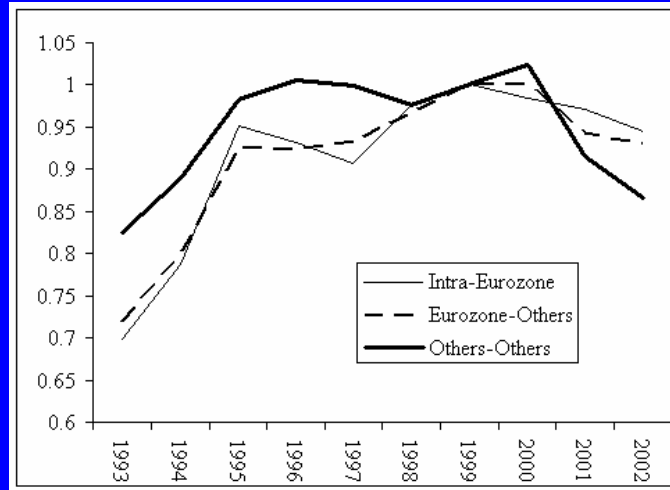
Source: MSO (2003); data for 22 industrial nations

Collection of clues

- Extract 'facts' from the empirical literature on Rose effect of euro.
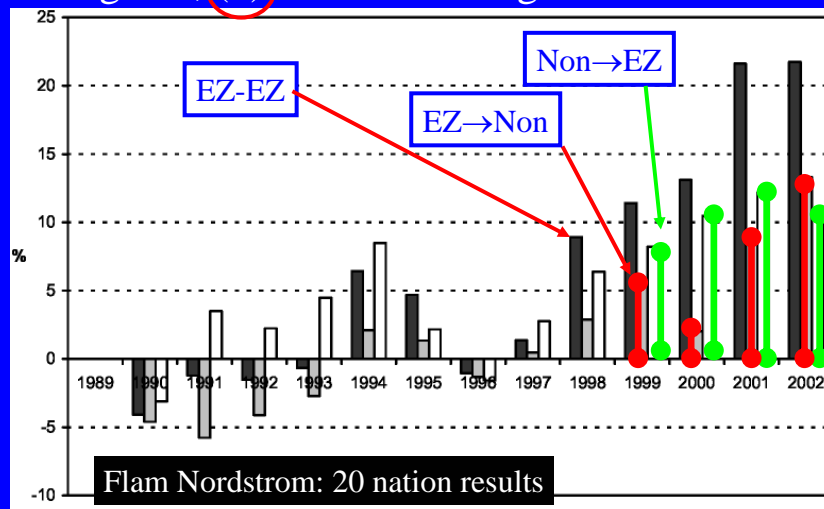
Spatial variation of Rose effect

- MSO (2003)
  - EZ2 dummy (both in); EZ1 dummy (only one in)
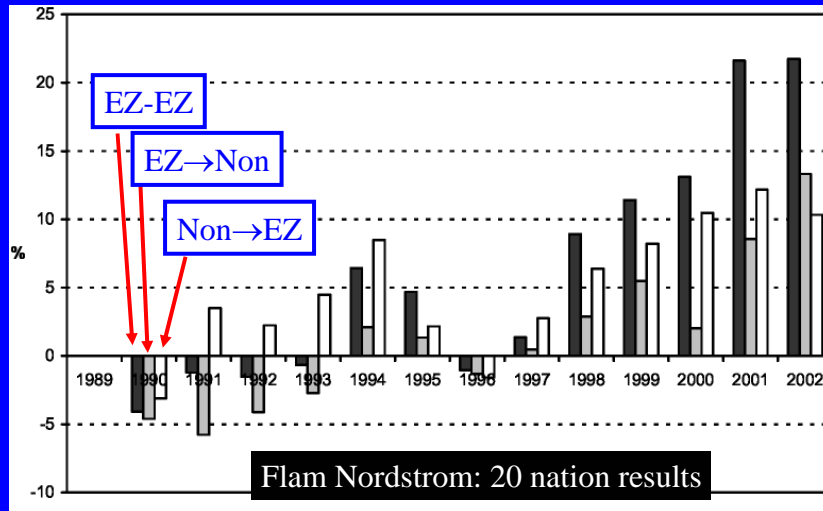- DM bloc biggest effect; Greece negative & signif.

No 'trade diversion'

- Best estimate: (1) EZ → EZ, 'signif.'; (2) EZ→Non 'not signif.', (3) Non → EZ 'signif.'

Flam Nordstrom: 20 nation results

Timing: Appears quickly

- EZ-EZ significant in 1998, jumps up 2001

EZ-EZ
EZ→Non
Non→EZ

Flam Nordstrom: 20 nation results

Sectoral results

Beverages & tobacco, 42%

Manufactures by material, 13%

Machinery & Transp. Eq. 25%

Misc. Manuf. 7%

Table 8. Results for sectors (one-digit SITC rev. 3), 1995-2002

	SITC 1-9 Aggregate export	SITC 0 Food & live animals	SITC 1 Beverages & tobacco	SITC 2 Crude materials, inedible, except fuels	SITC 3 Mineral fuels, lubricants & related material	SITC 4 Animal & vegetable oils, fats & waxes	SITC 5 Chemicals & related products, n.e.s.	SITC 6 Manufactured goods classified chiefly by materials	SITC 7 Machinery & transport equipment	SITC 8 Miscellaneous manufactured articles
EMU11	0.172***	0.014	0.352***	-0.033	-0.196	0.044	0.069*	0.124***	0.224***	0.071***
	(0.021)	(0.041)	(0.086)	(0.054)	(0.198)	(0.152)	(0.038)	(0.034)	(0.037)	(0.027)
EMU12	0.089***	0.047	0.129*	-0.063	-0.096	0.186	0.078**	0.002	0.087**	-0.002
	(0.018)	(0.037)	(0.072)	(0.052)	(0.172)	(0.125)	(0.033)	(0.032)	(0.035)	(0.023)
EMU21	0.089***	-0.088**	0.161*	-0.115***	0.075	0.139	0.059	0.088**	0.120***	0.009
	(0.019)	(0.039)	(0.087)	(0.044)	(0.167)	(0.133)	(0.036)	(0.036)	(0.036)	(0.025)

All other sectors insignificant

Eurozone trade pricing

- Meagre evidence is that there was no structural break in the EZ trade pricing.
  - "The dog that did not bark."

So…

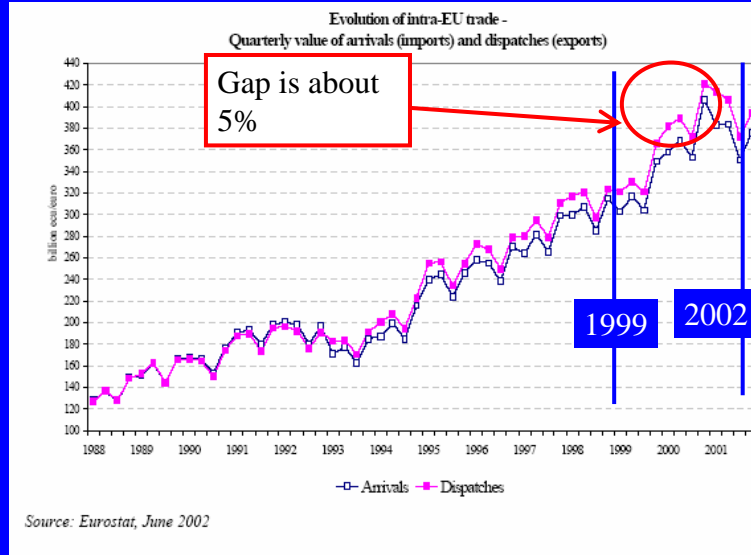- What caused the Rose effect in the Eurozone.

Two types of hypotheses

- 1. The whole thing is a down to spurious results.
- 2. It's real.

Hypothesis Type #1: spurious

A. Bad data

B. Lagged effect of euro's sharp depreciation at birth.

C. Lagged and differential effect of implementation of Internal Market measures in late 1990s.

Bad data

- VAT fraud = bad data
- 'Rotterdam effect'

Evolution of intra-EU trade -
Quarterly value of arrivals (imports) and dispatches (exports)

Gap is about 5%

1999   2002

Source: Eurostat, June 2002

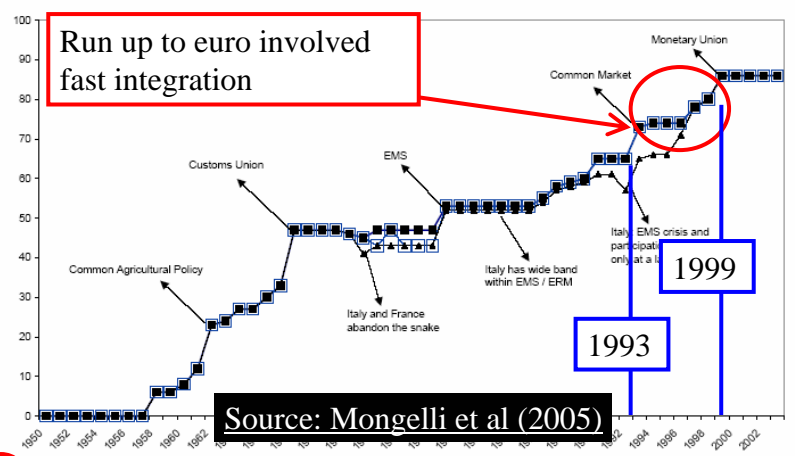- Arrivals — Dispatches

Delayed devaluation effects

- Euro-dollar depreciation makes intra-Eurozone trade relatively cheaper.
  - Boost intra-EZ trade, lagged effects = 2 yrs?

Figure 1:Euro against the dollar, 1999-2005

(c)2002 – European Central Bank

Min=0.8252 (26 Oct 2000) - Max=1.3633 (28 Dec 2004)

Index of European integration

Run up to euro involved fast integration

Source: Mongelli et al (2005)

1999

1993

1. Internal market measures have lagged effects.
- 2. Implemented at different pace by EU members in different sectors.
  - Non-EZ are 'rabbits', some EZ members are 'tortoises.'

Diagnostic tests: **Spurious results**

- **VAT fraud, 'Rotterdam effect' and false data.**
  - **Must dig into statistics more; Estimate model of fraud? In meantime, use only export figures (don't average bilateral flows).**

- **Euro depreciation.**
  - Included lagged ERs; check for differential effects according to EZ exposure (e.g. Ireland vs Austria).

- **Single Market initiatives.**
  - Include EU integration trend interacted with 'transposition deficit'.

9

Hypothesis Type #1: Real Rose effect

If it is real, what could it be?
- Trade volumes increasing by 5-15% in a few years.
- Possible sources:
  - The bilateral trade costs fall → "Lower tau".
  - The markup on intra-EZ trade falls→ "Lower mu".
  - EZ marginal production costs fall→ "Lower mc".
  - The number of varieties traded rises→ "Higher n".

An organising framework

- Look at import demand AND pricing equation.

$$X_{od} = n_o \tau_{od} \mu_{od} \left(\frac{RER_{od}}{\left(\sum_k n_k \tau_{kd}^{1-\sigma} \left(RER_{kd}\right)^{1-\sigma} \right)^{1/(1-\sigma)}} \right)^{-\sigma} \frac{E_d}{P_d}; \qquad RER_{kd} \equiv \frac{e_{kd} mc_k}{P_d}$$

$$p_{od} = (\tau_{od})(\mu_{od})(e_{od}) mc_o$$

- EZ dummy significant means structural break in volume equation.
  - Culprits: must be n, τ or μ.
- If true there's no structural break pricing, then 'n' is the perpetrator.
  - Suggests Melitz model effect (Baldwin & Taglioni 2004)

Diagnostic tests: **Real**

- Careful estimation of bilateral import demand equations (on EU15 data only).
  - Accounting for real ERs (bilateral & multilateral adjusted for the external exposure) allowing for lags
  - Account for lagged & differential implementation of internal market measures (need to develop proxies)
- Careful estimate of import pricing equations.
  - Control for all of above.
- Do both on aggregate and sectoral data.
- Estimate country-specific effects.
- Check for structural breaks.

τ, μ or n?

For trade costs, τ:

- Check the Flam-Nordstrom results on EZ$\rightarrow$Non & Non $\rightarrow$ EZ.
- Check the trade diversion story by nation using Flam-Nordstrom techniques.
  - Do they suggest particular types of trade cost changes?
- Trade diversion by EZ nation and by third country partner groups.
  - Is it some form of European integration not in regressions? For example, EEA changes, EU-Swiss Bilateral Agreements?
- Check by sector.
  - Is it something sector specific?
  - Check Flam-Nordstrom hypothesis of components trade.

τ, μ or n?

For pro-competitive effect, μ:

- Check for change in pricing equations.
- Check for changes in profitability (stock market prices? Corporate accounts? Anecdotes?)
- Check for domestic price evolution and domestic sales (all sales should rise, including domestic producers).

τ, μ or n?

For Melitz effect, n:

- Work in progress.
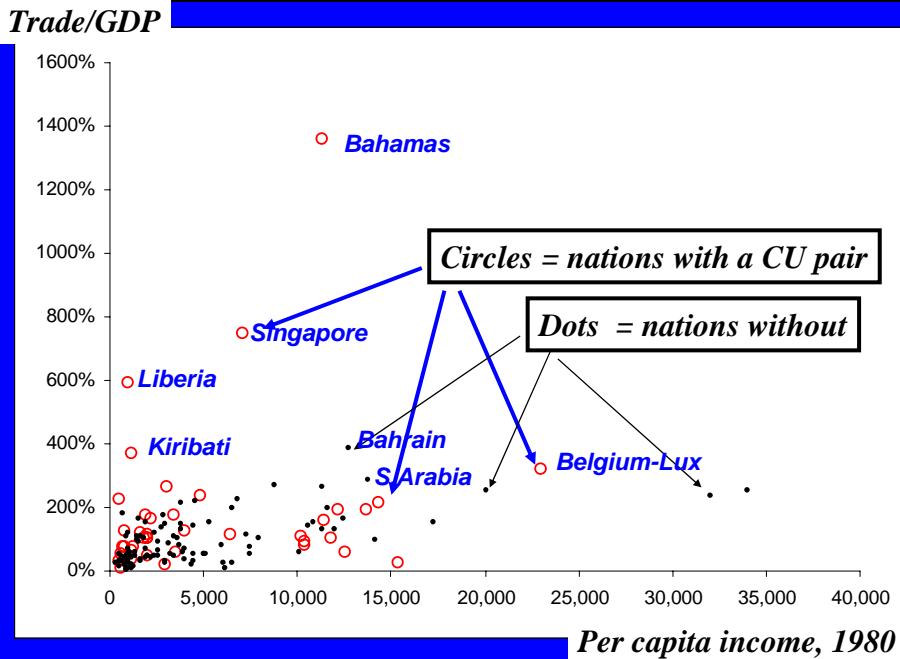
End

- Thank you for listening.

Euro's trade effect is important

- Eurozone covers 300 million people, 1/5th of world GDP and 1/3 of world trade.
- Eurozone problems with one-size-fits-all monetary policy.
- Tighter trade integration could help
  - Harmonise inflation rates:
    - Imported inflation channel
    - Price species flow mechanism
  - Demand-shock transmission via trade
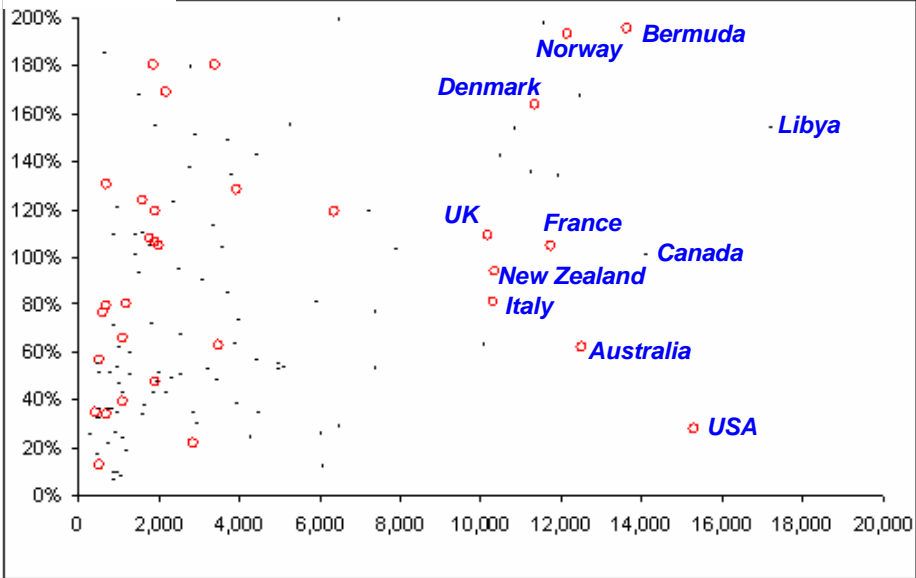
The CU pairs are bizarre

Hub and Spoke arrangements		Multilateral currency unions	Misc.
√ **Australia**	√ **USA**	**CFA**	√ **India**
Christmas Island	American Samoa	√ Benin	√ Bhutan
Cocos (Keeling) Islands	Guam	√ Burkina Faso	√ **Denmark**
Norfolk Island	√ US Virgin Islands	√ Cameroon	Faroe Islands
√ Kiribati	Puerto Rico	√ Central African Republic	√ Greenland
√ Nauru	Northern Mariana Islands	√ Chad	**Turkey**
√ Tuvalu	√ British Virgin Islands	Comoros	N. Cyprus
Tonga (pre '75)	√ Turks & Caicos	√ Congo	**Singapore**
√ **France**	√ Bahamas	√ Cote d'Ivoire	Brunei
√ French Guyana (OD)	Bermuda	Equatorial Guinea (post '84)	**Norway**
√ French Polynesia	√ Liberia	√ Gabon	Svalbard
√ Guadeloupe (OD)	Marshall Islands	Guinea-Bissau	**South Africa**
Martinique (OD)	Micronesia	√ Mali (post '84)	Lesotho
Mayotte	Palau	√ Niger	Namibia
√ New Caledonia (OT)	√ Panama	√ Senegal	Swaziland
√ Reunion (OD)	√ Barbados (? 2:1)	√ Togo	**Switzerland**
Andorra	√ Belize (? 2:1)	**ECCA**	Liechtenstein
√ St.Pierre & Miquelon	√ **Britain**	√ Anguilla	**Spain**
Wallis & Futuna Islands	√ Falkland Islands	√ Antigua and Barbuda	Andorra
Monaco	√ Gibraltar	√ Dominica	**Singapore**
√ **New Zealand**	Guernsey	√ Grenada	Brunei
√ Cook Islands	Jersey	√ Montserrat	**Italy**
√ Niue	Isle of Man	√ St. Kitts and Nevis	San Marino
Pitcairn Islands	√ Saint Helena	√ St. Lucia	Vatican
Tokelau	Scotland	√ St.Vincent	**Morocco**
	√ Ireland (pre '79)		Western Sahara

CUs nations are unusual

Trade/GDP vs *Per capita income, 1980*

Circles = nations with a CU pair

Dots = nations without

Labeled points: Bahamas, Singapore, Liberia, Kiribati, Bahrain, S.Arabia, Belgium-Lux
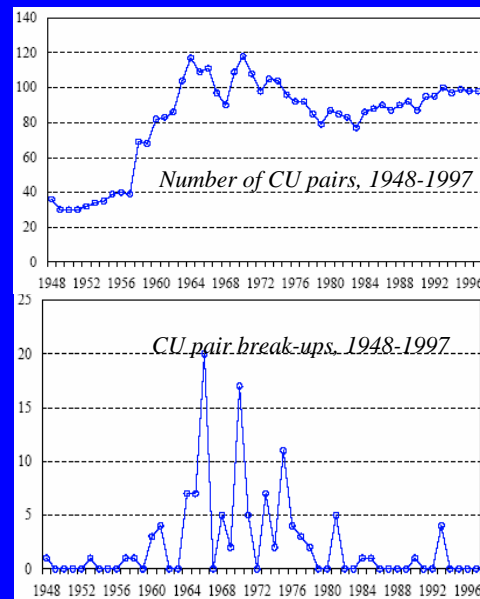
Openness < 200%

Trade/GDP

Per capita income, 1980

Time variation from CU break ups

- Most changes = CU break ups
  - 16 joiners and 130 leavers in Rose (2000)
- Data since 1948
- Independence =
  - #1 collect trade data
  - #2 get own money

Number of CU pairs, 1948-1997

CU pair break-ups, 1948-1997

Ignore pre-euro studies: Reason #2

- Many studies have severe econometric problems
- Rose (2000), e.g., widely cited but should be ignored for policy purposes.
  - The identification assumptions have been proved to be false by Andy Rose and many others

---

Gold medal error: estimate this on pooled panel data

- CU dummy coefficient is biased: Part 1
  - CU and X_{21} are correlated since X_{21} contains CU and all other determinants of bilateral trade costs
- CU dummy coefficient is biased: Part 2
  - CU and Z are likely to be correlated since CUs more likely among idiosyncratically close trade partners
    - Je-ne-sais-quoi factor

$$\hat{\beta}_1 = \begin{pmatrix} 1 \\ -b_1(\sigma-1) \\ b_2(\sigma-1) \end{pmatrix} + \begin{bmatrix} (RY_{o,t}RY_{d,t})X_{21t} & (RY_{o,t}RY_{d,t})\cdot Z_t \\ dist\cdot X_{21t} & dist\cdot Z_t \\ CU_t\cdot X_{21t} & CU_t\cdot Z_t \end{bmatrix} \begin{pmatrix} 1 \\ b_3 \end{pmatrix}$$

  - RY = real GDP

$$X_{21} \equiv \frac{P_o P_d / P_{USA}}{\sqrt{\Omega_o \Delta_o \Delta_d \Omega_d}}$$

Think about it

- Close to naïve gravity (2 GDPs divided by distance)

$$V_{od,t} = \left(\frac{\tau_{od,t}^{1-\sigma}}{\Omega_{o,t}\Delta_{d,t}}\right) E_{o,t} E_{d,t};$$

- Extra terms Δ and Ω are called 'remoteness', or 'multilateral trade resistance'
  - reflects fact that RELATIVE prices matter.

Gold medal error: estimate this on pooled panel data

- Real GDP figures likely to be downward biased since the error contains 1/P.

$$\hat{\beta}_1 = \begin{pmatrix} 1 \\ -b_1(\sigma-1) \\ b_2(\sigma-1) \end{pmatrix} + \begin{bmatrix} (RY_{o,t}RY_{d,t})X_{21t} & (RY_{o,t}RY_{d,t}) \cdot Z_t \\ dist \cdot X_{21t} & dist \cdot Z_t \\ CU_t \cdot X_{21t} & CU_t \cdot Z_t \end{bmatrix} \begin{pmatrix} 1 \\ b_3 \end{pmatrix}$$

$$X_{21} \equiv \frac{P_o P_d / P_{USA}}{\sqrt{\Omega_o \Delta_o \Delta_d \Omega_d}}$$

- The 2 kluges may help by forcing an averaging of the biases

Bit of theory (sorry)

- *"Without theory, practice is but routine born of habit." ~ Louis Pasteur*
- Gravity model is basically a demand equation with a twist.
- Derivation of gravity equation is a one line proof …
- if we start sufficiently far to the left.

Bit of theory (sorry)

- Step 1: CES expenditure function:

$$V_{od} = n_o \frac{p_{od}^{1-\sigma}}{\Delta_d} E_d$$

Value of sales of nation o's goods to nation d. 'o'=origin 'd'=destination

Number of goods sold by nation 'o' to nation d

Relative price of o's goods in d's market

Expenditure of destination nation (measured in numeraire)

Bit of theory (sorry)

- Step 2: Assume perfect pass-thru pricing

$$p_{od} = p_o \tau_{od}$$

o's producer price → ← o to d trade cost

- Step 3: Impose pass-thru pricing:

$$V_{od} = n_o p_o^{1-\sigma} \frac{\tau_{od}^{1-\sigma}}{\Delta_d} E_d$$

Bit of theory (sorry)

- Step 4: Eliminate unobserved $n_o p_o^{1-\sigma}$ with G.E. condition for the origin nation, i.e. the exporting nation:

$$E_o = n_o \sum_k (s_{ok} E_k)$$

Nation-o's GDP (measured in numeraire)

Nation-o's sales to all nations (including itself)

- Plugging into the expenditure function yields the value version of gravity equation:

$$V_{od,t} = (\frac{\tau_{od,t}^{1-\sigma}}{\Omega_{o,t} \Delta_{d,t}}) E_{o,t} E_{d,t};$$

Two common 'kluges'

- #1: Average V_{od} and V_{do}
- #2: Force coefficient on GDP's to be same.
- If trade costs are bilaterally symmetric, the true model is:

$$\ln\sqrt{V_{od}V_{do}} = \ln\left(\tau_{od}^{1-\sigma}\right) + \ln\left(\frac{E_o E_d}{\sqrt{\Omega_o \Delta_o \Delta_d \Omega_d}}\right); \quad \tau_{od} = f(dist_{od}, other\ stuff)$$

"Cannot" estimate true model, so

- Most people estimate:

$$\ln\left(\frac{V_{od} + V_{d0}}{2P_{USA}}\right) = \ln\left(\tau_{od}^{1-\sigma}\right) + \ln(\frac{E_o}{P_o}\frac{E_d}{P_d}) + u$$

  - where P's are GDP deflators Pusa is US price index.
- - τ proxied by distance, CU dummy & other stuff (language etc)
- Given the true model,

$$u = \ln\left\{\frac{P_o P_d / P_{USA}}{\sqrt{\Omega_o \Delta_o \Delta_d \Omega_d}}\right\} + \ln Z_{od} + \varepsilon$$

where Z is 'other stuff' determinants of trade costs
- What is wrong with this?
  - Gold, Silver and Bronze medal errors.

Gold medal error: estimate this on pooled panel data

- If estimated on pooled panel data, e.g. Rose (2000), results are biased upwards
  - #1: Correlation between omitted D and W terms and CU dummy
    - NB: D and W include CU
  - #2: Correlation between CU and omitted determinants of bilateral trade costs.
- Rose (2000) estimate of 200% more trade includes both of these biases.
  - When he roughly corrects for these in same paper (in text, not tables), estimate falls to 17% more trade, not 235% more.
    - Difference in differences estimate takes out some of the biases.

Silver medal error: log of sums=sum of logs

- Note that we should be using the average of the logs when averaging bilateral exports between nations o and d.
- Most authors average first and then take logs

$$wrong:$$
$$\ln(\frac{x+y}{2}) = \ln(x(1+\delta)) - \ln 2 \; ; \quad y \equiv x\delta$$
$$= \ln x + \ln(1+\delta) - \ln 2$$

$$right:$$
$$\ln(\sqrt{xy}) = \frac{\ln x + \ln y}{2} = \ln x + \frac{\ln \delta}{2}$$

$$over-estimate: \quad \ln\left((1+\delta)/(2\sqrt{\delta})\right)$$

- So bias depends on bilateral trade imbalance (as % of smaller flow, i.e. delta)

e.g. US currency union pairs

Table 1: Bilateral Imbalance as % of 1-way flow, US dollar currency pairs

	Am. Samoa	Bahamas	Belize	Bermuda	Guam	Liberia	Palau	Panama	USA
Am. Samoa									
Bahamas									
Belize		-1420%							
Bermuda		-120%							
Guam									
Liberia		100%							
Palau									
Panama		100%	89%						
USA		76%	52%	91%		12%		78%	

Source: My calculations on IMF DOTS for year 2000, export data.

$$NB: over-estimate = \quad \ln\left((1+\delta)/(2\sqrt{\delta})\right)$$
$$\delta \equiv 1 + \% \quad bilateral \quad imbalance \quad in \quad \%$$

Bronze medal mistake

⊙ Deflation by US price index is wrong

- – Can induce spurious correlation with real GDP figures if global inflation trends.

⊙ Most authors off-set this mistake by including time dummies in the regression.

- – NB: estimates with and without time dummies can be very different

Recall Rose data

Trade/GDP

Big bilateral imbalances
Transit trade

Bahamas

Singapore

Liberia

Kiribati

Bahrain

S.Arabia

Belgium-Lux

Per capita income, 1980