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**The Effect of Common Currencies on  
International Trade:  
Where Do We Stand?**

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**Occasional Paper No. 22  
August 2002**

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# **THE EFFECT OF COMMON CURRENCIES ON INTERNATIONAL TRADE: WHERE DO WE STAND?**

**BY**

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**AUGUST 2002**

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JEL CLASSIFICATION NUMBER: F34

KEYWORDS: MONETARY; UNION; REGRESSION; LITERATURE; TEST; STUDY; ESTIMATE.

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	<u>Page</u>
ABSTRACT	i
I. INTRODUCTION	1
II. A SHORT HISTORY OF THE LITERATURE	2
III. META-ANALYSIS	6
IV. DIFFERENT ESTIMATES OF $\gamma$ AND ITS SIGNIFICANCE	11
V. CONCLUSION	15
Appendix	17
References	18

## ABSTRACT

Twenty-four recent studies have investigated the effect of currency union on trade, resulting in 443 point estimates of the effect. This paper is a quantitative attempt to summarize the current state of debate; meta-analysis is used to combine the disparate estimates. The chief findings are that:

- a) the hypothesis that there is no effect of currency union on trade can be rejected at standard significance levels;
- b) the combined estimate implies that currency union approximately doubles trade; and
- c) the estimates are heterogeneous and not consistently tied to features of the studies.

## **I INTRODUCTION**

1.1 In this short paper, I review the small recent literature that estimates the effect of common currencies on trade. I use meta-analysis to provide a quantitative summary of the literature, and draw out its conclusions for Singapore.

1.2 The next section briefly reviews the literature qualitatively. Section III is the heart of the paper; it provides the quantitative meta-analysis that studies the preferred point estimates of the nineteen different studies collectively. Section IV reviews the (over four hundred) different point estimates tabulated in the literature, and the paper ends with a short conclusion.

## II A SHORT HISTORY OF THE LITERATURE

2.1 Much ink has been spilled on the topic of monetary unions. Most of it has been theoretical, and most of it concludes, on the basis of Mundell's celebrated "optimum currency area" criteria that most countries in the world do not seem to be obvious candidates for currency unions. In particular, the costs of foregoing macroeconomic stabilization which are entailed by the loss of monetary independence, does not seem to be worth the benefit of lower inflation and deeper financial markets which currency union (with a stable anchor) brings.

2.2 Until recently, this seemed a reasonable enough conclusion, since there seemed to be no other obvious benefits of joining a currency union. In particular, the trade-expanding benefit of currency union seemed to be small. Economists came to this conclusion by: a) noting that the effect of exchange rate volatility on international trade is usually estimated to be small, and b) assuming that currency union was the same as the complete elimination of exchange rate volatility. But suppose that currency union is not the same as the absence of exchange rate volatility? And what if the effect of currency union on trade is large? If both of these questions can be answered affirmatively, the case for currency union becomes much stronger.

2.3 In the summer of 1999, I began to circulate a paper that *estimated* the effect of currency union on trade directly (that is, without equating currency union with the absence of exchange rate volatility); *Economic Policy* subsequently published this paper in 2000. I exploited a panel of cross-country data covering bilateral trade between 186 "countries" (really different trading partners) at five-year intervals between 1970 and 1990. The trade data was drawn from the *World Trade Data Bank* ("WTDB"), which contains data for a large number of country-pairs (thereby effectively rendering the analysis cross-sectional), though with many missing observations. In this data set, only a small number of the observations are currency unions; further, countries in currency unions tend to be either small or poor (or both).

2.4 The surprising and interesting finding was that currency union seemed to have a strong and robust effect on trade. Using a linear “gravity” model of bilateral trade to account for most variation in trade patterns, my point estimate was that the coefficient for a currency union dummy variable (which is unity when a pair of countries share a common currency and zero otherwise) has a point estimate of around  $\gamma=1.21$ . This implies that members of currency unions traded over three times as much as otherwise similar pairs of countries *ceteris paribus*, since  $\exp(1.21)>3$ . While there was no benchmark from the literature, this estimate seemed implausibly large to me (and many others).<sup>1</sup> Almost all the subsequent research in this area has been motivated by the belief that currency union cannot reasonably be expected to triple trade.

2.5 There have been a number of different types of critique. Some are econometric. For instance, Thom and Walsh (2002) argue that broad panel studies are irrelevant to e.g., EMU, since most pre-EMU currency unions involve countries that are either small or poor. They adopt a case study approach, focusing on the 1979 dissolution of Ireland’s sterling link; Glick and Rose (2002) provide related evidence. Bomberger (2002) focuses on the linkage between newly independent countries and currency union dissolution, while Micco et. al. (2002) use actual data on the creation of the Euro.<sup>2</sup>

2.6 Others have stressed the importance of relying on time-series rather than cross-sectional variation. The time-series approach has the advantage of addressing the relevant policy issue (“What happens to trade when a currency union is created or dissolved?” rather than “Is trade between members of currency unions larger than trade between countries with sovereign currencies?”). This can be done most obviously by using country-pair specific “dynamic fixed effects” with panel data. This is difficult

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<sup>1</sup> Actually, make that many many others.

<sup>2</sup> I do not use Micco et. al.’s (2002) interesting estimates, since they are not easy to compare with those of other studies.

to do sensibly using the WTDB because there is such little time-series variation in currency union membership after 1970 as recognized in my original paper and by e.g., Persson (2001); nevertheless, see the inglorious attempt by Pakko and Wall (2001). However, Glick and Rose (2002) exploit the almost 150 cases of currency union exit and entry they find when the panel analysis is extended back to 1948 using the IMF's *Direction of Trade* data set.

2.7 In my original paper, I stressed that only about 1% of the sample involves pairs of countries in currency unions. Persson (2001) argues that this makes standard regression techniques inappropriate since currency unions are not created randomly, and advocates the use of matching techniques; see also Rose (2001) and Tenreyro (2001).

2.8 Nitsch (2002a, 2002b) is concerned with aggregation bias, and argues that combining different currency unions masks heterogeneous results. Along the same lines, Levy Yeyati (2001) divides currency unions into multilateral and unilateral currency unions (as did Fatás and Rose, 2002), while Melitz (2001) splits currency unions into those that are also members of either a political union or regional trade area, and others that are neither; see also Klein (2002). Saiki (2002) dis-aggregates total trade into exports and imports.

2.9 Tenreyro (2001) argues that sampling the data every fifth year (as I did in my original paper) is dangerous, since trade between members of currency unions may not be large enough to be consistently positive. She advocates averaging trade data over time, and argues that this reduces the (otherwise biased) effect of currency union on trade. While this may be true with the *WTDB* data set employed by Tenreyro, it seems not to be true of the *DoT* data set, where no bias is apparent (see my website for details).<sup>3</sup>

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<sup>3</sup> Also, Box-Cox tests indicate that the data prefer a log-transformation to the levels transformation used by Tenreyro. In any case, Alesina, Barro and Tenreyro (2002) use an improved methodology to address the same issue and find very large effects of currency union on trade.



2.10 Rather than focusing on post-WWII data, some have extended the data set back to the classical gold standard era. Flandreau and Maurel (2001) and López-Córdova and Meissner (2001) use data sets that include monetary unions from the pre-WWI period. Estevadeoral, Frantz, and Taylor (2002) estimate a lower bound on the currency union effect by using membership in the gold standard; the inclusion of their estimates imparts a slight downward bias to the meta-analysis below.

2.11 A number of researchers have followed my original paper in worrying about reverse causality, including Flandreau and Maurel (2001), López-Córdova and Meissner (2001), Tenreyro (2001), Alesina, Barro and Tenreyro (2002), and Smith (2002). It is possible to also to take a more structural approach as I do in my work with van Wincoop (2001), which also takes account of country-specific effects.

2.12 Finally, some research takes a big effect of currency union on trade as given, and seeks to determine the implications of this estimate for e.g., output (Frankel and Rose, 2002) or business cycle co-ordination (Flandreau and Maurel, 2001). Other aspects of the behavior of currency union members are examined by Rose and Engel (2002) and Fatás and Rose (2002).

2.13 In all, a number of papers have provided estimates of the effect of currency union on international trade. Obviously many of these estimates are dependent; they sometimes rely on the same data set, techniques, or authors. Still, there seem to be enough studies to warrant at least a preliminary meta-analysis.

### III META-ANALYSIS

3.1 Meta-analysis is a set of quantitative techniques for evaluating and combining empirical results from different studies. Essentially one treats different point estimates of a given coefficient as individual observations. One can then use this vector of estimates to: a) estimate the underlying coefficient of interest, b) test the hypothesis that the coefficient is zero, and c) link the estimates to features of the underlying studies. Since there are currently a number of studies that have provided estimates of  $\gamma$ , the effect of currency union on trade, meta-analysis seems an appropriate way to summarize the current state of the literature. Stanley (2001) provides a recent review and further references.

3.2 One begins meta-analysis by collecting as many estimates of a common effect as possible. To my knowledge, there are twenty-four papers that provide estimates of the effect of currency union on bilateral trade, which I denote  $\gamma$ . I tabulate these in the Appendix, along with the associated estimates of  $\gamma$  (and its standard error) that seems to be most preferred or representative (if a preferred estimate is not available). While I have strong views about the value of some of these estimates (or lack thereof), I weigh each estimate equally, simply because there is no easily defensible alternative weighting scheme.

3.3 The most basic piece of meta-analysis is a test of the null hypothesis  $\gamma=0$  when the twenty-four point estimates (and their standard errors) are pooled across studies. This classic test is due originally to Fisher (1932) and uses the p-values from each of the (24) underlying  $\gamma$  estimates. Under the null hypothesis that each of the p-values is independently and randomly drawn from a uniform [0,1] distribution, minus twice the sum of the logs of the p-values is drawn from a chi-square. The hypothesis can be rejected at any standard significance level, since under the null hypothesis, the test-statistic of 716 is drawn from  $\chi^2(48)$ .<sup>4</sup> While there is manifestly

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<sup>4</sup> Edgington's (1972) small sample correction leads to the same conclusion.

considerable heterogeneity between the different estimates, the fixed- and random-effect meta-estimates are quantitatively similar, as I show in Table 1. They are also economically substantial; both pooled estimates of  $\gamma$  indicate that currency union approximately doubles trade (as  $\ln(2) \approx .69$ ). Also, none of these conclusions substantively change if my six studies are dropped; the test-statistic rejects the hypothesis of no effect, as under the null of no effect, 342 is drawn from  $\chi^2(36)$ .

**Table 1**  
**Meta-Analysis of Currency Union Effect on Trade ( $\gamma$ )**

	<b>Pooled Estimate of <math>\gamma</math></b>	<b>Lower Bound of 95% CI</b>	<b>Upper Bound of 95% CI</b>	<b>P-value for test of no effect</b>
Fixed	.62	.58	.66	.00
Random	.71	.53	.89	.00
Fixed without Rose	.50	.43	.56	.00
Random without Rose	.61	.35	.86	.00

3.4 There is little indication that any single study is especially influential in driving these results. If the studies are omitted from the meta-analysis one by one, one finds the following point estimates for  $\gamma$  (tabulated in Table 2 along with a 95% confidence interval).

**Table 2**  
**Sensitivity of Meta-Analysis of  $\gamma$  to Individual Studies (Fixed Effects)**

Study Omitted:	Coefficient	95% CI, lower	95% CI, upper
Rose	.60	.56	.65
Engel-Rose	.62	.57	.66
Frankel-Rose	.61	.56	.65
Rose-van Wincoop	.61	.57	.66
Glick-Rose	.61	.56	.66
Persson	.62	.58	.66
Rose	.59	.54	.64
Honohan	.62	.57	.66
Nitsch	.62	.57	.66
Pakko-Wall	.62	.58	.67
Walsh-Thom	.63	.58	.67
Melitz	.62	.57	.66
Lopez-Cordova and Meissner	.62	.57	.66
Tenreyro	.62	.58	.66
Levy Yeyati	.62	.58	.66
Nitsch	.62	.57	.66
Flandreau and Maurel	.56	.51	.60
Klein	.62	.58	.66
Estevadeoral, Frantz, and Taylor	.63	.58	.67
Alesina, Barro and Tenreyro	.62	.57	.66
Smith	.63	.59	.68
Bomberger	.76	.71	.81
Melitz	.60	.56	.65
Saiki	.62	.58	.67
Combined	.62	.57	.66

3.5 While I tried to choose the preferred/representative estimates to match the intentions of the authors, I did ... choose them. An alternative way to proceed is to use a more mechanical procedure to choose the underlying estimates of  $\gamma$  for the meta-analysis. This is easy, since each of the underlying studies provides a number of individual  $\gamma$  estimates. Thus, an alternative I now deploy is to use the (24) median estimates of  $\gamma$  from the 24 underlying studies to construct an alternative set of  $\gamma$  estimates (and associated standard errors) suitable for meta-analysis. I also use the estimates at the 25<sup>th</sup>, 10<sup>th</sup>, and 5<sup>th</sup> percentiles.<sup>5</sup> Table 3 repeats the meta-

<sup>5</sup> Thus, my initial study contains 52 estimates of  $\gamma$ . The median of these is 1.285 (with standard error of .13). The 25<sup>th</sup> percentile estimate is 1.1 (.14); the 10<sup>th</sup> percentile is 1.09 (.26); and the 5<sup>th</sup> percentile estimate is .96 (.15).

analysis using these four alternative data sets. The default “preferred” estimates from Table 1 are tabulated at the top to facilitate comparison.

**Table 3**  
**Sensitivity of Meta-Analysis of  $\gamma$  to Choice of “Preferred” Estimate**

		<b>Pooled <math>\gamma</math> Estimate</b>	<b>Lower Bound, 95% CI</b>	<b>Upper Bound, 95% CI</b>	<b>P-value for Ho: no effect</b>
“Preferred”	Fixed	.62	.58	.66	.00
“Preferred”	Random	.71	.53	.89	.00
Median	Fixed	.61	.55	.66	.00
Median	Random	.85	.62	1.08	.00
25 <sup>th</sup> -Percentile	Fixed	.28	.25	.32	.00
25 <sup>th</sup> -Percentile	Random	.53	.34	.71	.00
10 <sup>th</sup> -Percentile	Fixed	.20	.16	.24	.00
10 <sup>th</sup> -Percentile	Random	.32	.15	.50	.00
5 <sup>th</sup> -Percentile	Fixed	.14	.12	.17	.00
5 <sup>th</sup> -Percentile	Random	.31	.14	.47	.00

3.6 The pooled meta-estimate of  $\gamma$  falls (by design) as one moves away from the median estimate towards estimates that are lower within individual studies. But it is interesting to note that even using the  $\gamma$  estimates taken from the 5<sup>th</sup>-percentile of each underlying study, the hypothesis of no effect of currency union on trade can be rejected at conventional significance level. Further, all the effects are economically substantive. The lower bound for the lowest estimate is .14, implying an effect of currency union on trade of some fifteen percent.

3.7 One might then ask which design features of the individual studies account for the differences across individual estimates of  $\gamma$ . It would be fun and interesting to explain the variation in  $\gamma$  estimates across studies with a large number of study characteristics. Unfortunately, given the paucity of studies, it does not seem wise to use multivariate meta-regression techniques very intensively. Nevertheless, I report in Table 4 the results of a series of bivariate meta-regressions. Each row tabulates the intercept and slope coefficient from a different bivariate regression, where the regressand

is the set of nineteen  $\gamma$  estimates, and the independent variable is listed at the left of the table.

**Table 4**  
**Meta-Analysis: Bivariate Determination of  $\gamma$  Across Studies**

Study Characteristic	Slope Coefficient ( z-statistic )	Intercept ( z-statistic )
Number of Observations in study	-.00 (0.0)	.71 (6.8)
Number of Countries in study	.00 (0.3)	.66 (3.5)
Number of Years in study	-.00 (0.1)	.72 (4.2)
Standard Error of $\gamma$	.15 (0.2)	.68 (3.9)
Dummy for post-WWII study	-.04 (0.1)	.74 (3.2)
Dummy for cross-section or panel study	.22 (0.9)	.53 (2.4)
Dummy for Rose as Author	.37 (2.1)	.60 (6.4)

3.8 There are two interesting positive results in Table 4, and one negative finding. First, there is not a positive relation between the number of observations and  $\gamma$ . The fact that there is no positive (let alone significant) relation between the sample size and the estimates of  $\gamma$  raises a seriously worrying question as to whether the underlying empirical phenomenon is authentic (Stanley, 2001). Second, papers that I have co-authored have consistently higher point estimates of  $\gamma$  (though other papers still have an economically and statistically significant effect of currency union on trade). Finally, there do not seem to be any other strong relationships between other characteristics of the studies (e.g., the span or nature of the data set) and point estimates of  $\gamma$ .

3.9 To summarize: the meta-analysis indicates two strong and one weak finding. First, the hypothesis that there is no effect of currency union on trade can be rejected at standard significance levels when the results from the individual studies are pooled. Second, the pooled effect is not just positive but economically significant, consistent with the hypothesis that currency union approximately doubles trade. Third, the preferred estimates of  $\gamma$  from individual studies are not closely linked to the characteristics of the studies.

#### IV DIFFERENT ESTIMATES OF $\gamma$ AND ITS SIGNIFICANCE

4.1 Each of the twenty-four studies provides a number of different estimates of  $\gamma$ . For instance, my original paper provided over fifty estimates of  $\gamma$  as a result of sensitivity analysis. In all, there are currently 443 estimates of  $\gamma$  (and accordingly, 443 associated t-statistics for the hypothesis of an insignificant  $\gamma$ ). Simply averaging across these 443 different estimates of  $\gamma$  produces a mean of 1.3; the average t-ratio is 5.7.

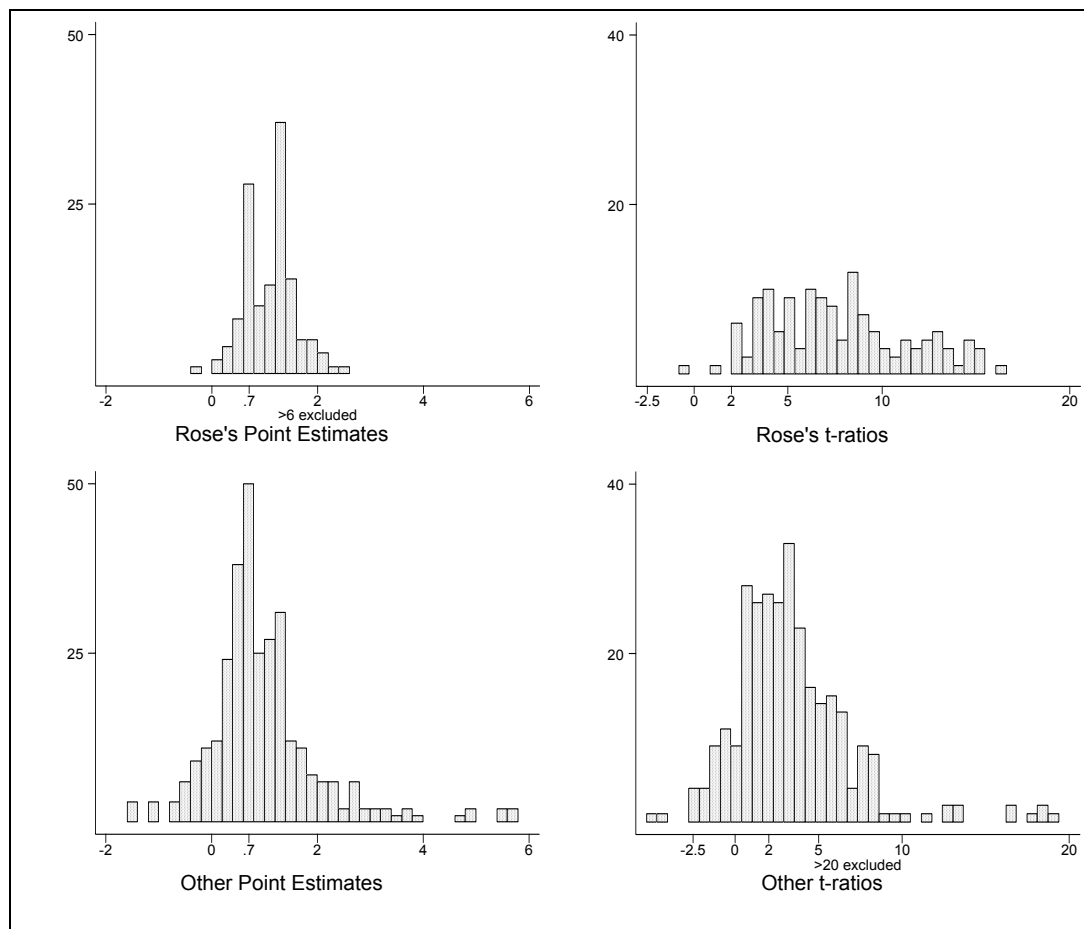
4.2 I provide histograms of the 443  $\gamma$  estimates and their t-statistics in Figure 1. I personally estimated some 134 of them, and the meta-analysis of Table 4 shows that I typically find higher results than others. Accordingly, I split the data into two: those I estimated myself, and those estimated by others. The top left graphic in Figure 1 is a histogram of the 132 point estimates of  $\gamma$  I estimated that are less than 6.<sup>6</sup> Immediately below on a comparably scaled graph are the remaining (309) estimates produced by others. The two graphics to the right of the figure are analogues that portray the corresponding t-statistics.<sup>7</sup>

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<sup>6</sup> That is, two large outliers are not graphed; I estimated both.

<sup>7</sup> This time, fourteen t-statistics are dropped from the graph. All are larger than twenty, and I estimated none.

**Figure 1**  
**The Estimated Effect of Currency Union on Trade**



4.3 What does the graphic show? The vast majority of the point estimates of  $\gamma$  are positive; only 36 of the 443 ( $\approx 8\%$ ) are negative. Most are also economically large; 63% exceed .7 in magnitude, a number that implies that currency union is associated with a doubling of trade. It is interesting to note in passing that one cannot reject the hypothesis of equal means across my estimates and those of others, at even the ten percent level (the t-test for equality of means across the two sets of  $\gamma$  estimates is 1.54).

4.4 It is clear that many of the estimates are also statistically significant. The median t-statistic is 3.2; over three-quarters (335/443) exceed 2. My t-ratios tend to be larger than those of others, but two-thirds of the t-statistics of others are at least two (the median is 3.2).



4.5 Finally, one can also combine the different estimates that exist within the nineteen studies, on a paper-by-paper basis. Table 5 provides twenty-four rows (one for each study), which perform meta-analysis within the individual study to arrive at both fixed- and random-effect estimates of  $\gamma$ . I also tabulate the z-statistics which test the null hypothesis  $H_0: \gamma=0$ , and the associated p-values. The number of estimates provided by each study is also tabulated.

4.6 Table 5 clearly shows heterogeneity across  $\gamma$  estimates. While none are significantly negative and most are significantly positive, they vary considerably.

**Table 5**  
**Within-Study Meta-Estimation of  $\gamma$**

Study		Coefficients	Asymptotic z-statistics	p-values	No. of Estimates
Rose	Fixed	1.29	50.6	.00	52
	Random	1.31	32.9	.00	
Engel- Rose	Fixed	1.35	7.4	.00	5
	Random	1.35	7.4	.00	
Frankel- Rose	Fixed	1.63	19.8	.00	5
	Random	1.63	11.8	.00	
Rose-van Wincoop	Fixed	0.23	13.8	.00	18
	Random	0.65	7.7	.00	
Glick- Rose	Fixed	0.70	59.3	.00	37
	Random	0.77	27.8	.00	
Persson	Fixed	0.65	7.7	.00	6
	Random	0.59	4.8	.00	
Rose	Fixed	0.82	43.5	.00	17
	Random	1.06	8.9	.00	
Honohan	Fixed	0.35	3.7	.00	12
	Random	0.36	1.9	.05	
Nitsch	Fixed	3.00	111.4	.00	83
	Random	1.55	6.8	.00	
Pakko- Wall	Fixed	0.87	8.5	.00	6
	Random	0.33	0.9	.35	
Walsh- Thom	Fixed	-0.01	-0.6	.57	7
	Random	0.02	0.6	.54	
Melitz	Fixed	1.89	21.7	.00	6
	Random	1.91	10.8	.00	
Lopez-Cordova and Meissner	Fixed	0.72	21.6	.00	47
	Random	0.72	20.7	.00	
Silvana Tenreyro	Fixed	0.80	9.5	.00	4
	Random	0.71	4.2	.00	
Levy Yeyati	Fixed	1.01	16.4	.00	19
	Random	1.06	11.4	.00	
Nitsch	Fixed	0.46	5.6	.00	8
	Random	0.43	2.6	.01	
Flandreau and Maurel	Fixed	0.94	35.9	.00	8
	Random	0.90	7.3	.00	
Klein	Fixed	0.09	2.5	.01	25
	Random	0.37	2.0	.05	
Estevadeoral, Frantz, and Taylor	Fixed	0.43	0.37	0.50	18
	Random	0.45	0.35	0.55	
Alesina, Barro and Tenreyro	Fixed	1.16	0.97	1.35	8
	Random	1.65	1.11	2.19	
Smith	Fixed	1.01	0.91	1.10	17
	Random	1.12	0.75	1.49	
Bomberger	Fixed	0.21	0.15	0.26	6
	Random	0.32	0.09	0.54	
Melitz	Fixed	1.31	1.21	1.41	13
	Random	1.31	1.21	1.41	
Saiki	Fixed	1.16	1.11	1.22	16
	Random	0.52	0.14	0.90	

## **V CONCLUSION**

5.1 It is too early to claim much for a meta-analysis like this. Twenty-four studies sounds like a lot. But one would prefer even more observations before starting to appeal to the large of law numbers. This is especially true since the studies are dependent and not all of equal interest, two features that I have ignored above. The different estimates of this effect are heterogeneous and cannot be linked to study features such as the sample size. Thus it would be unreasonable for anyone to have too much confidence in the meta-analytic estimate of the effect of currency union on trade.

5.2 There are further reasons for caution before one can easily recommend that Singapore consider currency union with the United States. First, while there are benefits to currency union, there are also costs (e.g., financial market stability and adjustment to idiosyncratic shocks) that must be borne in mind. Second, the MAS has a good track record of monetary stability, which reduces the nominal gains from currency union (compared to e.g., certain Latin countries). Finally, the literature to date has been based on the trade patterns of currency unions consisting of small and/or poor countries. However, the trade benefit seems especially large for a small open economy like Singapore which regularly exports and imports more than its GDP. Singapore also trades heavily with a natural monetary anchor, the United States. While there are a number of important caveats, including the loss of monetary independence, Singapore should also watch closely the experiences of the EMU. If large rich countries such as those inside EMU experience substantial increases in trade as a result of currency union, we will have much more confidence in the size of the estimates. Time will tell.

5.3 To summarize, my quantitative survey of the literature shows substantial evidence that currency union has a positive effect on trade. When the estimates are examined collectively, this effect is large in terms of both economic and statistical significance, implying that currency union is associated with an approximate doubling of trade. This does strengthen the

case for currency unions considerably, since the benefits seem to be larger than previously thought.

**Appendix**  
**Estimates of the Effect of Currency Union on Trade**

<b>Author</b>	<b>Year</b>	$\gamma$	<b>s.e. of <math>\gamma</math></b>
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	-0.378	0.529
Walsh and Thom	2002	0.098	0.2
Melitz	2001	0.7	0.23
López-Córdova and Meissner	2001	0.716	0.186
Tenreyro	2001	0.471	0.316
Levy Yeyati	2001	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, Frantz, and Taylor	2002	0.293	0.145
Alesina, Barro and Tenreyro	2002	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

Estimates of  $\gamma$  and standard error from  $\ln(\text{Trade}) = \gamma \text{CurrencyUnion} + \text{controls} + \text{error}$

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