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Monetary Union, Trade Integration, and Business Cycles in 19th Century Europe

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Abstract

This paper studies the impact of monetary arrangements on trade integration and business cycle correlation in late 19th century Europe. We estimate a gravity model and show that tighter monetary integration was associated with substantially higher trade, as in recent studies using contemporary data. For instance, the Austro-Hungarian monetary union improved trade between member states by a factor of 3. To explain this, we build and estimate a simple model where greater monetary integration weakens the current account constraint by fostering business cycle co-movements.

Until the late 1990s, the macroeconomic debate on the feasibility of EMU has been dominated by American skepticism. Europe, the story went, is not an Optimum Currency Area (OCA). With low labor mobility and sticky prices, the cost of losing the monetary weapon is huge. All the more so, because Europe is not going to have stabilizing budgetary transfers.

But we finally got the Euro, most probably for political reasons. However, just before European citizens began receiving in the mail their first checkbooks in euros, a new wisdom emerged, rooted in the Lucas critique: any attempt to assess *ex ante* whether a group of countries is an OCA is flawed, because entering a monetary union induces structural changes that may imply that those countries become an OCA *ex post*.

From a purely theoretical point of view, there is no reason why this "endogeneity" argument should contradict the earlier skepticism (Schelkle, 2001). As emphasized by some authors, the creation of a monetary union could in fact create problems of its own: greater integration may cause greater specialization thus making asymmetric shocks *more* likely and finally weakening the case for monetary integration (Kenen, 1969; Eichengreen, 1992; Krugman, 1993).

The empirical case that "Euroland" may be an endogenous OCA rests on two propositions. On the one hand, Frankel and Rose (1998) argued that greater trade integration is associated with greater correlation of business cycles. On the other hand, Rose (2000) estimated that the creation of a monetary union has "very large" effects on trade (an estimated factor of 3). European policy makers should relax: EMU shall mean more trade, and more trade will imply greater correlation of business cycles.

These papers sparked a considerable research effort. In particular, macroeconomists found the trade bias incredibly high.[1] But while the debate focused primarily on econometrics, the interpretation of the economic significance of these various estimates was left under explored.

In this paper, we investigate the relation between monetary integration and trade integration by examining the late 19th century European experience. One reason for choosing this period of time is that it does display a variety of monetary arrangements that enables us to distinguish sharply between degrees of monetary integration. We show that the tightest form of monetary integration one century ago, illustrated by the Austro-Hungarian monetary union, was indeed associated with the same surprisingly high levels of trade integration that Rose found for the 1975–95 period: it displayed a roughly 3-fold increase in bilateral trade (Section 1).

In addition, and quite significantly, we offer an economic interpretation of this finding. Monetary integration, we argue, promotes capital market integration in general and portfolio diversification in particular, and it fosters macroeconomic coordination as well by assigning to participating regions common rules and targets. This increases business cycle symmetry, and in turn promotes bilateral trade, by facilitating the financing of imports via exports, since booming domestic demand will be matched by booming foreign demand (Section 2).

The conclusion is that this is great news for the euro.[2]

1. Monetary regimes and trade biases in nineteenth century Europe

1.1. Historical background: Patterns of monetary integration

Traditional accounts of the 19th century international monetary system claim that it was universally ruled by the gold standard which is often inappropriately described as a completely fixed exchange rate regime.[3] In fact, the actual arrangements of the time may be ranked by increasing order of monetary integration. On the one hand, we find those countries that floated. This usually involved limited foreign exchange market intervention: such regimes were approximations of "pure" floats (Portugal and Spain after 1900 are examples). On the other hand, there was one instance of a "pure" monetary union, that between Austria and Hungary dating back to 1867 (Flandreau, 2003). In between were a number of intermediary regimes, characterized by one version or another of currency bands. The archetype of these regimes was the gold standard,

a successful forerunner of modern target zones (Eichengreen and Flandreau, 1997).

Within the gold standard group, some regimes have been called, somewhat inappropriately, "monetary unions". These comprised the Latin and Scandinavian Unions. The word union is very misleading. Basically, these arrangements rested on setting an agreed upon type for *gold coins* which were then issued independently by member states.[4] Union coins were identical in all respects—except for the print, which displayed some national symbol—, and since they had partial or full legal tender status throughout the union, travelers could use them abroad. Yet, since there was neither a common central bank nor a federal monetary authority, and since the arrangement did not provide for the international circulation of banknotes, nothing prevented a member state running into serious financial problems to over-issue paper money which displaced specie in the domestic circulation but which could not circulate abroad. The result was inevitably suspension of convertibility and exchange depreciation in the problem country, and this *de facto* forfeited "union" membership. Italy—a rogue member of the Latin "union"—did it repeatedly.

Moreover, even under the best circumstances of faithful convertibility, intra-union exchange rates fluctuations were not entirely eliminated, because the "union" coins were in any case a costly mean of international settlement. Union coins saved on re-coinage, but sending coins abroad still involved expenses (shipping, insurance etc.) so that bankers drafts (known as "bills of exchange") were preferred. The price of these drafts ("the exchange rate") depended on supply and demand, and fluctuated within "gold points", just as happened for any pair of countries on a gold standard.

From that respect, the record of the Scandinavian union must be contrasted with that of the Latin union. Unlike the Latin union, the Scandinavian union took deliberate steps to foster monetary integration. On top of having common gold coins, the Scandinavian banks of issue implemented various methods to facilitate intra-Scandinavian clearing. Between 1892 and 1905, they ran a scheme by which all Scandinavian notes were taken at par.[5] This entirely eliminated intra-union exchange rate fluctuations. But the negligible fluctuations that existed before and after 1892–1905 suggest that informal arrangements existed throughout the entire period. This presumably raised Scandinavian monetary integration above what the gold standard achieved.

1.2. Trade and monetary integration: Gravity estimates

In this subsection, we use a gravity model to estimate the impact of monetary integration on bilateral trade flows by controlling for some structural factors.[6] The first set of controls is market sizes, and the second is trade frictions. Frictions include transport costs, bilateral exchange rate volatility, and protection. Protection, although rarely used, is a very important variable. By including protection, we can disentangle monetary union effects from customs union

effects. Moreover, since protection should be correlated with other variables of the model, such as exchange depreciation or transport costs (Bairoch 1989), omitting it might create biases.[7]

Market sizes are measured by the log of real GDP (GDPimp(ij,t)) for the importer and GDPexp(ij,t) for the exporter. Transportation costs are proxied by the log of distance (Dist). Exchange rate volatility is measured in two alternative ways. Vol1 is the coefficient of variation of the exchange rate (sqrt(x-mean$x$)/12)/mean$x$), where x is monthly exchange rate and mean$x$ is the mean of x over a year, while Vol2 is the variance of exchange rate changes (Var(x)). Without loss of generality, we only report results with Vol1.[8] Protection is measured by the ratio of custom revenues to total trade. Protection matters from both the importer and exporter's side because it reduces specialization at both ends. Finally, dummies identify the various regimes involved. AH captures the Austro-Hungarian trade bias, GS the gold standard bias, LU the Latin union bias (restricted to its permanently convertible core countries, i.e. France, Belgium, and Switzerland), SU the Scandinavian union bias, and PAR the Scandinavian par clearing scheme (1892–1905). In line with the discussion above, GS and LU on the one hand and GS, SU and PAR on the other hand are additive effects. This is because we explained that the "Latin" and "Scandinavian" unions essentially added a measure monetary coordination on top of what was implied by the gold standard and provided that the gold standard be in operation in union members. By contrast, since the Habsburg monarchy was a radically different arrangement than the "reinforced gold standards" adopted by other monetary unions, AH and GS are mutually exclusive. Therefore, to compare these alternative unions, the proper benchmark is between the effect of AH on the one hand, and—if for instance we want to compare the Habsburg Union with the Scandinavian union—the combined effect of GS, SU and PAR on the other hand.

In practice, we work with the following basic specification:[9]

$$\begin{aligned}\textsf{Trade}(ij,t) = {} & \mu_0 + \mu_1\textsf{GDPimp}(ij,t) + \mu_2\textsf{GDPexp}(ij,t) + \mu_3\textsf{Dist}(ij) \\ & + \mu_4\textsf{Protimp}(ij,t) + \mu_5\textsf{Protexp}(ij,t) + \mu_5\textsf{Vol1}(ij,t) + \mu_6\textsf{GS}(ij,t) \\ & + \mu_7\textsf{AH}(ij) + \mu_9\textsf{LU}(ij) + \mu_{10}\textsf{SU}(ij) + \mu_{11}^{*}\textsf{PAR}(ijt) + u(ij,t) \qquad (1)\end{aligned}$$

The results are shown in Table 1. The large size of the panel provides a basis for consistent estimation. We compute cross sectional estimates (OLS), and report 2SLS, using populations as instruments. To facilitate the comparison with related work, we report results both with and without protection.

One striking feature of the results is how closely they resemble the estimates from contemporary data. Market sizes affect bilateral trade positively while trade frictions have a negative impact. Order of magnitude and significances are fairly common. All variables matter in the expected way with T-statistics above critical levels. Only volatility fails to pass this test (low T-statistics), but this also is fairly common (IMF, 1984). Of interest is the very significant effect of protection. This is not surprising, but this study is the first to make that point.

Table 1. Gravity estimates (Equation (1)); Bilateral Trade; 1880–1913.

	OLS		2SLS	
Equation	With protection	Without protection	With protection	Without protection
GDPimp	0.57	0.57	0.55	0.53
	(44.80)	(45.72)	(40.9)	(37.1)
GDPexp	0.76	0.74	0.78	0.76
	(56.35)	(54.48)	(49.3)	(44.8)
Dist	−0.79	−0.99	−0.79	−0.99
	(−25.64)	(−35.35)	(−25.4)	(−35.4)
Protimp	−3.07	–	−3.13	–
	(−13.05)		(−13.4)	
Protexp	−1.01	–	−0.95	–
	(−3.64)		(−3.5)	
Bilateral vol.:Vol1	−1.4	−5.44	−1.3	−5.6
	(−0.71)	(−4.70)	(−0.67)	(−2.7)
Gold Standard: GS	0.31	0.41	0.31	0.41
	(6.21)	(8.42)	(6.2)	(8.32)
Austro-Hungary: AH	1.16	1.29	1.16	1.28
	(16.69)	(18.40)	(16.7)	(18.2)
Latin Union: LU	−0.01	−0.11	−0.013	−0.11
	(−0.33)	(−2.70)	(−0.307)	(−2.7)
Scand. Union: SU	0.65	0.52	0.67	0.48
	(8.45)	(6.85)	(8.251)	(5.8)
Par clearing: PAR	−0.04	0.007	−0.042	0.009
	(−0.45)	(0.087)	(−0.46)	(0.108)
Intercept	−2.28	−1.19	−2.4	−0.98
	(−7.55)	(−3.90)	(−7.2)	(−2.776)
N	3558	3558	3558	3558
R squared	0.66	0.64	0.67	0.64

ln 2LSL. GDP(imp and exp) are instrumented by their respective populations.
T-statistics in parentheses.

As shown in the alternative specifications reported, excluding the protection variable leads to an overestimate of the distance effect, and of the effect of exchange rate volatility. Some regime variables such as GS are affected as well. This is because gold standard countries also tended to be free traders, so that the very large effect of gold adherence reported in other studies (e.g. López-Córdova and Meissner, 2003) may be partly spurious.

Turning to the monetary regimes variables, the Habsburg's union was associated with a 3-fold increase of bilateral trade (precisely 3.2 or exp(1.16)).[10] A bilateral gold standard regime was also associated with increased trade, but by a much more moderate factor of 1.36 (exp(0.31)).[11] The Scandinavian union

displayed a substantial trade bias. As a quasi-monetary union (since effectively it almost eliminated exchange fluctuations) its total effect (gold dummy plus Scandinavian dummy) comes close to the Habsburg effect (2.61 or exp(0.96)). By contrast, as in Flandreau (2000), the Latin union does not add anything to bilateral trade between member states.

Thus tighter monetary integration in the 19th century was associated with higher trade integration, *ceteris paribus*. The question is why. One way of thinking, implicit in related papers, is that monetary arrangements foster trade through a *reduction in trade frictions*. This view is in line with recent research (Obstfeld and Rogoff, 2000) and has also a venerable tradition in international economics. For example, Mill (1848) famously suggested that monetary unification would promote commercial globalization. Kemmerer (1944) claimed that bilateral adherence to the gold standard favored trade integration.

We think, however, that our results only partially support this view. The fact that volatility is not significant (unlike the monetary integration dummies) shows that monetary regimes do not impact trade solely through the trade frictions channel.[12] Some structural effects are to be expected: for instance, sustaining a certain level of monetary integration requires adjustments in economic policies and induces structural changes. This is consistent with the notion that European unification shall lead to increased integration through policy harmonization (e.g. European Commission, 1989). Likewise, nineteenth century economists advocated the adoption of certain arrangements such as the gold standard in order to promote trade because this was also forcing other adjustments themselves conducive of trade integration. Our point, in summary, is that viewing the exchange rate regime as referring strictly to trade frictions would be partial at best.

2. Monetary integration and business cycle correlation: A model and some tests

In this section, we model the interactions between monetary and trade integration. We do this by estimating a system of equations that relates trade integration, business cycles correlation, and monetary arrangements.

2.1. The model: The current account constraint hypothesis, monetary integration and the business cycle

The first part of the model explains trade flows. It rests on what we suggest calling the current account constraint hypothesis. In a world of incomplete markets where credit rationing might arise, trade integration runs into constraints that are set by the degree of bilateral business cycle correlation. The intuition is the following: when two countries have similar cycles, bilateral imports and exports move in pace, hereby reducing the risk of running into financial

constraints since imports are financed through exports. By contrast, when cycles are very different, the current account constraint becomes a serious obstacle to trade integration. Thus, *ceteris paribus*, a greater correlation of cycles renders bilateral trade integration easier.[13] The equation is completed by the use of "friction" variables as controls. This gives:

$$\text{inte}(ij,t) = a_1 + b_1\ \text{corr}(ij,t) + c_1\ \text{trade frictions}(ij,t) + v(ij,t) \quad (2)$$

In equation (2), inte(ij,t) is the bilateral trade between country i and j divided by the product of the income of the two countries weighted by the respective elasticities estimated in equation (1); corr(ij,t) is the correlation of their business cycles (deviations of growth rates from deterministic trend) over a period centered at t; and trade frictions(ij,t) is a matrix that comprises distance, protection and exchange volatility. In line with the discussion above we expect that the vector of parameters c_1 (effect of frictions) is negative while b_1 (the effect of business cycle symmetry) is positive.

On the other hand, the symmetry of business cycles is influenced by both monetary and trade integration. Calling monetary coordination(ij,t) a set of zero-one dummy variables that captures alternative exchange rate regimes (i.e. GS, AH, UL, SU), we write the second part of the model:

$$\text{corr}(ij,t) = a_2 + b_2\ \text{inte}(ij,t) + c_2\ \text{monetary coordination}(ij,t) + w(ij,t) \quad (3)$$

Should b_2 and c_2 be positive or negative? Consider first the sign of b_2. Krugman (1993) argues that trade integration, by facilitating specialization in supply, would lead to greater asymmetry $(b_2 < 0)$. This contradicts the empirical results of Frankel and Rose (1998). Fontagné and Freudenberg (1999) suggest that this is because specialization among integrating regions occurs within the industrial chain. This would strengthen supply shocks spillovers, fostering business cycle symmetry. On the other hand, international trade in the second half of the 19th century involved much less intra-industry trade than today. According to Bairoch (1989), trade in 19th century Europe was consistent with the implication of the Hecksher-Ohlin theory of product specialization. Komlos (1984) argues that the Habsburg union enabled Austria and Hungary to reap all the gains associated with sustained trade specialization. Recent work by Schulze (2003) provides evidence of substantial productivity gains for Hungary's agriculture as it took advantage of broad access to the Austrian market.[14] In other words, one would expect that the 19th century experience would conform to Krugman's view. It should thus provide estimates of what would obtain today under a "worst case scenario".

Consider now the relationship between monetary integration and business cycles (sign of c_2). The empirical analysis in Engle and Rose (2002) suggested that c_2 is positive. It might be worth pondering the rationale for positing such a relation. We can think of two main channels. First, international monetary arrangements usually rely on a common institutional framework, which by itself

increases the degree of co-movements. For instance, for the period that we study, the patterns of fiscal cycles in Austria and Hungary were strikingly similar: this happened because public infrastructure building was decided in a co-operative way by both parts of the monarchy (Flandreau, 2003).[15] Also, there is evidence that the clearing facilities Scandinavian central banks provided each other with were conditional upon the adoption of "appropriate" policies that prevented the accumulation of bilateral imbalances. Finally, one can remark that countries that remained durably on gold were also the ones with a record of relative fiscal moderation (Bordo and Schwartz, 1997).[16] In other words, monetary unions induce a measure of macroeconomic policy convergence that is by itself conducive of greater co-movements.[17]

The second channel has to do with transaction costs. Monetary integration reduces the barriers to monetary and financial exchange thus creating a greater scope for business cycle correlation. First, the transmission of monetary shocks across regions will tend to be more important in a closely knitted banking and financial system (see Angeloni, Kashyap and Mojon, 2003).[18] Second higher capital markets integration leads agents to diversify their portfolio so that wealth, and therefore consumer demand tends to exhibit greater co-movements across regions: when a given region is hit by an adverse productivity shock, local demand does not necessarily follow down the drain, since risks are spread all over the monetary union.[19] As a result, monetary integration is likely to increase the correlation of business cycles, rather than decrease it.

To conclude, note that by substituting equation (3) in equation (2) and solving for trade integration, one obtains a reduced form of the monetary union augmented gravity equation estimated in the previous section. In other words, our story can be seen as an attempt to decompose the large monetary union effect in gravity models. The explanation is the following: monetary integration increases the correlation of cycles through a number of "demand" channels. Increased correlation in turn leads to a higher degree of bilateral trade integration by relaxing the current account constraint. And this increased integration will either magnify $(b_2 > 0)$ or dampen $(b_2 < 0)$ the correlation of business cycles.[20]

2.2. OCA endogeneity and the choice of instruments

Consistent with the discussion above, we base our estimation strategy on the hypothesis that causality goes solely from monetary union to OCA criteria. In other words, we argue that monetary unions are created for essentially political or possibly geographical reasons, and that their creation in turn affects trade integration and business cycle correlation. From an empirical perspective, our rationale is that monetary unions are rare events (Mundell, 1961). It is true that monetary unions tend to occur among nations that trade a lot, or among nations that have substantial migrations among them, etc. At the same time how many large trade partners, or countries related by migration flows, have actually created monetary unions? In our 19th century sample, monetary unions remained

exceptional and displayed little variation. The Habsburg union, the Scandinavian union, and the Latin union were left untouched over the entire period under study. Most countries that were on gold in 1880 were still on gold 30 years later. Some countries hopped on and off the gold standard, but this arguably did not come from economic "choices". Wars or political crises were the most frequent motive for renouncing gold standard membership.

So what we assume here in line with a literal definition of the endogeneity of OCA criteria is that geography and monetary integration are exogenous, while trade integration and business cycle correlation are endogenous. In the next sub-section, this approach will be subjected to formal statistical tests. For our present purpose, however, it is important to recognize that this view in turn motivates the estimation method: since OLS estimates are biased, the use of instrumental variables is necessary. In what follows, we will focus in the following on 2SLS and 3SLS estimates.[21] In equation (2), *corr* is instrumented using monetary integration (*AH*, *SU*, *GS*).[22] In equation (3), inte (bilateral trade integration) is instrumented using distance.

Tables 2 and 3 show results from equations (2) and (3) respectively. In equation (2), the estimates for distance, protection and volatility are as expected. Interestingly, exchange rate volatility is now significant. This suggests that once we control for the business cycle, the transaction cost effect of exchange rate volatility can be identified.The main result, however, is that the impact of business cycle co-movements on trade integration, measured by 2SLS and 3SLS, is large. A move from zero correlation (corr $=$ 0) to a full correlation (corr $=$ 1) increases trade by a factor of about 10.2 (=exp(2.33)).

In equation (3), the effect of trade integration on "corr" (our measure of business cycle correlation) is found to be negative, and this supports Krugman's conjecture: in the late 19th century, more trade implied more specialization,

Table 2. Equation (2) estimates; Trade Integration (inte); 1880–1913.

	OLS		2SLS (IV)		3SLS	
corr	−0.05	(−1.49)	2.33	(7.09)	2.33	(6.34)
Trade frictions:						
Dist	−0.92	(−27.9)	−0.92	(−18.14)	−0.84	(−20.18)
Protimp	−3.26	(−12.7)	−2.66	(−7.18)	−3.33	(−11.38)
Protexp	−1.13	(−3.80)	−0.60	(−1.49)	−1.05	(−3.96)
Vol1	−7.92	(−4.46)	−5.24	(−2.21)	−3.68	(−1.96)
Intercept	−1.13	(−5.74)	−1.27	(−4.02)	−1.74	(−6.25)
N	2914		2914		2914	
	R^2: 0.45		F: 302		Chi^2: 1151	

2SLS: Corr is instrumented by monetary coordination dummies: AH, Scandinavian Union and Gold Standard.
T-statistics in parentheses.

Table 3. Equation (3) estimates; correlation of business cycles (corr); 1880–1913.

	OLS		2SLS		3SLS	
Inte	−0.02	(−2.83)	−0.03	(−2.00)	−0.03	(−2.25)
Monetary coordination:						
GS	0.04	(2.15)	0.059	(2.22)	0.10	(5.53)
AH	0.44	(7.90)	0.48	(6.15)	0.508	(6.99)
LU	0.20	(3.36)	0.21	(3.39)	0.084	(1.83)
SU	0.23	(5.86)	0.24	(5.50)	0.28	(7.20)
Intercept	−0.25	(−3.17)	−0.36	(−2.19)	−0.36	(−2.76)
N	2914		2914		2914	
	R^2: 0.024		F: 20.17		Chi^2:112	

2SLS: inte is instrumented using Dist.
T-statistics in parentheses.

and this in turn exerted a negative influence on economic co-movements.[23] Monetary coordination by contrast, had strong positive effects on economic co-movements. The Gold Standard, Scandinavian Union, and Austro-Hungarian Empire dummies all turn out to positively affect business cycles correlation. The results also show that the tighter the monetary coordination, the higher the correlation. The gold standard did foster business cycle correlation (a result that echoes recent work by A'Hearn and Woitek, 2001), but much less so than the Habsburg union. The latter, by itself, increased the correlation by almost .5. Using the parameters in Table 2, this .5 correlation should be expected to have had a marginal effect on trade of 3.2 ($=$ exp(.5 $\times$ 2.33)), which is about the same as the effect reported in Table 1. The high trade integration that the Habsburg monarchy achieved can therefore be explained as a by-product of very tight monetary coordination.[24]

2.3. Competing methodologies

Before we conclude the paper, it is useful to compare our methodology with those used in related papers which we discussed earlier. In effect, our approach departs from Frankel and Rose (1998) in one crucial respect, namely its econometric treatment of endogeneity. Frankel and Rose consider the following equation:

$$\text{corr}(ij,t) = \alpha_2 + \beta_2\ \text{inte}(ij,t) + w(ij,t) \tag{4}$$

Equation (4) may be thought of as a variant of our equation (3). Frankel and Rose are concerned about getting the sign of β_2 (i.e. the effect of trade integration as business cycle correlation) right. They recognize that more integrated countries are likely to co-ordinate their monetary policies (hence to be more

Table 4. Equation (4) estimates (based on FR's methodology) Correlation of business cycles; 1880–1913.

	OLS		2SLS	
Inte	0.008	(1.14)	0.027	(2.55)
Intercept	0.070	(1.209)	0.231	(2.57)
N	2914		2914	
Fisher statistics	$F(1, 2912)$: 1.37		$F(1, 2912)$: 6.51	

2SLS: inte is instrumented using geography (Dist.).
T-statistics in parentheses.

correlated with one another) so that OLS estimates of 4 are biased. To control for this, they perform instrumental variable estimation, taking as instruments the geographical variables of the gravity model. This is because while Frankel and Rose acknowledge that OCA criteria are endogenous to the creation of a monetary union, they also share with traditional analyses the converse notion that monetary union is motivated by OCA criteria. Geography would thus be the ultimate exogenous variable and therefore an appropriate tool to purge policy effects from the data.[25] In contrast with Krugman's conjecture, Frankel and Rose find that trade integration has a positive effect on business cycle correlation.

In Table 4, we report estimates of equation (4), following the methodology advocated by Frankel and Rose, but using our 19th century database. As can be seen, had we followed their approach, we would have indeed obtained a positive effect of trade integration on business cycle correlation.

In a subsequent exercize, Frankel and Rose speculate that the positive effect of trade integration they reported might have come from the fact that countries that decide to give up some monetary independence are also those that have a higher bilateral trade. Therefore, they suggested that one potential problem with their estimation of equation (4) is that "the high correlation among European incomes is a result not of trade links, but of European decision to relinquish monetary independence vis-à-vis their neighbors". To cope with that, Frankel and Rose consider an alternative to equation (4), in which a variable for fixed exchange rate arrangements, FIX(ij, t), has been added. FIX(ij, t) is a period average dummy which is one if i and j had a mutually fixed exchange rate during the period. The result is something that is almost a replica of equation (3) above. Formally:

$$\text{corr}(ij, t) = \alpha_2 + \beta_2 \,\text{inte}(ij, t) + \gamma_2 \,\text{FIX}(ij, t) + v(ij, t) \tag{5}$$

However, because they treat monetary union as an endogenous variable, they again instrument both inte(ij, t) and the fixed exchange rate dummy using geographic variables, while we suggest that only inte(ij, t) should be instrumented since monetary unions are exogenous. They then report a maintained positive effect for trade integration on business cycle correlation. In Table 5 we

Table 5. Equation (5) estimates (based on FR's methodology); Correlation of business cycles; 1880–1913.

	OLS		2SLS[a]		OLS		2SLS[b]	
Inte	−0.01	(−1.3)	−0.013	(−0.66)	−0.01	(−1.48)	−0.03	(−1.17)
AH	0.39	(7.14)	−0.06	(−0.14)				
GS	0.05	(2.72)	0.23	(1.32)				
FIX					0.08	(5.14)	0.17	(1.98)
Intercept	−0.12	(−1.66)	−0.25	(−1.02)	−0.15	(−2.19)	−0.43	(−1.34)
N	2914		2914		2914		2914	
Fisher statistics	F(3, 2910): 10.86		F(3, 2910): 2.89		F(2, 2911): 13.9		F(2, 2911): 4.23	

[a]inte, AH, GS are instrumented using distance, adjacency, language.
[b]*inte*, FIX (= GS + AH + SU + LU) are instrumented using distance, adjacency, language.
T-statistics in parentheses.

essentially replicated this methodology, and again get results with a similar flavor:[26] instrumental variable estimation of both trade integration and monetary arrangements, using geographical variables as instruments, return a non-significant effect of trade integration, and unstable effects of monetary regimes.

In other words the signs of the key parameters of the endogeneity debate are heavily influenced by estimation techniques. Indeed, we were able to replicate the Frankel and Rose result on a 19th century sample where there are strong *a priori* reasons to believe that trade specialization mattered a lot. By contrast, in paragraph 2.2, using an alternative estimation technique, we found evidence that the effect of trade integration is truly negative.[27]

The implication is that the debate boils down to determining which is the correct estimation strategy. To support our findings we thus performed a number of robustness tests, in the form of Hausman tests, reported in Table 6. First, we tested whether, in a standard gravity like equation, monetary union

Table 6. Durbin-Wu-Hausman tests.

	H_0: variable X is exogeneous	
Exogeneity tests	Fisher statistics	Probability of rejecting H_0 while H_0 is true[a]
Exogenity of monetary arrangements in a standard gravity equation: inte$(ij,t) = a_1 + b_1$ FIX$(ij,t) + c_1$ trade frictions $(ij,t) + u(ij,t)$	0.89	34%
Exogenity of *corr* in equation (2): inte$(ij,t) = a_1 + b_1$ corr$(ij,t) + c_1$ trade frictions $(ij,t) + u(ij,t)$	347	0%
Exogenity of *fix* in equation (3): corr$(ij,t) = a_2 + b_2$ inte$(ij,t) + c_2$ Fix $(ij,t) + v(ij,t)$	1.07	30%

[a]If number greater than 5%, we accept H_0.

is endogenous. The result suggests that the exogeneity of monetary arrangements cannot be rejected in our sample. This, we argue, is evidence of the exogenous character of monetary arrangements and a serious empirical justification of the methodology we advocate: the use of monetary union variables as instruments is a legitimate one. Second, we examined equation (2) to determine whether corr, our measure of the covariance of business cycles, is endogenous. Exogeneity is this time rejected suggesting that it is appropriate to instrument it as we did for estimating equation (2). The last exercise was to question our exogeneity assumption in equation (3) (exogeneity of monetary arrangements). This time again, exogeneity is accepted suggesting that instrumenting was not required. In summary, the empirical evidence is consistent with our analytical discussion and provides firmer ground for our conclusions.

3. Conclusion and lessons for Euroland

In his classic article on Optimum Currency Areas, Robert Mundell emphasized that the question of determining the "appropriate domain of a currency area" might seem "at first purely academic since it hardly appears within the realm of political feasibility that national currencies would ever be abandoned in favor of any other arrangement" (1961, p. 657). Forty years later, the making of the euro, showed that what was lacking is not political will, but perhaps an economic motivation.

In this paper, we examined the monetary arrangements of the late 19th century Europe. Using an almost comprehensive sample of European nations, and applying the conventional gravity equation methodology, we found that the trade bias of monetary unions (i.e. the association between monetary unions and increased trade compared to what countries achieve without them) was already a fact of life one century ago. Moreover, the order of magnitude has proved remarkably stable. We also found that the result was robust when we took into account trade protection, a previously neglected but important explanatory variable of international trade patterns.

Concerning the origin of the monetary arrangement bias, we suggested that monetary integration operates in the following way: it loosens the current account constraints by fostering income co-movements, which in turn facilitates bilateral integration. To test this hypothesis, we developed a framework in which the interrelations among monetary arrangements, trade integration and business cycles correlation could be estimated. We argued that monetary integration increases business cycles correlation through "demand" effects and found evidence of this in the data. Moreover, this study is the first to show that these forces dominated the effect of "supply" factors such as trade specialization.

Our analysis suggests two strands for future research. First, it shows that the debate over the relationship between trade integration and specialization is only a (tiny) part of the whole issue of the sustainability of monetary unions.

Whether or not greater integration, by favoring greater specialization might be disruptive, depends on whether the co-movements generated by monetary coordination compensate the supply side effects of specialization. We found that the co-movements created by monetary coordination are substantial. In this respect, creating an integrated monetary and financial system is probably the main step a group of countries needs to achieve in order to become an optimum currency area, despite the traditional caveats that have often been put forward.

Second, our discussion of the current account hypothesis suggests some possible extensions. We think that the emphasis by Rose and the followers on the "large, very large" effects of monetary unions has concealed the fact that it could as well be argued that the monetary union bias could be "small, very small". Several studies have shown that bilateral regional trade flows within a given "country" might be between 15 times (McCallum 1995) and 9 times (Anderson and Wincoop, 2003) bigger than across nations. These results were based on empirical studies that looked at those federations (e.g. Canada and the United States), which macroeconomists are used to thinking of as benchmarks for EMU. The three fold increase associated with monetary unions falls short of this. Thus either the use of the US and Canada as benchmarks to think of European integration is inappropriate, or the trade bias created by monetary unions is very small.

We think looking at the Habsburg record may give us some clues. We know, for instance, that in the 1900s, banks in the Austrian part of the monarchy did not treat Hungarian borrowers in the same way as they treated Austrian debtors. They even began to establish formal distinctions between balances depending on the nationality, at a time when neither the credibility of the Habsburg Union, nor the credit of Hungarian borrowers, were suspected. This finding points to a sharp distinction between the regions of a single country and the nations forming a monetary union. This paper suggests that the rationale for explaining the difference between the border and currency union effects—the former being much larger than the latter—is that the external constraint disappears entirely between regions in a "country", but might in effect survive between the nations forming a monetary union. Ironically, that would be an additional reason why monetary unions might be more stable than what many people think: because of the relatively "moderate" integration they achieve, compared to other nations, they are more likely to stay together, precisely because that will prevent the forces of specialization to give their full sway.

Data Appendix

We work with annual data from 1880–1913. The sample includes 16 European countries: Austria, Belgium, Hungary, Denmark, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United-Kingdom, Russia.

- GDPs, Populations, Exchange Rate Regimes, Total Exports are from the database in Flandreau and Zumer (2004) which contain all the details. Series are available at: http://www.eh.net/databases/finance/
- Data for bilateral trade was collected from Mitchell (1992) for all countries except Austria and Hungary. Data for these two countries were constructed from the Austro-Hungarian returns in Mitchell (1992) which reports totals for Austria and Hungary, and Hungarian sources collected with the help of John Komlos. The period covered is 1882-1913. Data is available upon request.

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Notes

1. See Rose (2001), Persson (2001) and Mélitz (2001) for recent discussions. One pending issue, with which this paper does not deal, but has sympathy with, is that trade biases reflect unobserved factors. Rose deals with this by taking into account reasonable candidates such as common colonial past etc. For an alternative econometric methodology that focuses on dynamics, see Pakko and Wall (2001).
2. For a similar claim applied to the debate on Eastern enlargement where specialization is likely to prevail, see Maurel (2004).
3. Meissner and López-Córdova (2003) is a recent illustration of such inadequate accounts.
4. The Latin and Scandinavian unions lasted respectively between 1865–1914 and 1874-1914. The first comprised France, Belgium, Italy and Switzerland. There were also negotiations with other states that were never finalized (Einaudi, 2001). The Scandinavian union comprised Sweden, Norway, and Denmark.
5. Similar blueprints were only considered between France and Belgium (Willis, 1901).
6. An earlier pre-1914 gravity model is Flandreau (2000) (it is based on the Savage and Deutsch (1960) approach). Related work includes Meissner and López-Córdova (2003).
7. Despite this, most papers in this literature do not look at protection, or look at it in a very crude way. Frankel (1997) and Mélitz (2001) deal with protection, but only through dummy variables. Rose's database includes measures of protection, but they are not used in his 1998 paper. Meissner and López-Córdova only consider Most Favoured Nation dummies.
8. Results were almost identical and available upon request.
9. See Helpman and Krugman (1989). Excluding populations from equation (1) saves this variable as an instrument.
10. Komlos (1983). De Ménil and Maurel (1994) estimate a cross section gravity equation for European countries 1924–26. They get an Austro-Hungarian bias of 1.15. Running an equation similar to theirs gives for our period a coefficient of 1.62. Maurel (1998) runs the same equation as in de Ménil and Maurel for the period 1924–1929 and gets 0.89.

11. This is substantially lower than the numbers reported by López-Córdova and Meissner (2003) who do not consider protection.
12. Obviously, multi-colinearity is an issue: it is hard to think of, say, a country on gold with large volatility against another country on gold. And when we keep protection but discard the monetary regime dummies, exchange rate volatility becomes significant (results available upon request). On the other hand, results show that countries with large bilateral exchange rate volatility did not trade significantly less than countries with comparatively smaller bilateral exchange rate variations. This suggests that there is some non linearity in the effect of integration when one approaches complete union, and that this non-linearity is better captured by dummy variables. Barring a non-linear effect of trade frictions, results thus point to an explanation of the trade bias in terms of structures and institutions, rather than trade frictions.
13. We realize that in a complete monetary union, the integration of the financial system should in principle provide for the complete financing of regional imbalances, so that current account constraints would disappear regardless of the correlation of business cycles. In practice, however, there is evidence that complete monetary unions (nations ?) achieve much higher level of integration than unions that preserve the sovereignty of nation states, so that for all relevant purposes this objection can safely be ignored. We return to this in the conclusion.
14. Before W.W.I., the large grain storage complex near Budapest was only surpassed by that of Chicago.
15. For a study along similar lines in a contemporary context see Maurel (2004).
16. Fatas and Rose (1999) give some evidence indicating that countries that have tied their hands to another currency tend to make a marginally greater use of fiscal tools. At the same time, the need to retain credibility is bound to put some checks on such behavior.
17. von Furstenberg (2004) argues that in an ideal world where monetary policy can succeed in entirely wiping out common disturbances, pooling monetary policy under a single authority may decrease business cycles correlation compared to what would obtain without a single monetary policy. This is because in a monetary union, idiosyncratic disturbances, unlike common shocks, do subside. Note however, that this view considers the common monetary policy as primarily geared towards eliminating common disturbances. But in practice monetary policy generally does not do much stabilization of real activity if at all. Rather, it serves mainly to target the rate of inflation—or the exchange rate. And if the view that macroeconomic stabilization matters is pushed to its extreme, fiscal policy will stabilize the remaining idiosyncratic shocks so that, within a monetary union, there will be zero correlation among regional (ex post) disturbances but zero disturbances as well.
18. Interestingly one reason for Hungary to remain part of the union after a secessionist government was elected in 1905 was fear of losing the benefits of financial integration (Flandreau, 2005).
19. For a discussion of the role of asset diversification in interregional risk sharing, see Asdrubali Sorensen and Yosha (1996) as well as Mélitz and Zumer (1999). Note however, that what we have in mind here is not the effect of asset diversification on regional welfare, but on regional demand. Regional shocks are compensated by the fact that diversified holdings are insured against regional shocks: the more stable local income provides a measure of relief to locally depressed area, since consumption standards are maintained.
20. Since we assume that c_2 and b_1 are positive, and since $d(\textit{corr})/d(\textit{monetary integration}) = c_2/(1 - b_1 b_2)$, the effect of monetary integration on business cycle correlation is by construction greater than zero (provided that $1 - b_1 b_2 > 0$).
21. The latter are to be preferred, because they take into account the possible correlation between the residuals of equations (2) and (3).
22. We exclude LU, whose coefficient was not significant in equation (1). Results remain unchanged when we include it. They are available upon request.
23. It is interesting to contrast this result with that of Engel and Rose (2002). The difference might have to do with the evolving nature of international trade.
24. These results may be compared with Clark and Wincoop (2000) and Engel and Rose (2002). Note that we abstract here from the feed-back from greater trade integration onto smaller business

cycle correlation (equation 3). The net effect is therefore actually slightly lower than the one we report here.

25. See Frankel and Rose (1998) for a discussion of these matters. See also Fatas and Rose (2001).
26. Note that since we only have three instruments the number of monetary regime variables is consistently limited. We decided to restrict our attention to the most interesting regimes, the gold standard and the Austro-Hungarian monetary union. In an extension of the same exercize, we constructed a new variable FIX = AH + GS + SU + LU. The Hausman test again suggested that this variable did not need to be instrumented.
27. An essentially similar estimation technique is implemented by Engel and Rose (2002) on a contemporary sample. They regress business cycles synchronization (measured as the correlation of real GDPs de-trended with linear time trends), on a currency union dummy and on the (logarithm of) bilateral trade. Trade is instrumented using the standard regressors of the gravity equation. The coefficient they find is positive, unlike what we get, suggesting that trade flows involve much more intra-industry trade than in our 19th century trade sample. Somehow surprisingly however, Engel and Rose (2002) emphasize the double causality running from trade to business cycle synchronization and from business cycle synchronization to trade, but they do not discuss the endogeneity of the currency union variable. This is in contrast with the methodology in Frankel and Rose (1998), who recommend instrumenting monetary arrangements.

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