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DISCUSSION PAPER SERIES

No. 3087

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INTERNATIONAL MACROECONOMICS

Centre for Economic Policy Research

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Available online at: **www.cepr.org/pubs/dps/DP3087.asp**

ISSN 0265-8003

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Discussion Paper No. 3087
November 2001

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CEPR Discussion Paper No. 3087

November 2001

ABSTRACT

Monetary Union, Trade Integration, and Business Cycles in 19th Century Europe: Just Do It*

This Paper seeks to trace the impact of monetary arrangements on trade integration and business cycle correlation, focusing on Europe in the late 19th century period as a guide for modern debates. For this purpose, we first estimate a gravity model and show that monetary arrangements were associated with substantially higher trade. The Austro-Hungarian dual monarchy, by many aspects a forerunner of Euroland, improved trade between member states by a factor of three. Other arrangements, such as the gold standard and the Scandinavian union also impacted trade favourably. To explain this, we argue that monetary coordination, by fostering the correlation of business cycles compensates the adverse effect that the current account constraint has on trade integration. This is found to vastly compensate the negative consequences that trade integration might have on the symmetry of shocks, of which this Paper finds strong evidence, in contrast with recent empirical work.

JEL Classification: F40 and N20
Keywords: 19th century, endogeneity, europe, gravity equations, monetary unions, optimum currency area and trade and business cycles correlation

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* We are grateful to Bonko Sagna and Ignacio Briones for research assistance. The comments of Barry Eichengreen and participants at the OFCE-Centre François Simiand Symposium on ‘Habsburgnomics’ (May 2000) and to the Kassel conference on ‘Conflict Potential in Monetary Unions’ (April 2001) are gratefully acknowledged.

Submitted 25 October 2001

Introduction

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. In a context where labor mobility is low while wages and prices are sticky, the cost of losing the monetary weapon is huge. All the more so, because Europe lacks, and is not going to have, those budgetary transfers that might produce a measure of regional stabilization in case of asymmetric shocks.

But we finally got the Euro, most probably for political reasons, good or bad. However, just before Europeans began to receive in the mail their first checkbooks in Euros, the debate twisted radically and a new wisdom emerged. This new wisdom is rooted on the Lucas critique, according to which one cannot assess *ex ante* whether a group of countries is an OCA, because the mere fact of entering a monetary union produces a structural change that may imply that those countries become an OCA *ex post*. [2]

From a purely theoretical point of view, there is no reason why this so-called "endogeneity" argument should *per se* contradict the earlier wisdom. The creation of a monetary union could render even more problematic the maintenance of a common currency, because the resulting integration will lead to greater specialization thus making idiosyncratic shocks *more* likely, as previously argued by Kenen [1969] Krugman [1992] and Eichengreen [1993]. In effect, that endogeneity is a case *for* the euro rests on two empirical propositions. On the one hand, Frankel and Rose [1998] argued that greater trade integration truly caused greater correlation of business cycles. On the other hand, using a gravity model, Rose [2000] reported results that suggested that the creation of a monetary union would have "very large" effects on trade – in numbers an increase by a factor of 3. European policy makers should relax: EMU shall mean much more trade, and this in its turn shall increase the correlation of national business cycles in Europe. The need for idiosyncratic adjustments will hereby be drastically reduced.

These papers sparked a considerable research effort. Macroeconomists generally found Rose's factor 3 a bit hard to swallow and sought ways to provide econometric refinements to play down the monetary union effect. But the bias has proven quite resilient.[3] Interestingly however, while discussion of Rose's findings rapidly took on econometric issues, matters of

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[2] . For a recent discussion of OCA criteria, both endogenouys and exogenous, see Schelkle [2001].
[3] . See Rose [2001] and Mélitz [2001] for recent surveys of the state of the debate.

significance and interpretation were generally left aside. The more or less implicit presumption is that monetary union fosters trade through the reduction in transaction costs associated with suppressing exchange rate volatility.[4] This is consistent with the logic of the gravity model. It is nevertheless hard to resist from thinking that the monetary unions dummies which have been used in trade biases studies are truly capturing the effect of other, unobserved factors that are correlated with monetary union. To deal with that Rose provided a wealth of robustness checks, testing whether various candidates (customs union, common colonial past etc) could wipe out the monetary union bias. But is there such a thing as a comprehensive list of unobservable factors?[5]

Moreover , we feel that in recent controversies on the "endogeneity of OCA criteria", the exclusive focus on the "trade channel" has led to an overly restrictive concentration on the supply side. It is true that specialization may reduce the correlation of supply shocks. But demand factors may on the other hand increase co-movements. A downturn in one part of the union decreases the demand for products from the other part, perhaps all the more so if the two parts are specialized. Similarly, the tightening of credit conditions will be transmitted extremely rapidly from one country to the other one when a closely knitted web of financial intermediaries connects both parts, as should be the case under monetary union. And the kind of fiscal discipline that is commonly associated with having a monetary union might be another factor. As far as EMU is concerned, however, the only thing that matters in the end is the net effect of these various influences. It could well be, for instance, that the supply side effects of trade integration – even if monetary unions do lead to specialization as hypothesized by Eichengreen and Krugman - might be more than compensated by other forces[6].

To deal with these crucial issues, this paper takes a historical perspective, and focuses on the experience of late 19th century Europe. We believe that the episode is a rich source of inspiration and quantitative work. First, examining that very sample of countries whose future prospects are under current consideration, is a very useful complement - and arguably a better alternative – to speculation based on the basis of wholly different groups of nations at a time

[4] . Obstfeld and Rogoff [2000] argue that transaction costs might be the story behind many "puzzles" in international macro such.

[5] . See Pakko and Wall [2001] for an alternative strategy.

[6] . This matter has a considerable importance for discussions of the EU enlargement. While within current members of Euroland, intra-trade may possibly prevail, so that trade integration might foster symmetry, Eastern European countries will arguably deepen existing specialization. In this case the existence of other forces will prove essential. For an empirical analysis net impact of EU enlargement on the symmetry of business cycles in Eastern Europe, see Maurel [2001].

which is past anyway:[7] geographical, cultural, and political similarities provide natural controls. Moreover, Europe in the late 19th century embedded a continuum of monetary arrangements, from the pure float that existed in some quarters to the complete monetary unification of Austria and Hungary: this wealth of institutional arrangements will enable us to work out an interpretation of the trade bias of monetary arrangements, and provide some insights on the sources of stability in monetary unions.

The remainder of this paper is organized as follows. Section 1 carefully reviews the variety of monetary arrangements in late 19th century Europe. Section 2 uses standard gravity estimation and identifies a trade bias associated with some of these arrangements. Section 3 lays out the "financial integration hypothesis", on which much of this paper rests. Our contention is that alternative monetary arrangements have implications on the degree of financial integration that a given pair of countries can achieve, and in turn on their ability to expand bilateral trade. In this section, we develop a model that provides an explanation of why some monetary arrangements are associated with a higher degree of trade integration, other things being equal. Contrary to recent papers, this model helps to identify a negative impact of trade integration on business cycles symmetry via the specialization channel. But it also outlines that the creation of a monetary union also puts into action "demand" forces which more than compensated the potentially disruptive consequences of trade specialization. Our conclusion is that this is great news for the euro.

Section 1: Historical background: monetary regimes in late 19th century Europe

This paper's goal is to discuss the interrelations between monetary arrangements, trade integration, and business cycles in late 19th century Europe. We begin with a discussion of the exchange rate system that prevailed in Europe between 1880 and 1913. Traditional descriptions of the 19th century international monetary system claim that it was ruled by the gold standard, conventionally described as a fixed exchange rate system (or a modern equivalent of currency boards). A more careful look at the actual record however, shows that this description is incomplete at best (see e.g. Flandreau, Le Cacheux and Zumer, 1998). In effect, we find a wide variety of situations encompassing complete monetary freedom, complete loss of autonomy, as well as "mixed" regimes of exchange rate bands.

[7] . This strategy is reminiscent to the attempts to assess the trade potential in post communist central Europe from interwar trade patterns (Maurel [1998]).

One way to look at the historical record, is to "rank" the various monetary arrangements in force in late nineteenth century Europe according to the degree of monetary "tightness" which they implied. At one end of the spectrum we find those countries that did not peg to gold. Since foreign exchange market intervention was in these years kept to minimum, these regimes may be thought of as an approximation for "pure" floats.[8] At the other end of the spectrum we find the Austro-Hungarian dual monarchy. This was the one genuine monetary union of the time, albeit not one by name. Because it can be thought of as a paradigm for EMU, it will receive much attention in this paper.

In between were a number of intermediary regimes whose analysis requires more careful attention. First, we find the countries that had adopted some form of the gold standard. As a first approximation, these can be described as having essentially adopted currency bands. Under these systems, the central bank stood ready to purchase its notes against gold when the gold "agio" (the premium of gold against currency) rose "too much" above parity, and sell gold against notes when the opposite happened.[9] Current research emphasizes that these bands were forerunners of modern target zones (Eichengreen and Flandreau [1997]).

Within this broad category of gold bands, some regimes have been called "monetary unions", a misnomer that keeps confusing many researchers.[10] Given the importance of this issue for the remainder of the paper, a word of clarification is in order. These "unions", which for the period under study comprised, in Europe, the Latin Union, and the Scandinavian Union, were very different from Euroland. Basically, they rested on giving partial or full legal tender status to the foreign gold coins issued by participating countries.[11] As a result, gold coins were identical in all respects – except for the print, which displayed some national symbol. But countries participating to those arrangements never achieved complete monetary unification in the modern sense: neither bankers' drafts, nor banknotes, had an international circulation, and the national central bank did not surrender to a federal authority. Thus,

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[8] . Note that even then, there were foreign exchange interventions and exchange stabilization funds. In the real world, there seems not to be such a thing as a "pure" float.

[9] . Under a strict gold standard (Britain) this level was more or less exogenous, apart from paying with used coins. Former bimetallic countries (France) could get some more leeway. Since they were not bound to pay in gold, they could charge a premium on gold bar, thus widening the spread. A third group did not have formal convertibility (Austria-Hungary post 1896) implying that the size of the gold band was discretionary. In practice, however, central banks sought to avoid widening the band.

[10] . Note that as far as the Latin Union is concerned, that union was initially more modestly referred to as convention of 1865, in reference to the year when the currency treaty was signed.

[11] . Latin and Scandinavian experiments respectively created in 1865 and 1873-4 and that lasted until after the First World War. The Latin union comprised France, Belgium, Italy and Switzerland. There were negotiations with Greece, Romania, the Papal States and other countries that had adopted the French system of coinage, but the agreements they produced were never ratified. Similarly Italy went on an inconvertible paper standard in 1866 just before the Treaty was ratified. The Scandinavian union comprised Sweden, Norway, and Denmark.

nothing prevented a country running into serious financial problems to over-issue national banknotes that would thus become inconvertible. The result was the disappearance of all gold coins (national and foreign) from the domestic circulation, and exchange depreciation. This was experienced in several occasions by Italy – a rogue member of the Latin "Union" – during the years on which this paper focuses: thus these "unions" could truly turn out to be nothing more than floating exchange rate regimes.

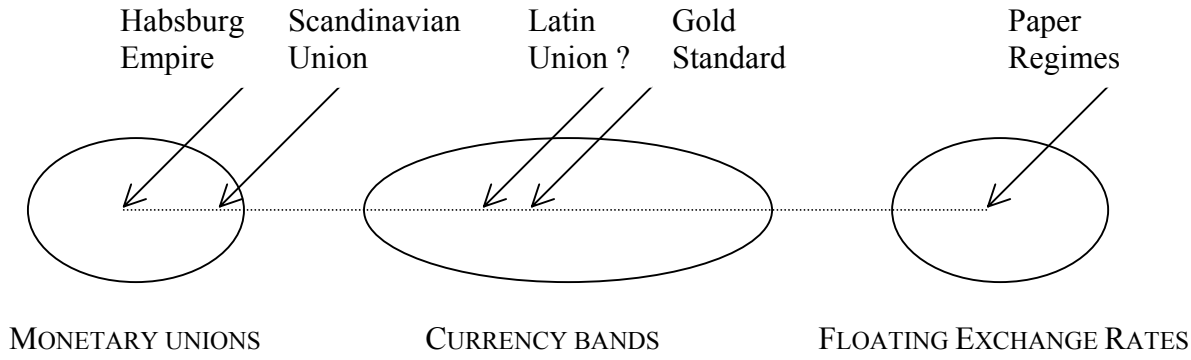
Moreover, even when this did not occur and convertibility was faithfully adhered to, these "unions" were nothing more than unions of standards – pretty much like the gold standard. This is because the "union" coins were in any case a costly mean of international settlement. Union coins were readily accepted in union countries and thus saved on re-coinage. But sending them abroad still involved shipping and insurance charges, along with the cost of interest foregone. As a result, international bankers preferred to use foreign exchange. In the end, the exchange rate between two faithful members of one of these "unions", say France and Belgium, fluctuated within gold points whose size was related to the costs of shipping bullion between participating countries, just like any pair of countries under a gold standard. And because the transportation costs vastly surpassed the re-coinage cost, the distance separating the gold points between two gold standard countries were essentially the same as between two, non gold standard, union members.

Thus, the point is that these unions cannot be said to have induced greater monetary coordination over and beyond what was achieved under a gold standard. Any further coordination had to come from additional rules and policies that were superimposed onto these basic agreements. From that respect, a sharp distinction must be made between the Latin Union and the Scandinavian union. Indeed, the later took deliberate steps to foster monetary integration. This was done through arrangements between the central banks and financial systems. On top of having very close financial centers and common gold coins the Scandinavian banks of issue implemented various methods to facilitate intra-Scandinavian clearing. One such arrangement was one whereby members of the group would accept notes from other members at their face value ("at par"). This obviously required a huge amount of trust among national central banks, as well as rules preventing free riding. Such an arrangement was in force in the Scandinavian Union from 1892 to 1905, and in effect, it entirely eliminated exchange rate fluctuations between member states during those years. However, the negligible exchange fluctuations that existed the rest of the time suggest that even without this, Scandinavian coordination was large, raising its integration well above what would have been achieved under a strict gold standard. Quite characteristically, a similar

blueprints for greater integration was considered but, not implemented, between France and Belgium, two "core members" of the Latin Union (Willis [1901]).

The previous discussion suggests a simple way to identify alternative monetary arrangements in 19th century Europe (Figure 1). Austria-Hungary stands out as the most complete union. The gold standard group comes next with some sub groupings achieving more, such as the Scandinavian union, making it a quasi-monetary union in the modern sense. It is not clear by contrast, whether the Latin union added anything to gold convertibility. Finally, we have the countries that floated, such as the Austro-Hungarian monarchy vis-à-vis the rest of the world before 1896 or Portugal after 1892. Thus as far as monetary coordination is concerned, it is important to recognize the three tier nature of the European exchange rate system as it emerges from the previous discussion. There were three broad degrees of monetary integration (full union, exchange rate bands, and flexible exchange rates) and these will have to be factored in when we move to identifying their possible impact on trade.

Figure 1. A typology of exchange rate arrangements, 1880-1914



Section 2: Trade and Monetary integration: gravity estimates

This section is devoted to the analysis and measure of the patterns of trade within late 19th century Europe. Our goal is to try to assess the impact of given monetary arrangements on trade integration, after controlling for structural factors. To identify these factors, our methodology rests on the gravity model (whose name comes from the obvious parallel with Newtonian Physics): it recognizes that bilateral trade between a given pair of countries depends positively upon the trade potential of given pairs of nations and negatively on

obstacles to international trade: shipping charges volatility of bilateral exchange rates. This model is very convenient for the purpose of identifying the effects of institutional variables, such as the existence of a monetary arrangement between a given pair of countries, for these can be straightforwardly added on top of the structural model as dummy variables.[12]

2.1 Data and methodology: the gravity model

We thus focus on three sets of explanatory variables. The first set includes "structural" variables that reflect the size of the importer and exporter. The second set is made of transaction costs variables. We consider bilateral exchange rate volatility, transport costs, in line with recent research. We also consider protection - a little used, but essential variable.[13] Protection is considered here to matter from both the importer and exporter's side.[14] Explicitly taking into account protection enables to disentangle the effect of monetary union and custom union.[15] Moreover, protection is correlated with other variables of the gravity model, so that omitting it might bias the estimates of other elasticities. For instance exchange variation and protection may be correlated since exchange rate depreciation may be a substitute for tariffs. Similarly, distance and tariffs might be substitutes (Bairoch [1989]). Despite this, existing papers do not look at protection, or look at it in a very crude way. While our measure is far from being satisfactory, it nonetheless is an attempt at sorting out the various effects.[16]

Finally, the last set of right hand side variables we consider is monetary regimes. Following section 1, we identify: Austria-Hungary, the one "true" monetary union in the sample; the gold standard; monetary "unions". As argued above, the monetary "unions" of the late 19th century should be thought of as having at best added something on top of the gold bands, provided that gold convertibility was adhered to. This way, the Latin bias (where the Latin union is restricted to its convertible core, comprising France, Belgium, and Switzerland)

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[12] . The first of pre 1914 gravity model is due to Flandreau [2000]. Related works include Meissner and Lopez-Cordoba [2000].

[13] . Protection is measured by the average rate of protection (i.e. the ratio of customs revenues to total imports). Some authors (Frankel [1997], Melitz [2001]) have included protection as a dummy variable that takes value one when there is a custom union. But the effect of a custom union cannot be properly assessed without reference to the existing, non union level of protection since this can be changing across countries and across time.

[14] The rationale for introducing the level of protection in the importer country is obvious. That for including the exporter's protection is the same as the one that leads to consider the exporter's market share as an explanatory variable for bilateral trade. Exporters' protection, as an obstacle to specialization, turns out to reduce trade.

[15] . In other words, while previous research has assigned to Austria-Hungary's customs union the entire responsibility for Austria-Hungary's greater trade integration, our method enables us to trace what could be due to the absence of intra-union's protection and what could be due to the monetary union per se, if anything

[16] . A possible improvement of the model is to take MFN clauses into account, since our measure captures "average" protection, while MFN clauses reflect "relative" protection. However, the value of a MFN clause depends upon the country that grants it This implies that there are as many MFN dummies as there were countries in the sample. This considerably increases the number of explanatory variables and turned out to raise many interesting econometric problems that are nonetheless way beyond the point we want to make here.

the Scandinavian bias, and the potential bias created by the par clearing agreement of 1892-1905 are added on top of the gold dummy when appropriate.

In practice we work with the following basic specification[17]:

$$Trade_{(ij,t)} = a1*gdp_{(i,t)} + a2*gdp_{(j,t)} + a3*dist_{(ij)} + a4*protimp_{(t)} + a5*protexp_{(t)} + a5*Vol_{(ij,t)} + a6*GS_{(ij,t)} + a7*AH_{(ij)} + a9*LU_{(ij)} + a10*SU_{(ij)} + a11*PAR_{(ijt)} + a6*cons + u_{(ij,t)} \quad \text{(Eq. 1)}$$

Trade potentials are measured as the log of real GDP for both the exporter and importer. Transportation costs are proxied by the log of distance (dist). Exchange rate volatility is measured in two alternative ways.[18] Protection is measured as the ratio of custom revenues to total trade. *GS* is set equal to one when both trade partners belong to the Gold Standard. *AH* is set equal to one when the exporter and the importer is Hungary and Austria. Similar rules apply for *LU*, *SU*, and *PAR*.

2.2 Results

Results are presented in Table 1. We use a sample of 16 countries from 1880 to 1913[19]. Data were collected from a series of national and international sources. From a combination of Magyar and Austro-Hungarian publications, we worked out the international trade of Austria and Hungary as separate entities.[20] The large size of the panel (unlike many studies we use annual data) provides a basis for consistent estimation, and the inclusion of a large number of explanatory variables. Following the common practice, we compute cross sectional estimates (OLS), and also report 2SLS, taking *populations* as instruments.[21] Since the specification considered here differs from existing ones because it considers protection, we

[17].The importer's and exporter's populations are absent from our specification. This follows the simplest version of the gravity equation (Helpman and Krugman [1989]) and saves *population* as convenient instrument in a context where these are not too many. Another specification of the gravity equation which has received less attention is that of Savage and Deutsch [1960]. By contrast with what we do here, Flandreau [2000] relies on the Savage and Deutsch approach.

[18] . *Vol1* is the bilateral exchange rate volatility, calculated as the coefficient of variation for the exchange rate in terms of gold (sqrt(xi-xmoy)/12)/xmoy. We also computed Vol2, the variance of exchange rate changes (Vol2 is thus the variance of log(e(t)/e(t-1))). Vol1 is small when the exchange rate is stable around a parity while Vol 2 is small when the exchange rate is stable around a trend. Results were almost identical. They are available upon request. Eichengreen and Irwin [1995] use Vol1. Rose [2000] by contrast uses the standard error. There does not seem to be any "best practice".

[19] . Austria, Belgium, Hungary, Denmark, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United-Kingdom, Russia.

[20] . Mitchell gives Austro-Hungarian imports and exports. Hungarian sources, give, from 1882 onwards Hungarian imports and exports, from which specific Austrian figures can be constructed. We are grateful to John Komlos for having assisted us in the occasion.

[21] . This is because GDP might be endogenous.

report results both with (eq. 1) and without (eq. 2) protection. This will facilitate comparisons with related literature.

One striking feature of the results is how typical they are compared with modern estimates: significant positive effect of outputs (as countries grow larger, they increase their bilateral trade, albeit less than proportionately), as well as significant negative effect of the log-distance. Volatility also has the right sign albeit it is not significant, which is also consistent with several studies.[22] Our results contribute to existing studies by providing some insights on the effects of protection. Protection is highly significant and has the right sign. This is not surprising, but this study is the first to make that point. The alternative versions of the basic equation were protection has been omitted underline that the estimated effects of transport costs and volatility are quite substantially affected by the inclusion of protection. One gets a higher effect of distance and a significant effect of volatility when protection is not in the regression.[23]

Moreover, we find that the various monetary regimes under study tend to impact trade in substantial ways. "True" monetary unions, such as the Habsburg's union have a huge impact on trade, which can be meaningfully related to earlier research. [24] Intriguingly, the "impact" of the Austro-Hungarian union on trade is a factor of 3.2 (exp(1.16)), which is reminiscent of the estimate in Rose [2000]. Bilateral participation to the gold standard does increase trade, although by a much more moderate estimated factor of 1,36 (exp(0.31)). The Scandinavian Union adds quite a lot on top. As a quasi-monetary union (since it effectively almost eliminated exchange fluctuations) its total effect (gold dummy plus Scandinavian dummy) comes close to the Habsburg effect, which is comforting. By contrast, the Latin union does not add much to bilateral trade. This is also consistent with estimates for earlier periods (Flandreau [2000]), and with the discussion in the first section.

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[22] . On the difficulty to find empirical evidence of the negative impact of volatility on trade, see IMF [1984]. This is in contrast with the results in Rose [1998] (contemporary period) and Meissner and Cordoba [2000] (late 19th century) who report significant effects of volatility. However, both work with (2).

[23] . Note also that the effect of the "on gold" dummy is seriously reduced when protection is omitted, probably because countries on gold were also free traders.

[24] Komlos [1983]. De Ménil and Maurel [1998] estimate a cross section gravity equation for European countries 1924-26. Their goal is to assess the Austro-Hungarian bias, just after the breakdown of the dual monarchy. They get a coefficient of 1.15. Running an equation similar to theirs (without protection and volatility, but with adjacency) 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. These bias are respectively associated with a 505% increase (pre WWI), 316% increase (early years of the break up) and 244% increase (late 1920%) in Austro-Hungarian trade.

Table 1: Gravity estimates (Equation 1)
(equation 1 takes protection into account, while equation 2 excludes it. Results without the exporters protection are similar to 1. They are available upon request).

	OLS		2SLS	
Equation	1	2	1	2
GDPimp	0,57 (44,80)	0,57 (45,72)	0,55 (40,9)	0,53 (37,1)
GDPexp	0,76 (56,35)	0,74 (54,48)	0,78 (49,3)	0,76 (44,8)
Dist	-0,79 (-25,64)	-0,99 (-35,35)	-0,79 (-25,4)	-0,99 (-35,4)
Prot_imp	-3,07 (-13,05)		-3,13 (-13,4)	
Prot_exp	-1,01 (-3,64)		-0,95 (-3,5)	
Bilateral vol.:vol1	-1,4 (-0,71)	-5,44 (-4,70)	-1,3 (-0,67)	-5,6 (-2,7)
Gold Standard: *GS*	0,31 (6,21)	0,41 (8,42)	0,31 (6,2)	0,41 (8,32)
Austro-Hungary: *AH*	1,16 (16,69)	1,29 (18,40)	1,16 (16,7)	1,28 (18,2)
Latin Union: *LU*	-0,01 (-0,33)	-0,11 (-2,70)	-0,013 (-0,307)	-0,11 (-2,7)
Scand. Union: *SU*	0,65 (8,45)	0,52 (6,85)	0,67 (8,251)	0,48 (5.8)
PAR	-0,04 (-0,45)	0,007 (0,087)	-0,042 (-0,46)	0,009 (0,108)
Intercept	-2,28 (-7,55)	-1,19 (-3,90)	-2,4 (-7,2)	-0,98 (-2,776)
N	3558	3558	3558	3558
R squared	0,66	0,64	0,67	0,64

In 2LSL, GDP(imp and exp) are instrumented by their respective Populations.
T-statistics in italics

To conclude, our results show that monetary arrangements mattered for international trade in the 19th century. Monetary arrangements back then just like now had "very, very large" effects. This is in line with a long tradition in 19th century monetary economics according to which, the creation of a monetary union (J. S. Mill [1894]) or the adoption of the gold standard (Kemmerer [1944]) were *per se* good for trade *because of the reduction in transaction costs*.[25] The evidence we get here, however, is only partly consistent with this view. It is true that the monetary regime dummies show up with strongly significant signs. However, we interpret our result that volatility is not significant as evidence that monetary

[25] . See Flandreau [2000] for a review of the transaction costs argument in the 19th century.

regimes did not impact trade through the transaction costs channel. Obviously, multi-colinearity is a problem here, since the exchange rate regime dummies could be thought of as proxies for exchange rate volatility: it is hard to think of, say, a country on gold that experiences violent volatility against another country that is also on gold.[26] However, our finding that the significance of exchange rate volatility is swamped by the monetary regime dummies shows that the big divide is between countries that floated and those that did not, rather than between those that floated but were not too volatile, and those that experienced violent exchange rate gyrations. Otherwise, countries with huge bilateral volatility (say Greece or Portugal vis-à-vis to the rest of the world) should have traded significantly less than those with limited one (say Italy or Austria-Hungary) which they did not, as the non significance of estimates show.

Our view is that a number of institutional features typically accompany monetary arrangements. Being on gold, or being part of the Scandinavian Union, or being part of the Habsburg Empire, was associated with many other things: similar past, similar culture, similar legal system, similar level of development, etc. The modern European idea that monetary union shall lead to increased integration because it will induce harmonization and adjustments in other areas typically rests on this principle.[27] Likewise, nineteenth century economists might possibly have been right to advocate the adoption of certain arrangements such as the gold standard *because adopting gold was also forcing other adjustments*. But they were certainly wrong, as our results suggest, when they motivated this with transaction costs arguments. And we would be seriously mistaken to do the same today.

The challenge, thus, is to make sense of the huge biases, which our results display. A more careful look at the previous results may provide a clue: there is a relation between the degree of monetary "tightness" we identified it in the first section, on the one hand, and greater or lesser trade integration, on the other hand. The *AH* coefficient reported in Table 1, stands out as exceptionally large. So does the sum of the *GS* and *SU* coefficients (the total "Scandinavian" bias). The effect of *GS* alone, albeit large, is considerably smaller. Finally, the Latin Union, does not seem to have added much on top. In other words, while monetary arrangements mattered back then and certainly do matter today, they did and do it in very different ways according to the degree of monetary coordination they implied. This finding is going to be the building block of the rest of the analysis.

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[26] . As a matter of fact, when we keep protection but discard the monetary regime dummies, exchange rate volatility becomes significant. Results available upon request.

[27] . See European Commission, 1989.

Section 3. Trade biases and business cycle correlation: the current account constraint hypothesis

This section provides an interpretation for the monetary union biases. The strategy is the following: rather than introducing monetary arrangements in a purely *ad hoc* way in a gravity equation as in the previous section, we seek to model the interactions between monetary regimes and trade integration in a more explicit and economically meaningful fashion. We achieve this by building a system of equations that relates trade integration, business cycles correlation, and monetary arrangements.

Our argument rests on two ideas. First we claim that difficulties with financing the current account determine the degree of bilateral integration, and that these difficulties are themselves affected by the coordination of macroeconomic policies through their impact on business cycles. We call it the current account constraint hypothesis. Second, we argue that monetary coordination is largely a political decision, whose motivation it is hard to ascribe to strictly economic motives, and which is reversed much less often than economics would warrant. In other words, by contrast with the traditional OCA approach, we treat monetary unification as a mostly *exogenous* decision.

3.1. The current account constraint hypothesis

The current account constraint hypothesis states that there is a positive relation between the degree of correlation of business cycles between a given pair of countries, and their bilateral integration. The intuition is the following. When two countries have similar cycles, bilateral imports and exports tend to move at the same rhythm, hereby reducing the risk of running into the current account constraint. Imports get financed through exports and the need for the financial system to make up for the difference is reduced. By contrast, when cycles are *very* different, the current account constraint may become a serious obstacle to trade integration because the financial system is not prepared tolerate (i.e. finance) growing bilateral imbalances. The resulting reluctance to finance current account disturbances, shall in its turn lead to less bilateral trade integration. In other words, in a world of imperfect finance trade integration is limited by the amount of business cycle correlation. *Ceteris paribus*, a greater correlation of cycles renders bilateral trade integration easier.

This gives us our first equation (equation 2.1 below), which captures the notion that bilateral trade intensity depends upon constraints that include transaction costs (presumably

negative effect) and the degree of symmetry in business cycles (presumably positive effect). Since we compute trade intensity as bilateral, GNP weighted, trade,[28] equation 2.1 should be understood as a reduced form gravity equation, where the current account constraint is introduced as an additional hindrance.

$$Inte(ij,t) = a1 + b1\ corr(ij,s) + c1\ transaction\ costs(ij,t) + u(ij,t) \qquad (Eq.\ 2.1)$$

To close the system we decompose the various factors affecting business cycle correlation. We differentiate between supply side and demand side variables.

On the demand side, we consider the role of monetary coordination. Regardless of whether coordinating monetary policy is a good or a bad thing, a higher coordination aims by definition at synchronizing business cycles. Thus monetary coordination will have a positive impact on business cycle correlation, the empirical question being to determine by how much. Monetary coordination should be understood in a quite comprehensive way. It includes, on top of strictly defined monetary policy, fiscal policy inasmuch as it is also required to adjust over the medium run, either through formal rules (e.g. the stability pact) or through informal ones (the market discipline hypothesis).[29]

On the supply side we have the disputed relation between trade integration and business cycle correlation: trade integration may reduce income co-movements as suggested by euro-skeptics, or it may foster it, as argued by euro-optimists. Equation 2.1 summarizes these effects:

$$Corr = a2 + b2\ inte + c2\ monetary\ coordination + v \qquad (Eq.2.2)$$

We expect c2 to be positive. The sign of b2, as already argued, is opened to debate. Nevertheless, in the context of this paper, there are *a priori* reasons to argue that b2 *should* be negative. Historical evidence suggests that international trade in 19th century Europe, consistently with the Hecksher-Ohlin theory, involved much specialization (Bairoch [1989]). It is well known that the one true monetary union in our sample achieved a huge degree of

[28]. The weights used are those retrieved from OLS estimates of the gravity equation considered earlier.

[29] . It is well known that countries that remained durably on a gold standard tended also to be the ones with the best fiscal record. Similarly, Flandreau [2001] reports elements for Austria-Hungary showing that the pattern of fiscal cycles in Austria and Hungary was strikingly similar. By contrast, 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.

specialization, because in such a context the more integrated would also become the more specialized: Austria was predominantly industrial, while Hungary specialized in agriculture (Komlos [1984]). Thus a reasonable guess is that b2 should be negative. In other words, there is no setting that is more favorable to those authors who emphasize the adverse role of specialization on income co-movements. From that respect, the continued maintenance of the Habsburg union, of the Scandinavian union, or of the gold standard all over the period under study, is somewhat puzzling, because if specialization is pervasive, monetary arrangements should have generated disruptive forces that would have undermined them in the first place.

3.2. Taking endogeneity seriously

At that stage, one remark is in order: if we combine the two simple equations of our system by substituting for correlation in equation 2.1 using its decomposition in equation 2.2, and solve for trade integration, we recover the monetary union augmented gravity equation estimated in the previous section. In other words, our analysis here is just a way of attempting to make sense of the monetary union effect.

Thus the story we tell is the following: monetary coordination increases the correlation of cycles through a number of "demand" channels. In its turn, increased correlation shall lead to a higher degree of bilateral integration by relaxing the current account constraint. And this increased integration will lead to greater or lesser correlation of business cycles depending on the contentious effect of integration on specialization. If integration does not promote specialization, b2 is positive and the net effect must be positive. But even if b2 is negative, the question of determining what channel dominates remains open.[30]

Thus, our way of thinking, while progressing along the lines of the recent controversy on the effects of integration on business cycles co-movements also differs from the current approach in one important respect. As already emphasized, recent articles have been primarily concerned with getting the sign of b2 right. To do so they have adopted a methodology, which while recognizing that Optimum Currency Area criteria are endogenous to the creation of a monetary union, nonetheless shared with earlier traditional analyses the notion that monetary unions are endogenous to Optimum Currency Area criteria. In the end everything is endogenous leading to considerable econometric difficulties since all variables must be

[30] A recent paper by Rose and Engel [2000] shows that while members of a currency union are more integrated than countries with their own currencies, the business cycles of the former are more highly synchronised, suggesting that the effect of monetary coordination more than compensates that of specialization. We interpret this finding as consistent with the intuition on which this paper rests.

instrumented and it is never clear what are the appropriate instruments. Instrumental variables are a necessary evil, and in the present circumstances they can easily be criticized.[31]

We suggest here as an alternative route to take endogeneity seriously, i.e. to base our analysis on the principle that the causality goes from monetary union to OCA criteria rather than the other way round.

From a theoretical perspective, our rationale is that monetary unions are fairly rare events, which, as Mundell [1961] himself recognized, often stumble, even when economically "desirable" on political obstacles. To put it simply: it is true that monetary unions tend to occur among neighbors, or among nations that trade a lot, or among nations that have substantial migrations among them. At the same time how many neighbors, how many trade partners, how many countries related by migration flows, have actually created a monetary union? In our 19th century sample, monetary unions, if not uncommon, remained fairly rare events.

From an empirical perspective, it should be emphasized that over the period under study, the monetary arrangements we consider did not experience much changes. The Habsburg union, the Scandinavian union, and the Latin union were left untouched. Some countries hopped on and off the gold standard, but it is likely that this was not an "economic" choice, in a strict *à la* Mundell perspective. The decision of Russia or Austria-Hungary to link their currency to gold in the 1890s had a strong political content, and they were followed by greater trade integration rather than the other way round.[32]

Of course, we fully realize that over the long run everything is endogenous and we are all dead. So the acid test of the approach developed here is going to be its ability to produce meaningful estimates in view of the hypotheses laid out.[33]

3.3. Empirical Results

From an econometric point of view our analysis rests on a clear cut distinction between what we consider here as exogenous (geography and policy coordination) and what we treat

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[31] . See Frankel and Rose [1998] for a lucid discussion of these matters. Fatas and Rose [2001] also consider the endogeneity problem when they look at the causality running from memberships in a currency union to government's size. Although they believe that "currency unions have not been adopted as a result of macroeconomic instability", their methodology focus on countries with stable and well-defined exchange rate regimes in order to minimise the issue of endogeneity.

[32] . Flandreau, Le Cacheux and Zumer [1998] emphasize the role of feasibility constraints on the adoption of the gold standard. According to this approach, the spread of the gold standard, in the late 19th century is more a historical accident than an economic "choice".

[33] . For an in depth discussion of the implications of alternative methodologies, see Appendix A.

as endogenous (trade integration and business cycle correlation). This in turn motivates our estimation method.

Table 2.1 and 2.2 reports estimates of equations 2.1 and 2.2 respectively. The correlation of business cycles is computed as cyclical deviations from a time trend.[34] OLS estimates being obviously biased we report (and focus on) 2SLS and 3SLS estimates. The latter are to be preferred, because they take into account the possible correlation between the residuals of equations 2 and 3. [35]

Our modified gravity equation (2.1) yields estimates for the impact of distance, protection and volatility, which are in line with what we found earlier. Interestingly, exchange rate volatility is again negative but this time the effect is significant.[36] Finally, and most importantly, the impact of business cycle co-movements, as shown by the 2SLS and 3SLS estimates, is very strong. A move from zero correlation to a correlation of .5 increases trade by a factor of about 3.2 (=exp([2,33 * .5]), which is fully consistent with the AH effect found in Table 1 (exp(1.16)=3.19).[37]

Table 2.1: Equation 2.1 estimates

	OLS		2SLS (IV)		3SLS	
Corr	-0,05	(-1,49)	2,33	(7,09)	2,33	(6,34)
Transaction costs:						
Dist	-0,92	(-27,9)	-0,92	(-18,14)	-0,84	(-20,18)
Prot_imp	-3,26	(-12,7)	-2,66	(-7,18)	-3,33	(-11,38)
Prot_exp	-1,13	(-3,80)	-0,60	(-1,49)	-1,05	(-3,96)
Vol	-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	
	R2: 0,45		F: 302		Chi2: 1151	

2SLS: *Corr* (based upon the "residuals" proxy) is instrumented by dummies set equal to one when monetary coordination holds: *AH*, Scandinavian Union and Gold Standard.

T-statistics in italics

[34] . Corr(ij,s) is the correlation between residuals,from regression of log real GDP on a time trend plus constant. The correlation is computed over a time span s centered on date t. For instance, for t = 1890 and s=7, correlation is computed for 1887-1893. Sensitivity tests included working with GDP first differences, and trying different values for s. Results were unchanged and are available upon request. Obvious data limitations prevent from computing as many measures as one would want. For instance, there are no independent estimates of price movements for Austria and Hungary.

[35] . According to equation 2.2 corr is affected by trade intensity, which is endogeneous in equation 2.1. As a consequence the correlation between corr and the residual in 2.1 is not null (running a Hausman test shows this). We have to instrument corr with the monetary coordination variables (exogeneous by assumtion).

[36] . Exchange rate volatility truly reflects two things at once: it is a policy variable that serves to deal with the business cycle and adjust domestic conditions to external disturbances. It can also be seen as a transaction cost. Results suggests that once we control for the business cycle, the pure transaction cost effect is more evident.

Table 2.2 shows the estimates for the second equation. The effect of trade integration on correlation is negative, as expected, given the nature of trade at the time: more trade implies more specialization, which in turns exerts a negative influence on economic co-movements. Monetary coordination by contrast, has strongly favorable effects: the Gold Standard, Scandinavian Union, and Austro-Hungarian Empire dummies turn out to all influence positively business cycles correlation. It is also worth noticing that we retrieve the ranking implied by section 1. The gold standard did foster business cycle correlation (as argued in a recent paper A'Hearn and Woitek [2001]), but much less so than the Habsburg union. This latter, by itself, increased the correlation by almost 0.5, an effect which can then be seen as responsible for the drastic increase of trade within the Empire that would not have occurred, if there had not been a monetary union.[38]

Table 2.2: Equation 2.2 estimates

	OLS		2SLS		3SLS	
Inte	-0,02	(-2,83)	-0,03	(-2,00)	-0,03	(-2,25)
Monetary Coordination:						
Gold Standard	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)
UL	0,20	(3,36)	0,21	(3,39)	0,084	(1,83)
Scandinavian Union	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 squared	0,024		F: 20,17		Chi2:112	

2SLS: *inte* is instrumented using *distance*
T-statistics in italics

[37] . Similarly, using the parameter estimates in Table 2.1, we get a Gold Standard effect of 26% vs 36% in Table 1, a SU effect of 92% vs 95%, and a LU effect of 20% vs 0%.

[38] .Clark and Wincoop (2000) find that intra-national business cycles correlations are approximately 0.7 for regions within countries, but between 0.2 and 0.4 for comparable regions drawn *across* countries. Rose and Engel (2000) argue that membership of a CU is correlated with business cycles symmetry by a factor of 0.1. Adding the across countries and currency union effect gets us close to the measured factor of 0.5 we obtain for the members of the Habsburg Empire.

Section 4. 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 is 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 after this was written, the making of the euro sounds a bit like a challenge. Contradicting Mundell's early concerns, what has lacked is not political will, much to the contrary, but perhaps, according to some, an economic motivation.

To make sense of this, we examined the monetary arrangements of the late 19th century Europe, with a special emphasis on the Austro-Hungarian monetary union. Using an almost comprehensive sample of European nations, and applying the by now conventional gravity equation methodology, we outlined that the association between monetary unions and increased trade (compared to what countries achieve without them) was already a fact of life one century ago, and that orders of magnitude have proved remarkably stable. Moreover, the robustness of this result was fostered by taking carefully into account protection, a heretofore neglected but important explanatory variable of international trade patterns.

In order to explain the origin of the monetary arrangement bias, this paper has suggested that the coordination of monetary policy achieved under monetary integration loosens the current account constraints and facilitates bilateral integration. In order to test this hypothesis, we developed a framework to handle the complex interrelations between monetary arrangements, trade integration and business cycles correlation. We found that monetary integration favors business cycles correlation through huge "demand" effects which were found to over compensate the disruptive consequences of "supply" factors such as specialization, of which we report, unlike many recent papers, but in line with the intuitions of Kenen [1969], Eichengreen [1992] and Krugman [1993], strong empirical evidence.

Our analysis inspires us two main thoughts that should guide future research. First, it shows that the debate about the trade integration-specialization nexus 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. From that respect, creating an integrated financial system is probably the main step which a grouping of countries needs to achieve in order to become an optimum currency area, and this despite the traditional caveats which have often been put forward. In other words, what

remains to be fully understood is the net sum of the various effects which creating a monetary union put into motion.

Second, the emphasis by Rose and 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 regional trade within a given "country" might be 15 times bigger than international trade (McCallum [1995]). These results were based on empirical studies that looked at those federations (Canada and the United States) macroeconomists have got used to think of as benchmarks for EMU. A factor of three falls way 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. Here again the question is why?

Our suggestion to look at the Habsburg record may give us some clues. The fact is that we do know that banks in the monarchy worried about their exposure to private debts from the other part of the monarchy. In the 1900s, banks began to establish formal distinctions between balances depending on the nationality, at a time when the credibility of the Habsburg Union as such was not 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 "mere" 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 nations, they are more likely to stay together, precisely because that will prevent the forces of specialization to give their full sway.

References:

A'Hearn, Brian and Ulrich Woitek, 2001, "More international evidence on the historical properties of business cycles", Journal of Monetary Economics, 47, pp. 321-346.

Bairoch, Paul, 1989, "European Trade Policy", in *Cambridge Economic History of Europe*, Vol. VIII, pp. 1-160.

Clark, Todd E. and Eric van Wincoop, 2000, "Borders and Business cycles", FRBNY manuscript.

De Ménil, Georges, Maurel, Mathilde, 1994, « Breaking up a custom Union: The case of the Austro-Hungarian Empire in 1919 », *Weltwirtschaftliches Archiv*, Band 130, Heft 3: 553-575.

Eichengreen, Barry, 1992, "Should the Maastricht Treaty Be Saved?", *Princeton Studies in International Finance*, N° 74, International Finance Section, Princeton University, December.

Eichengreen, Barry, Irwin, Douglas A., 1995, "The Role of History in Bilateral Trade Flows: Trade Blocs, Currency Blocs and the Reorientation of World Trade in the 1930s", *Journal of International-Economics*, 38(1-2), pages 1-24.

Fatas, Antonio, and Andrew Rose, 2001, "Do monetary Handcuffs restrain Leviathan? Fiscal Policy in Extreme Exchange Rate Regimes", CEPR DP n°2692.

Flandreau, Marc, 2001a, "The Bank, the States and the Market, an Austro-Hungarian tale for Euroland", Östereichische National Bank,Working papers N° 43.

Flandreau, Marc, 2000, "The economics and politics of monetary unions: a reassessement of the latin Monetary Union, 1865-1871", *Financial History Review* 7, pp. 25-43.

Flandreau, Marc, Jacques Le Cacheux and Frédéric Zumer, 1998, « Stability Without A Pact ? Lessons from the European Gold Standard 1880-1913 », *Economic Policy*, 1998.

Frankel, Jeffrey (1997). *Regional trading blocs in the world economic system*, Institute for International Economics.

Frankel, J.A., and A. K. Rose, 1998, "the Endgeneity of the Optimum Currency Area Criteria", *Economic Journal*, 108, 1009-25.

Helpman, Elhanan, and Paul R. Krugman, 1989, *Trade policy and market structure*, Cambridge, Mass. and London: MIT Press, 1989, pages 191.

IMF [1984], "Exchange Rate Volatility and World Trade", International Monetary Fund Occasional Papers, 28/7/84.

Kemmerer, Edwin, 1944, Gold and the Gold Standard. The story of gold money, past present future, Mac Graw Hill: NY and London.

Kenen, Peter, 1969, "The theory of optimum currency areas: an eclectic view", in R. Mundell and A. Swoboda, *Monetary Problems of the International Economy*, Chicago: University of Chicago Press.

Krugman, Paul, 1993, "Lessons of Massachussets for EMU", in F. Giavazzi and F. Torres, *The Transition to Economic and Monetary Union in Europe*, NY, Cambridge University Press, pp. 241-61.

Lopez-Cordova J. Ernesto and Meissner Christopher, 2000, "Exchange-Rate Regimes and International Trade: Evidence from the Classical Gold Standard Era", Draft, University of California at Berkeley.

McCallum, John 1995. « National borders matter: Canada-US: National trade patterns » *American Economic Review*, 85 (June), 615-623

Maurel, Mathilde, 1998 *Régionalisme et désintégration en Europe centrale et orientale : Une approche gravitationnelle*, Paris, Presses du CNRS.

Maurel, Mathilde, 2001, "Assessing the endogeneity of EMU enlargement towards CEECs", mimeo.

Melitz, Jacques, 2001, "Geography, Trade and Currency Union", mimeo.

Mill, John Stuart, 1894, *The Principles of Political Economy*, Vol II, New York.

Mundell, Robert, 1961, " A theory of optimum currency areas" *American Economic Review*, Vol. 51, November, pp. 509-17.

Obstfeld, Maurice, and Kenneth Rogoff,, 2000, "The six major puzzles in International Macro: is there a common cause?", NBER WP N° 7777.

Pakko, Michael R. and Howard Wall, "Reconsidering the trade creating effects of a currency union" , Federal Reserve Bank of Saint Louis, September-October 2001.

Rose A. K. and Engel C., 2000, "Currency Unions and International Integration", *NBER working Paper* 7872.

Rose, A. K., 2000, "One Money, One Market", *Economic Policy*, 15-30, 7-46.

Rose, A. K., 2001, "The effect is large", presented at the Economic Policy Panel, Stockholm, April 2001.

Rose, Andrew and Charles Engel, 2000, "Currency Unions and International integration", *NBER working Paper* N° 7872.

Savage, I. Richard, and Karl W. Deutsch, "A Statistical Model of the Gross Analysis of Transaction flows", Econometrica, Vol. 28, 3, 1960, pages 551-572.

Schelkle, Waltraub 2001, "The optimum currency area approach to European Monetary Integration: Framework of Debate or Dead End?" Working Paper.

Appendix A: A comparison with alternative strategies

In this appendix we discuss our findings and econometric strategy in contrast to that of Frankel and Rose [1998]. Because these authors were primarily concerned with the endogenous effects of trade integration on business cycle correlation, Frankel and Rose focus on the first part of our equation 2.2. Formally they look at:

$$Corr\ (ij,t)= a2 + b2\ inte(ij,t) + v(ij,t) \quad (Eq.A.1)$$

According to FR, more integrated countries are likely to co-ordinate their currencies (hence to be more correlated with one another). The coefficient obtained through simple OLS thus reflects the fact that in the sample, trade integrated countries have also adjusted their monetary policies. In other words FR argue that monetary coordination may contaminate the results of direct estimation of A.1, because inte(ij,t) may be correlated with monetary coordination which is bound to affect business cycles co-movements. To control for this, FR first suggest IV estimation (instrumental variables) and take as instruments the geographical variables of the gravity model. Instruments must be orthogonal to the residual v, and from that respect, geography is the most popular candidate, as it enjoys a sort of super-exogeneity. Thus the intuition is that geography is an exogenous determinant of bilateral trade patterns (what would occur without policies) and can be used to purge policy effects from the data.

We estimated equation A.1 following the methodology recommended by FR (using the geographical variables as instruments). Table A.1 reports the results. The positive coefficient we get by running IV regressions stands in contrast to what we get when working with equation 2.2. Moreover this coefficient is significant (in contrast with what we get with OLS). We interpret this as evidence of the failure of the instrumentation strategy suggested by Rose and Frankel. Obviously this result is in contrast with the negative coefficient obtained by estimating our own specification.

Table A.1. Estimates of A.1, FR's methodology

	OLS	2SLS
Inte	0,008 (1,14)	0,027 (2,55)
Intercept	0,070 (1,209)	0,231 (2,57)
N	2914	2914
R squared	0,0005	F: 6,51

2SLS: *inte* is instrumented using *distance*
T-statistics in parentheses

Finally, in a subsequent "sensitivity test", FR consider an equation that is similar to 2.3, in that fixed exchange rate arrangements are added as an additional explanatory variable in A.1. (FIX(ij,t) is a period average dummy which is unity if i and j had a mutually fixed exchange rate during the period) [39]:

$$Corr\ (ij,t)= a2 + b2\ inte(ij,t) + c2\ FIX(ij,t) + v(ij,t) \quad (Eq.A.1)$$

[39] . Formally, re-write equation 2.3 as follows: corr(ij,s) = a2 + b2*inte(ij,t) + v(ij,t), where v(ij,t) = c2 monetary arrangements + w(ij,t). Running 2SLS allows to tackle the correlation between inte and v(ij,t) only if corr(dist,v(ij,t)) is zero, that is if the correlation between the instrument and the omitted variable is null.

They use this equation as a test of the view 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". However, because they treat monetary union as an endogenous variable, they instrument both inte(ij,t) and the fixed exchange rate dummy using geographic variables. This may explain the maintained positive effect of trade integration on business cycle correlation, as well as the unstable estimate for the effect of fixed exchange rates. But if the endogeneity of OCA criteria is to be taken seriously, then exchange rate regimes should be treated as exogenous. Table A.2 illustrates this by showing the output of IV instrumentation of both trade integration and monetary arrangements in our sample, using geographical variables as instruments (column 2SLS). As can be seen, trade integration is not significant, and so are monetary regimes, which in some case do not even have the right sign.

Table A.2. Estimates of A.2, using FR's methodology

	OLS	2SLS
Inte	-0,01 (-1,3)	-0,013 (-0,64)
AH	0,05 (2,72)	-0,06 (-0,13)
GS	0,39 (7,14)	0,23 (1,22)
Intercept	-0,12 (-1,66)	-0,25 (-0,97)
N	2914	2914
R squared		

2SLS: *inte, AH, GS* is instrumented using *distance, adjacence, language*
T-statistics in parentheses