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Is EMU more justifiable ex post than ex ante?

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Abstract

Yes. A country's suitability for EMU entry depends on the intensity of trade with EMU members, and the extent to which its business cycles are correlated with those of other members. But both international trade patterns and international business cycle correlations are endogenous. Theoretically, economic integration has an ambiguous effect on the degree to which business cycles are correlated across countries. Empirically though, countries with closer trade links tend to have more tightly correlated business cycles. It follows that countries are more likely to satisfy the criteria for entry into a currency union after taking steps toward economic integration than before. © 1997 Elsevier Science B.V.

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1. Introduction

Potential entrants into the proposed European Economic and Monetary Union (EMU) will weigh the benefits of joining against the costs. The benefits of being a member include a reduction in the transactions costs associated with trading goods and services between countries with different moneys. Countries with close trade links to EMU members will benefit more from monetary union and are therefore

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more likely to join EMU themselves. But joining EMU also brings costs. Entrants will forego the possibility of dampening business cycle fluctuations through independent counter-cyclic monetary policy. Countries with idiosyncratic business cycles give up an important stabilizing tool if they join, and are thus less likely to join EMU. It seems reasonable to conclude that countries which are not very integrated, and countries with very different business cycles, should not be expected to join EMU. But can the degree of trade integration and business cycle symmetry – two important criteria for EMU entry – be considered independently? [1]

Our aim in this paper is to link the two issues so as to make a simple point. We argue that a naïve examination of historical data gives a misleading picture of a country's suitability for entry into a currency union, since both criteria are inter-related and *endogenous*.

EMU entry – possibly motivated by non-economic reasons – may significantly raise international trade linkages (and thus the benefits of EMU membership). In turn, tighter international trade ties may significantly affect the nature of national business cycles. Countries that enter EMU are likely to experience dramatically different business cycles than before. In part this may reflect closer international trade with other EMU members. From a theoretical viewpoint, closer international trade could result in either tighter or looser correlations of national business cycles. Cycles could, in principle, become *more asymmetric*, if countries become more specialized in the goods in which they have comparative advantage. The countries might then be more sensitive to industry-specific shocks, resulting in more idiosyncratic business cycles. However, if demand shocks predominate, or there are important shocks which are common across countries – or intra-industry trade accounts for most trade – then business cycles may become *more similar* across countries when countries trade more. We consider the latter case to be the more realistic one, but consider the question to be open.

We test our view empirically, using a panel of bilateral trade and business cycle data spanning 20 industrialized countries over 30 years. The empirical results are clear-cut. Closer international trade links result in more closely correlated business cycles across countries.

Our findings lead to a number of conclusions on the prospects and desirability of EMU. Continued European trade liberalization can be expected to result in more tightly correlated European business cycles, making a common European currency both more likely and more desirable. Indeed, monetary union itself may lead to a further boost to trade integration and hence business cycle symmetry. Countries which join EMU, no matter what their motivation, may satisfy optimum currency area criteria ex post even if they do not ex ante!

[1] We do not address the important issues of labor mobility or fiscal transfers in this paper.

2. Theoretical framework

Since Mundell first developed the concept of an optimum currency area (OCA), a vast literature has developed in the area. A recent survey is available in Bayoumi and Eichengreen (1996). Much of this literature focuses on four inter-relationships between the members of a potential OCA. They are: (1) the extent of trade; (2) the similarity of the shocks and business cycles; (3) the degree of labor mobility; and (4) the system of fiscal transfers. The greater the international linkages using any of the four criteria, the more suitable a common currency.

Given the theoretical consensus in the area, it is natural that the OCA criteria have been applied extensively. For instance, when most researchers judge the suitability of different European countries for EMU, they examine the four criteria (or some subset) using European data, frequently using the United States as a benchmark for comparison.

Such a procedure is untenable if the OCA criteria are *jointly endogenous*. That is, the suitability of European countries for EMU cannot be judged on the basis of historical data *since the structure of these economies is likely to change in the event of EMU*. As such, this paper is simply an application of the well-known 'Lucas Critique'.

Can the degree of integration between potential members of a common currency area be considered independently of income correlation? Surely not, since *the correlation of business cycles across countries depends on trade integration*. Integration changes over time. European countries trade with each other more than in the past, and this trend may continue. It is driven in part by trade policy: such initiatives as the completion of the single market in 1992. *EMU itself may promote intra-European trade, if the effects of the exchange rate risk and transactions costs are important, as EMU proponents claim.* Thus cyclic correlation is endogenous with respect to trade integration, while integration is also affected by policy.

Our hypothesis is that this relationship is positive: the more one country trades with others, the more highly correlated will be their business cycles. This is certainly the relationship pictured by the Commission of the European Communities (1990). But it is not universally accepted. Authors such as Krugman (1993) have pointed out that as trade becomes more highly integrated, countries can specialize more. Increased specialization may *reduce* the international correlation of incomes, given sufficiently large supply shocks.

Casual empiricism leads us to the view that integration results in more highly correlated national business cycles. However, the alternative view is defensible on theoretical grounds. The matter can only be resolved empirically. To our knowledge, there is no direct empirical work on this issue. Economists such as Bayoumi and Eichengreen (1993, 1996), have carefully analyzed the business cycles and shocks affecting different potential EMU members, to quantify the potential importance of national monetary policy. But such analysis implicitly takes the

business cycle correlations to be unaffected by economic integration. We now test this view formally.

3. Empirical methodology

Our empirical analysis relies on measures of two key variables: bilateral trade intensity; and bilateral correlations of real economic activity. We discuss these in turn.

We are interested in the bilateral intensity of international trade between two countries, i and j, at a point in time t. We use three proxies for bilateral trade intensity: (the natural logarithm of) the ratio of bilateral exports between i and j, divided by the sum of i and j's total exports; and comparable ratios for imports and total trade. Higher values indicate greater trade intensity between countries i and j.

The bilateral trade data are from the International Monetary Fund's *Direction of Trade* data set. The data are annual, covering 21 industrial countries from 1959 through 1993 [2].

Our other important variable is the bilateral correlation between real activity in country i and country j at time t. We use four different measures of real economic activity: the first pair taken from the International Monetary Fund's *International Financial Statistics*; the other two from the OECD's *Main Economic Indicators*. In particular, we use: real GDP (typically IFS line 99); an index of industrial production (line 66); total employment (OECD mnemonic 'et'); and the unemployment rate ('unr'). All the data are quarterly, covering (with gaps) the same sample of countries and years as the trade data.

We transform our variables in two ways. First, we take natural logarithms of each variable except the unemployment rate. Second, we de-trend the variables so as to focus on business cycle fluctuations. Given the importance of different de-trending procedures, and the lack of consensus about optimal de-trending techniques, we employ four different de-trending methodologies. First, we take simple fourth-differences of the (logs of the) variables (i.e., we subtract the fourth lag of e.g., real GDP from the current value), multiplying by 100 (so that the resulting variable can be interpreted as a growth rate). Second, we de-trend the variables by examining the residual from a regression of the variable on a linear time trend, a quadratic time trend, and three quarterly dummies. Third, we de-trend the variables using the well-known Hodrick–Prescott ('HP') filter (using the traditional smoothing parameter of 1600). Finally, we apply the HP filter to the residual of a regression of the variable on a constant and quarterly dummies.

[2] The countries are: Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Greece; Ireland; Italy; Japan; Norway; Netherlands; New Zealand; Portugal; Spain; Sweden; Switzerland; the UK; and the US. In future work, we hope to include developing countries.

After appropriately transforming our variables, we compute bilateral correlations for real activity. These correlations are estimated *between* two countries *over* a given span of time. Thus, e.g., we estimate the correlation between real GDP de-trended with the HP filter for two countries i and j over the first part of our sample period. We split our sample into four equally-size parts: the beginning of the sample through 1967Q3; 1967Q4 through 1976Q2; 1976Q3 through 1985Q1; and 1985Q2 through the end of the sample. Since we have twenty-one countries, we are thus left with a sample size of 840 observations; 210 bilateral country-pair correlations [$=(21 \times 20)/2$], with four (period) observations per country-pair.

4. Econometric methodology

The (reduced-form) regressions we estimate take the form:

$$\text{Corr}(v, s)_{i,j,\tau} = \alpha + \beta\ \text{Trade}(w)_{i,j,\tau} + \varepsilon_{i,j,\tau}.$$

$\text{Corr}(v, s)_{i,j,\tau}$ denotes the correlation between *country* i and *country* j over *time span* τ for *activity concept* v (corresponding to: real GDP; industrial production; employment; or the unemployment rate), *de-trended with method* s (corresponding to: fourth-differencing; quadratic de-trending; HP-filtering; HP-filtering on the SA residual). $\text{Trade}(w)_{i,j,\tau}$ denotes the natural logarithm of the average bilateral trade intensity between country i and country j over time span τ using *trade intensity concept* w (corresponding to: export; import; or total trade weights). Finally, $\varepsilon_{i,j,\tau}$ represents the myriad influences on bilateral real activity correlations beyond the influences of international trade; α and β are the regression coefficients estimated.

We have sixteen versions of the regressand (as we consider four activity concepts and four de-trending methods) and three versions of the regressor (since we have three sets of trade weights). We estimate all 48 versions of our regression to check results for robustness.

The object of interest to us is the slope coefficient β. We are interested in both the sign and the size of the coefficient. The *sign* of the slope tells us whether the specialization effect dominates (in which case we would expect a negative β, since more intense trade would be expected to lead to more idiosyncratic cycles and lower correlations of economic activity) or the expected traditional effect prevails (in which case β should be positive). The *size* of the coefficient allows us to quantify the economic importance of this effect.

A simple OLS regression of bilateral activity income correlations on trade intensity is inappropriate. Countries deliberately link their currencies to those of their most important trading partners, in order to capture gains associated with greater exchange rate stability. In doing so, they lose the ability to set monetary policy independently of those neighbors. The fact that their monetary policy will be closely tied to that of their neighbors could result in an observed positive

association between trade links and income links. In other words, the association could be the *result* of countries' application of the OCA criterion, rather than an aspect of economic structure that is invariant to exchange rate regimes.

To identify the effect of bilateral trade patterns on income correlations in such circumstances, we need exogenous determinants of bilateral trade to use as instrumental variables. We use the variables of the well-known 'gravity' model of bilateral trade.

5. Empirical results

Instrumental variables (IV) estimates of β are tabulated in Table 1. The estimates, along with their standard errors, are presented in three columns, corresponding to the three different measures of bilateral trade intensity. For each measure, sixteen estimates (four measures of economic activity, de-trended in four different ways) are presented in the rows.

We use three instrumental variables: the natural logarithm of the distance between the business centers of the two countries; a dummy variable for geographic adjacency; and a dummy variable for common language. Each of these variables is highly correlated with bilateral trade intensity, but can reasonably be expected to be unaffected by other conditions which affect the bilateral correlation of economic activity.

The estimates in Table 1 indicate that a closer trade linkage between two countries is strongly and consistently associated with more tightly correlated economic activity between the two countries. The size of this effect depends on the exact measure of economic activity, but does not depend very much on the de-trending method or the measure of trade intensity.

We have checked these results in a number of different ways, and they seem to be robust. Our results do not appear to be very sensitive to: the exact sample; the list of instrumental variables; the addition of the exchange rate regime; or adjustment for oil shocks.

6. A conclusion

In this paper we have considered the relationship between two of the criteria used to determine whether a country is a member of an optimum currency area. From a theoretical viewpoint, the effect of increased trade integration on the cross-country correlation of business cycle activity is ambiguous. Reduced trade barriers can result in increased industrial specialization by country and therefore more asynchronous business cycles resulting from industry-specific shocks. On the other hand, increased integration may result in more highly correlated business cycles because of demand shocks or intra-industry trade.

Table 1
Estimates of effect of trade intensity on income correlation

Activity	De-trending	Total trade weights	Import weights	Export weights
GDP	Differencing	10.3	10.2	9.7
		(1.5)	(1.4)	(1.4)
Ind Prod	Differencing	10.1	9.8	9.8
		(1.5)	(1.5)	(1.5)
Employ	Differencing	8.6	8.4	8.2
		(1.8)	(1.8)	(1.8)
Unemp	Differencing	7.8	7.6	7.5
		(1.6)	(1.6)	(1.6)
GDP	Quadratic	11.3	11.1	10.7
		(1.9)	(1.9)	(1.8)
Ind Prod	Quadratic	9.3	9.0	9.0
		(2.1)	(2.0)	(2.0)
Employ	Quadratic	8.6	8.6	7.9
		(2.5)	(2.4)	(2.4)
Unemp	Quadratic	10.8	10.5	10.6
		(2.4)	(2.4)	(2.3)
GDP	HP-filter	8.6	8.4	8.2
		(1.5)	(1.5)	(1.4)
Ind Prod	HP-filter	9.8	9.4	9.4
		(1.7)	(1.6)	(1.6)
Employ	HP-filter	10.1	9.8	9.7
		(1.8)	(1.8)	(1.8)
Unemp	HP-filter	7.8	7.5	7.6
		(1.7)	(1.7)	(1.6)
GDP	HP-SA	7.3	7.2	6.9
		(1.5)	(1.4)	(1.4)
Ind Prod	HP-SA	9.1	8.7	8.8
		(1.5)	(1.5)	(1.5)
Employ	HP-SA	8.6	8.4	8.2
		(1.7)	(1.7)	(1.7)
Unemp	HP-SA	8.1	7.8	7.8
		(1.7)	(1.7)	(1.6)

IV estimate of β (multiplied by 100) from
$\text{Corr}(v, s)_{i,j,\tau} = \alpha + \beta\ \text{Trade}(w)_{i,j,\tau} + \varepsilon_{i,j,\tau}$.
Instrumental Variables for trade intensity are: (1) log of distance; (2) dummy variable for common border; and (3) dummy variable for common language.
Standard errors in parentheses. Intercepts not reported.
Bilateral quarterly data from 21 industrialized countries, 1959 through 1993 split into four sub-periods. Maximum sample size = 840.

This theoretical ambiguity does not characterize the data. Using a panel of thirty years of data from twenty industrialized countries, we find a strong positive relationship between the degree of bilateral trade intensity and the cross-country bilateral correlation of business cycle activity. Greater integration historically has resulted in more highly synchronized cycles.

The endogenous nature of the relationship between various OCA criteria is a straightforward application of the celebrated Lucas Critique. Still, it has considerable relevance. For instance, some countries may appear, on the basis of historical data, to be poor candidates for EMU entry. But EMU entry per se, for whatever reason, may provide a substantial impetus for trade expansion. Though the size of this effect is uncertain, it in turn may result in more highly correlated business cycles. That is, a country is more likely to satisfy the criteria for entry into a currency union ex post than ex ante!

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