Income Insurance Aspects of Monetary Union

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Financial-sector effects are excluded from the traditional list of OCA criteria, but at least two of them are important. For one, regional monetary union offers important income and price-level insurance to its members. The welfare gains available through the completion of financial markets from income and consumption insurance alone are especially large. They are much greater than those available from access to noncontingent international borrowing among members that may also be promoted by monetary union.

While insurance tackles asymmetric, and hence diversifiable risks, the single monetary policy seeks to cushion symmetric disturbances that have a net effect on the union as a whole. Thus increased correlations among residual country disturbances are not necessary for the ex post justification of a monetary union. Nevertheless, increased correlation of the reduced-form national income disturbances remains likely because of the trade-enhancing effects of monetary union and its promotion of industrial networking documented by others. (*JEL* F33, F36, F41)

Introduction

Regional monetary union often is described as hazardous to the economic stability of individual member countries. The claim is this: Due to (a) the loss of the *independent* monetary policy instrument in integrating regions, (b) monetary union (MU) may be

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harmful to national economic stability, unless the integration process if intensified by MU and (c) this leads to *greater symmetry of shock exposure* for member countries. The counterclaims advanced in this study are: (a) Floating exchange rates, while compatible with an independent national monetary policy, are politically incompatible with deep and durable economic integration particularly between countries at greatly different levels of economic development. (b) MU embodies stabilizing price and income insurance features that guard against abrupt changes in competitiveness and country-specific income shocks. And (c) the single monetary policy pursued by MU, if successful, reduces, rather than increases, the symmetry of the remaining income disturbances.

Section Outline

Section I shows that fully specified optimization models can provide hitherto unexploited insights into the desirability of monetary unions as enabling various forms of insurance. New Open-Economy Macroeconomics (NOEM, for surveys and appraisals see Lane, 1999; Sarno, 2001; and, most importantly, Obstfeld, 2001) is particularly well suited to support such an analysis because it emphasizes consumption smoothing and insurance and give careful attention to the extent to which international financial markets are made more complete. A fully optimized numerical demonstration will show that the welfare effects of completing the internal market for contingencies through monetary union are likely to be much larger than the mere introduction of "perfect capital mobility." The latter is defined as unrestricted access to international borrowing at interest rates that are equalized throughout the area on contracts that are non-contingent.

Endogenous justifications frequently expected from monetary unions are confronted with its previously neglected financial-sector effects in Sections II and III.

Section II gathers all the factors, including insurance, making for increased symmetry of residual income disturbances. Section III shows that the single monetary policy of the union, if at all successful, would have the opposite effect. Hence endogenous justifications for monetary union need not come from growing business cycle correlations between countries once they have joined in monetary union as commonly claimed. Section IV concludes.

I. Sovereign Borrowing: A Paltry Substitute for Insurance

Cycles of overborrowing (McKinnon and Pill, 1996) followed by debt crises in emerging countries are so familiar as to lend credence to Dornbusch and Park's (1987, pp. 432-433) judgment that capital tends to rush to such countries "when it is unnecessary and leave when it is least convenient." Turkey and Argentina are recent examples of countries that have been unable to use the International Monetary Fund (IMF), let alone international financial markets, for consumption smoothing. Crudely put, these countries borrowed internationally when their economies were booming, and went into shock when new international loan funds became unavailable. Likewise, far from being usable to stabilize the economy, their monetary policy was driven to be relatively easy when capital was flowing in, while falling victim to the general strangulation of the intermediation system when capital was flowing out. Hence neither international capital flow, nor monetary policy to the extent it can be insulated from these flows, is likely to stabilize consumption or income over time in many emerging-market countries.

But what if these countries were free to pursue stabilization objectives through international credit and insurance channels? Table 1 then makes the point that the

benefits of international borrowing alone would be rather limited under the best of circumstances represented by ex ante equilibrium. It shows that even if such borrowing is optimally deployed and the set of possible future outcomes is known with exact probability, non-contingent sovereign borrowing can achieve little to smooth consumption. By contrast, large utility gains attach to the insurance available from a complete market in contingent claims between the two countries represented in Table 1.

This is of interest here because deep monetary and financial integration eventually facilitates a much higher degree of consumption insurance through a variety of formal and informal insurance channels than would be available to members in the absence of monetary union. The process appears, however, to be quite gradual. For instance, Berger, DeYoung and Udell (2001), OECD (2000, p. 65), and Prati and Schinasi (1999) have pointed out issues of residual market segmentation in the financial sector that remain to be resolved in the euro area, and von Furstenberg (1998) has summarized earlier evidence of large international differences in the prices of selected financial service that have continued to prevail inside the European Union.

{Table 1 about here}

Technical Specifications

This subsection specifies the cases laid out in Table 1. These three cases, involving financial markets that are increasingly complete from first to last, apply the NOEM logic developed by Obstfeld and Rogoff (1996, Chapter 5). As fully specified in the appendix for convenience, the basic set-up chosen for concreteness is that there are only two countries in the world (W) whose income (Y) at date 1 is equal such that $Y_1 = Y_1^*$. Hence Y_1^W equals $2Y_1$. At date 2 there is a 50 percent chance that the income

situation of date 1 will repeat itself exactly so that, in state s=1, $Y_2^W(1) = 2Y_1$ as before. Here states s=1,2 are identified in parentheses while dates are shown by subscript. However, there is an equal chance (so that probability $\pi(2) = \pi(1) = 0.50$) that $Y_2^W(2) = Y_2(2) + Y_2^*(2) = Y_1 + 2Y_1 = 3Y_1$, i.e., that foreign (*) income will be twice as high as domestic income at date 2 in state 2. Hence one member (say, Ireland) is taken to have significantly better prospects, allowing it to grow 2.8 percentage points faster per annum than another (e.g., Germany) so that its relative income in state 2 could double over 25 years if this is how far the "date 1" and "date 2" periods are apart. The pregiven taste parameter value used for the personal discount factor, β, is 1 so that there is no net time preference, and the constant relative risk aversion (CRRA) coefficient, ρ, is 2. Here $\beta=1$ is at the upper end in view of recent evidence provided by Warner and Pleeter (2001), while $\rho=2$, the benchmark value also used and discussed by Lucas (1990, pp. 304-306), is at the lower end of what commonly is accepted as arguably realistic in the Finance literature. As already hinted, date 2 may be thought of as one generation after date 1 so that the size of the cumulative multi-year discount rate (r) in Table 1 need occasion no surprise.

Riskless International Borrowing Only

In the riskless discount bonds (B, subscripted by maturity date) case portrayed in the middle column of Table 1, B_2 is negative indicating a capital export from the home to the foreign country at date 1. Because of zero net time preference and equal incomes of 100 at both dates, the home country also has a zero interest rate in the state of financial autarky. Hence it is willing to lend at any positive interest rate as soon as the international bond market opens up. Conversely, the foreign country whose desire to

anticipate higher future incomes is restrained by an interest rate of 60% under autarky in this consumption loan model involving nonstorable goods will be willing to borrow at any interest rate less than 60% from the home country. Hence the international bond market clears at an interest rate (r) between 0% and 60%, in fact, about midway between these rates, at r = 27.13%, in Table 1, with the home country lending $B_2/(1+r)$ to the foreign country at date 1, being repaid at date 2.

Because payment of B_2 is noncontingent, the foreign country owes the fixed amount B_2 at date 2 irrespective of whether the bad state, s=1, or good state, s=2, materializes on that date. Hence it would end up worse off than without foreign borrowing in state 1-- something that surely has occurred quite often in the real world when countries came to regret past foreign borrowing. Decision makers who are aware of this possibility optimally limit the amount of riskless international borrowing to low levels even when there is no external constraint set by lenders on such borrowing because repayment is certain and default ruled out by assumption.

Not surprisingly, therefore, only rather small gains in utility are achieved from optimal international borrowing as the negative utility index falls by between 0.3 and 0.4 percent in each of the two countries from the level under autarky shown in Table 1. The difference between consumption in states 1 and 2 at date 2 is not modified, remaining 0 for the home country and 100% for the foreign country. With complete contingent contracts, by contrast, both countries share the potential good fortune at date 2 by having their consumption rise 50 percent from date 1 to date 2 in the good state (s=2). Also unlike with complete contracts, when there is riskless bond financing only, each country's share of the expected discounted present value of world consumption -- 45.04

percent for the home and 54.96 percent of the same 396.65 for the foreign country -- is the same as its share of the corresponding expected value of world income endowments, $Y^W = Y_1{}^W + 0.5[Y_2(1)^W + Y_2(2)^W]/(1+r)$. The reason is that no income redistribution effects can arise across countries from non-contingent borrowing at the compound rate r if that is the discount rate applied by both countries.

Complete Market for Contingent Claims on Uncertain Future Incomes

The home country, with an assured endowment of 100 at every date in every state has no need for insurance per se since it faces no endowment-income risk. However, it still desires to distribute consumption from the present to the future at any positive interest rate as before when it could invest only in riskless international bonds. Hence at date 1 it wants to spend more on insurance purchased on one state than it receives from insurance sold on another state. It now finds that insurance on state 2, with world endowment income of 300, is cheap relative to insurance on state 1, with world endowment income of 200, given that both states are equally probable by assumption. Hence it will want to spend more on insurance on state 2 than is receives from selling insurance on state 1, a contract in which the foreign country is very much interested. With $B_2(1)$ positive and $B_2(2)$ negative in the optimal solution, the home country sells insurance on state 1 and buys insurance on state 2 at date 1. At date 2 it then pays $B_2(1)$ to the foreign country if state 1 occurs while collecting $B_2(2)$ from that country in state 2.

With an international market for contingent claims that is complete, much larger utility gains are registered than under riskless bond financing only and they accrue disproportionately to the home country. When each country buys insurance on one state and sells insurance on another, the gains from these intertemporal trades, relative to the

actuarial norm, differ between them. Unlike the foreign country, the home country does not have any use for insurance except as a highly profitable business. Compared with the outcome under "riskless bonds only" in Table 1, its negative utility falls by 2 percent while it declines by only 1 percent in the foreign country. The reason for the disproportionate gain by the home country is that since its income prospects are stationary and certain, while the foreign country's prospects for date 2 are on balance more favorable but highly uncertain, this country will have to accept insurance prices that are actuarially unfair and biased against it to clear the market for contingent claims. The appendix provides all the derivations.

Specifically, discounted at 38.46 percent, the present value sum of domestic income endowments is 172.223 for the home country. This is 45.26 percent out of the corresponding expected world total of 380.558. However, with the values for p(s), $B_2(s)$, and r from the last column of Table 1, the home country gains (and the foreign country loses) a combined total of 6.5234 from the needed overpricing [$p(1) > 0.5$, $B_2(1)>0$] of the insurance it sells on state 1 $\{(p(1) - 0.50)B_2(1)/(1+r) = 0.8416\}$ and the underpricing [$p(2) < 0.5$, $B_2(2)<0$] of the insurance – by the actuarial standard of equal probability of the two states – that it buys on state 2 $\{(p(2) - 0.50)B_2(2)/(1+r) = 5.6818\}$. As a result, its share of the expected present value of world consumption rises by almost 4 percent from 45.26 percent to 46.97 percent, while the foreign country's share declines by over 3 percent from 54.74 percent to 53.03 percent.

Generalizing slightly, monetary union with countries of far less certain prospects clearly is most advantageous for the insurance business of the stable core countries if monetary union is the key to more complete financial markets in the union. Overall the

theoretical demonstration of this section drawing on the results summarized in Table 1 creates a strong presumption that more complete financial markets for contingencies are a much more important welfare issue for monetary unions than the institution of perfect capital mobility -- "equal interest rates"-- between them. This conclusion is compatible with the important findings of Melitz and Zumer (1999) that credit plays a smaller role relative to claims on property in risk-sharing between countries and that EMU will encourage more consumption smoothing through market channels than through government transfers such as those originally brought by Kenen (1969, see also 2000) into the case for monetary union.

II. Factors Raising Shock Correlations Through Monetary Union

Although the insurance business would be very difficult to sustain if all its clients were expected to suffer damages at the same time, such joint suffering through symmetry of shock exposure frequently is described as the glue that holds monetary union together. Indeed, the glue hardens and bonds more firmly after such union as the degree of symmetry grows endogenously according to recent findings such as those first provided by Frankel and Rose (2000) and Rose (2000). A few years ago these authors started a burgeoning literature, critically surveyed and extended by Mélitz (2001) and Rose (2002), demonstrating the predictable endogeneity of Optimal Currency Area (OCA) criteria. They showed that the deepening of regional economic integration that results from monetary union adds to the justification for the latter after it has gone into effect. It does so by increasing the symmetry of shock exposure among members thus helping to meet one of the OCA criteria (see Kenen, 1969).

Symmetry Effects of Industrial Structure Integration and Trade Expansion through MU

There is little doubt that industrial supply chains inside integrating regions strengthen demand and supply shock spillovers and hence the symmetry of shock exposure as Kenen foresaw. Fontagné and Freudenberg (1999) have succeeded in documenting this persuasively for the pre-1995 member states of the European Union (the EU12). Since ever more of the external commerce inside integrating regions is in intermediate goods moving in intra-industry, and frequently intra-firm, trade, demand impulses or supply disruptions originating anywhere in the monetary area are bound to be diffused throughout the region.

If such a union serves to increase the income correlations and the symmetry of shock exposure of its members, it helps them meet one of the traditional optimal currency area (OCA) criteria for such union. And indeed, monetary union, by strengthening intra-industry cross-border networks in integrating regions, appears to raise correlations of both demand- and supply-shock effects across member countries by its impact on the structure of industrial production and trade. Expanding trade between neighboring countries appears not only to increase the "diversity of [each] nation's product mix" (Kenen, 1969, p. 49) but also to fuse (Frankel and Rose, 1998), rather than to separate, their production processes and supply chains. Hence neither shifts in demand between goods or services nor sector-specific technology shocks – the two factors emphasized by Krugman (1993) – need be disequalizing between countries as they would be if countries had specialized in vertically integrated production of final goods.

The tighter and the more horizontally and vertically diversified and interlaced the integration of production that is furthered by monetary union, the greater the transmission

of national impulses to its other members. As a result, the effects of these impulses will be weakened by dispersion throughout the region. Supply shocks originating in any one country also are broadcast quickly, but, unlike with aggregate demand shocks, their national impact may not be diluted by spreading the consequences. For instance, a strike at an auto parts factory may disrupt production not only at that factory but throughout the entire supply chain for both the part and the finished good to which it is dedicated if no substitute supplier of the essential part is immediately available in the region.

In all these cases, economic integration that is intensified by monetary union makes cross-country correlations of measured output disturbances more positive even when the original source of the shock is country-specific. An exception could occur when supply shocks in one country, that could be due not just to job and tax actions and technological breakthroughs but to rulings under competition policy, patent law, and prudential regulations, penalize one member country's production and inward FDI while benefitting those of others. Only in that case might one country's loss be the other members' gain, but such redistributive outcomes tend to be resisted and eventually redressed in the political management of an economic union.

Symmetry Effects Arising from Irrevocably Fixed Exchange Rates Between MU Members

In addition, monetary union, simply by also being a currency union, precludes precipitous changes in real exchange rates between members. This increases the predictability of cost conditions and hence the credibility of long-term contracts and of continuing relationships. Confidence in the reliability of foreign suppliers from within the union qualifies them as preferred participants in regional industrial networks. In this way monetary union contributes to these networks becoming more closely knit.

As Buiter (2000) has pointed out, under a high degree of international financial integration, market-determined exchange rates are primarily a source of shocks and instability rather than shock absorbers. Large changes in real exchange rates between neighboring countries, at least one of which is highly dependent on trade with the other, have little to do with contributing to the maintenance of equilibrium trade relations between them. Instead their effects are asymmetric. Thus Domingo Cavallo (*New York Times*, December 2, 2001, A7, col. 1), reflecting on the lack of exchange-rate coordination in Mercosur prior to 2002, characterized "the model of a commercial association with countries that allow themselves the luxury of doing whatever they want with their currency" as "totally exhausted." In thus pointed to the need for some form of currency union among regionally integrating countries to insure them against disruptive changes in real exchange rates and competitiveness with each other. Mundell (2000, p. 164) even has asserted that "you cannot have a common market when you have fluctuating exchange rates in an area," thereby prescribing a common currency as life insurance for a common market to persist and deepen.

As for Mercosur, internal exchange-rate shocks from 1999 to 2001 gave rise to growing internal protectionism detailed in Fernández-Arias, Panizza, and Stein (2002). This helped demolish, rather than just divert, trade because the composition of regional trade with a neighbor is quite dedicated and specific (Bevilaqua, Catena, and Talvi, 2001). According to Belke and Gros (2001), intra-European exchange rate variability also has significant economic costs. Hence the conviction has been growing that deep and secure integration and independent pursuit of an active monetary policy by a multiplicity of countries ultimately are incompatible. Eliminating the possibility of

abrupt variations in the real exchange rate by fixing the nominal exchange rate between members of EMU irrevocably at 1:1 through the switch to the euro thus eliminates a source of idiosyncratic exchange rate disturbances. It also neutralizes individual national money demand shocks by fluid reallocation of funds throughout the euro area. To this extent, the business cycle fluctuations that remain will appear more symmetric.

Insurance Effects of Monetary and Financial Union on Residual Symmetry

There are additional insurance elements brought into play by monetary union as the deep financial integration that undergirds it encourages the development of a much more complete financial market. Mutual insurance among members reduces the country-specific income disturbances that remain so that the residual income disturbances appear *more* symmetric. [Stockman's (2001, p. 663) claim, that "the more asymmetric certain real shocks, the greater the benefits of common currency and Central Bank," also rests on an insurance rationale as shocks that are asymmetric insure the central bank against their reaching systemic proportions that would require a lender-of-last-resort response.] For instance, countries would appear more willing to finance large current account deficits for each other once they have joined in monetary union. Indeed, "country" might cease to be a significant characteristic in deciding on the loanworthiness of particular parties even if their business is exclusively domestic. Along with eliminating currency risk within its boundaries, monetary union eliminates all those aspects of differential country risk that are associated with abuse of monetary policy for a national government's fiscal ends. This frees equity and debt financing from being overhung by country risk and creates near-equality of access conditions to financial markets throughout the union.

Thus larger net, and much larger gross financial flows between member countries could arise from the sum of private parties' assessing private counterparties and their prospects now with less reference to their home country or country risk than before monetary union. Table 1 can help once again to provide numerical concreteness and model support. The current account surplus of the home country at date 1, in the last column of that table, actually turns out to be only slightly larger with complete contingent markets (9.09 – 3.03 = 6.06) than with riskless borrowing only (6.76/1.2713 = 5.32). However, gross capital flows between home and foreign country are much higher with insurance -- 12.12 at date 1 and 23.485 in expected value at date 2 -- than the gross-equals-net flow with noncontingent borrowing, 5.32 at date 1 and 6.76 at date 2.

Conversely, countries otherwise subject to the tightest external constraints because they face the highest level of idiosyncratic shocks in relation to their average income have the strongest demand for monetary union and select for it. Countries contemplating accession to a monetary union will be attracted by the enhanced insurance enabled by a monetary union if (a) they have been unable to engage in successful countercyclical stabilization policy, monetary or fiscal, and (b) gain access to comprehensive insurance services by acceding to a monetary union with financially highly advanced countries. Being exposed to strong relative-income shocks is an insurance argument *for* joining a monetary union and may imply a certain selection bias. Conversely, high degrees of pre-existing economic integration and output correlation make monetary union less valuable for consumption insurance through financial markets.

Possible selection bias cautions against cross-sectionally comparing the stability of "ins" with "outs." As Persson (2001), Melitz (2001), and Tenreyro (2001) have noted

in a related context, the impact of a monetary union can be grossly mismeasured in cross-sectional analyses if countries that belong to that or other forms of currency union are systematically different from those that do not. Comparing what happened to the countries that eventually joined in monetary union over time would be more valid. It could show that the insurance features of monetary union gradually reduce the variance of any given member country's remaining idiosyncratic consumption disturbances.

III. The Single Monetary Policy Lowers the Symmetry of Disturbances that Remain

So far this study has sketched out three effects generally making for greater symmetry of the measured income disturbances among the members of a monetary union. But there is one contrary tendency to be noted that arises from the regional stabilization policy enabled by monetary union. That tendency arises from the transition from a fragmented or uncooperative, to a unified and cooperatively managed, monetary policy that succeeds to some extent in offsetting the balance of the various disturbances affecting the region. Curiously this change in monetary policy brought about by multilateral monetary union hitherto has been left out of account when considering the effect of monetary union on the residual income correlations of its members.

The discussion of monetary policy effects of monetary union on the symmetry of the remaining shock exposure is organized as follows: It proceeds from the most likely outcome of little if any income (as opposed to price-level) stabilization success to a polar, but clarifying, case exaggerating the stabilization benefits of the single monetary policy. The point of this procedure, indeed the entire section, is to show that the most successful monetary union conceivable could have *negative* effects on the expected symmetry of

any reduced-form disturbances that remain among members. Hence no automatic inferences can be drawn about an OCA from simply determining from the data what happened to the symmetry of business cycles among members from before to after monetary union.

The relation between monetary policy and economic performance needs to be discussed before deciding what a single monetary policy might possibly be able to accomplish under the charter of the European Central Bank (ECB). Monetary policy has been portrayed as prone to fiscal capture, inflation bias, and partisan manipulation as well as to time inconsistency, volatility, intransparency, and incompetence, not only in developing countries. Rational learning by all sides has not banished these concerns either from the literature (Lohmann, 1998) or from the real world (Stiglitz, 2000).

From this it might appear that the best that can be expected from monetary policy for stability and growth is not to add to business cycle disturbances by deviating from the steadfast pursuit of its low-inflation target (Taylor, 2001). The ECB (2001, pp. 38-39), for example, has defined its goal of price stability as year-on-year price increases for the euro area averaging below 2 percent but sufficiently above 0 to avoid any negative rates of "true" inflation after adjusting for any putative upward bias in measuring inflation with the Harmonized Index of Consumer Prices (HICP). Thus there can be room for experimenting with an actively countercyclical monetary policy of as yet unproven long-term success only if achievement of the inflation target appears secure, as it has been in the United States during the past few years. Smaller and more open countries do not tend to have this luxury. In developing countries, in particular, monetary policy is tight and intermediation impaired when they are in crisis and easy in the opposite case, making it

in general procyclical (Hausmann, 2000). This ineluctable coupling has been demonstrated most recently during the 1991-2001 currency-board chapter of Argentina's monetary and exchange-rate history.

In well-governed countries with reliably low inflation, by contrast, one would expect to find real income deviations from trend, or negatively signed output gaps, and real interest rates correlate positively, as under the Taylor rule, so that when business is down, so are real interest rates most of the time to varying degrees. In Europe, those countries that accepted "German dominance" in the decades leading up to EMU would then find that their exposure to the automatic interest-rate effects that are helpful for Germany would be less helpful, or even destabilizing for them, depending on the correlation of their individual business cycles with Germany's. The ECB may have no more discretion or competence actively to pursue countercyclical objectives than the Bundesbank before it. Yet the fact that its monetary policy proceeds from and for the euro area as a whole would at least let its automatic stabilizers work constructively and consistently not (just) for Germany, which at times has been an outlier. Instead it would become constructive for all countries that cluster around the cycle-average condition of the entire euro area at any one time. Hence the transition from "German dominance" to "collective responsibility" in the euro area, that may already have been well under way by the late 1980s (Laopodis, 2001), should involve a reduction in the severity of the common disturbances that remain for the area as a whole.

To clarify the last point, the term, German dominance, used functionally simply identifies a factual implication of the DM having been the de facto anchor currency of the European Monetary System (EMS). Politically the term refers to something quite

separate, namely to how this functional dominance was used. Political dominance is related inversely to the weight given to the stabilization requirements of other member countries in the objective function of the Bundesbank. EMU could have led to a diminution of that weight on German "altruism." Nevertheless, by eliminating functional German dominance, EMU inevitably reduced the weight of German concerns in the decision process of the ECB compared with those of the Bundesbank before it.

Another clarification is needed. Focusing on "symmetry," whose normal measure is the coefficient of correlation, can easily detract from the fact that it is the size of the variances and covariances of the logarithm of output or consumption, and not their correlation per se, that ultimately matters for welfare. Demertzis, Hughes Hallett and Rummel (2000, p. 670) already have made a similar point. Hence if the transfer of effective monetary policy authority for the euro area from the Bundesbank to the ECB reduces the variance of each country's reduced-form disturbances with the possible exception of Germany's, the covariance (cov) between their disturbances would fall not only on account of what happens to the coefficient of correlation (R) given that $cov_{xy} = R_{xy}\sigma_x\sigma_y$. Furthermore, the reduction in the variances or standard deviations (σ) would be critically important in its own right.

The Limit Effect of the Single Monetary Policy on the Symmetry of Income Disturbances

It is insightful to carry the common-shock elimination to extremes by assuming that, except for Germany, the national monetary policy of countries that later joined EMU could do little or nothing to stabilize their national economies, while monetary union now eliminate any of the disturbances they have in common completely. Nothing but idiosyncratic disturbances then would be left. This would turn the endogenous

justification requirement, that monetary unions produce *increased* measured business cycle correlations, on its head.

Assume therefore that future members of a monetary union -- perhaps for some of the reasons enumerated by DeGrauwe (2000, p. 83) or because floating jeopardizes the credibility of inflation targets (Calvo and Reinhart, 2000) -- were not, in fact, able or willing to pursue an active countercyclical monetary policy of their own. In Europe they might also remember the failure of French President Mitterand's "go it alone" experiment of the early 1980s (see Szász, 1999, pp. 66-69 and Gros and Thygesen, 1998, pp. 80-81 for vivid accounts). There had in fact been considerable "fear of realignment" and a strong preference for fixed rates among the members of the Exchange-Rate-Mechanism (ERM) because they had come to view devaluation against the ECU as a politically costly admission of mismanagement. They therefore opted for ever harder parities that implied an ever more complete sacrifice of a functionally independent monetary policy for all but the anchor country in the group.

Lacking an economically stabilizing national policy, there is both (i) a general net business cycle (or region-wide pattern of disturbances) affecting all countries in the region proportionately to their income and (ii) an idiosyncratic business cycle (or country-specific disturbance) for each country. By definition, the net contribution of the idiosyncratic parts of the business cycle to the cycle for the region as a whole is zero. Indeed, as in Goodfriend (1992) and as illustrated below, the common part is identified by this condition. Then an optimal and completely successful single monetary stabilization policy for the entire region tends to eliminate the region-wide co-movement, thereby leaving only members' idiosyncratic cycle components.

For example, if two equal-sized countries are expected to grow by 1 and 3 percentage points less than desired in the coming year, completely offsetting the inferred common component of –2 percentage points through successful monetary policy would leave deviations of +1 percentage point for the first and –1 percentage point for the second of the two countries, if the effectiveness of monetary policy is perfectly symmetric. If monetary policy effects were completely ineffective in one of the two countries, say the first, perhaps on account of differences in wage and price contracting as in the "archipelago" economy analyzed by Blinder and Mankiw (1984), the optimal monetary policy should aim to offset the 3 percent growth shortfall in the second country completely but not try to do more. This would leave an ex post "common" disturbance of –0.5 percent on average for the two equally weighted countries accompanied by idiosyncratic deviations of -0.5 percent for country 1 and 0.5 percent for country 2.

Of course responsiveness to the common monetary policy may vary appreciably on account of differences in indexation, nominal contract duration and rigidity, and in financing practices that cause the monetary transmission mechanism to differ in each country (Mihov, 2001). Monetary management gets yet more complicated if policy effects differ by both size and speed of transmission among members. However, with full knowledge of the entire process, the optimal monetary policy response still could be such as to reduce co-movement of members' economic variables substantially. The net results would be that the optimal single monetary policy reduces the variance of countries' output deviations to at least some extent and that the measured degree of correlation of the national output residuals falls. This is the opposite of what the endogenous-justification literature looks for by focusing only on production-structure and

trade-network integration effects of monetary union. A rigorous demonstration of this best case for monetary union and its subversion of endogenous OCA criteria follows.

Symmetry Eliminated Through Perfect Monetary Stabilization: A Demonstration

Let the income of country i=1,N with average economic weight of w_i inside the monetary union be composed of its normal share in the income of that entire union, w_iY_t, and an idiosyncratic iid disturbance, ε_{it}. Y_t, being detrended, in turn fluctuates around a constant expected level, $E(Y_t)$, again with normally distributed random fluctuations, η_t, where the form of the distribution is indicated by operator $\check{N}$.

$$y^i_t = w_iY_t + \varepsilon_{i,t}, \qquad \varepsilon_i \sim \check{N}(0,\sigma_{\varepsilon i}^2), \ \Sigma_{i=1,n}(\varepsilon_i) = 0 \qquad (1)$$

$$Y_t = E(Y_t) + \eta_t, \qquad \eta \sim \check{N}(0,\sigma_\eta^2), \ Y_t = \Sigma_{i=1,n}(y_i) \qquad (2)$$

The single-equation formulations above make clear that both ε_{it} and η_t are not structural disturbances but residual disturbances left after the structural disturbances have been processed through the economic and policy system. These so-called reduced-form disturbances therefore are highly regime-dependent. The discussion here focuses on how the symmetry pattern of the residual disturbances seen in the output data may change when various financial-sector effects of monetary union are considered. Substituting from equation (2) for Y_t in equation (1) shows that the covariance of incomes between two of the N member countries, i and j, is:

$$Covar(y^i_t, y^j_t) = w_iw_j\sigma_\eta^2, \qquad i \neq j. \qquad (3)$$

Now if the union's single monetary policy is completely successful in counteracting the common disturbance to aggregate demand so that $\sigma_\eta^2 \rightarrow 0$, correlation and covariance of income movements between i and j go to zero. In the simple special case where the N member countries have the same economic size and idiosyncratic error variances, so that $w_i = 1/N$ and $\sigma_{\varepsilon i}^2 = \sigma_\varepsilon^2$ for all i, the correlation coefficient between the incomes of any two countries i and j would fall from $\rho_{ij} = \sigma_\eta^2/(\sigma_\eta^2 + n^2\sigma_\varepsilon^2)$ to zero. In other words, the measured degree of shock asymmetry is increased as only the zero-sum relative income shocks between member countries, to borrow Goodfriend's (1992) concepts and terminology, and not the region-wide absolute income shocks remain.

This conclusion can be reinforced by considering the transition from presumed functional and political German dominance to the ECB regime. A selfish German monetary policy that is successful in stabilizing German (g) income will provide a disturbance-offsetting impulse to aggregate demand, u_t, such that $w_g\eta_t + \varepsilon_{gt} + u_t = 0$, or, with the equal-size assumption ($w_i = 1/N$) retained for simplicity of exposition for all (clusters of) countries in the euro area,

$$- u_t = \eta_t/N + \varepsilon_{gt} \qquad (4)$$

Hence the shock common to all other countries of the euro area is

$$u_t + \eta_t/N = - \varepsilon_{gt} \qquad (5)$$

and the total shock affecting them is $\varepsilon_{it} - \varepsilon_{gt}$, $i \neq g$. As a result, the correlation coefficient of the disturbances between any two member countries not including Germany equals:

$$\rho_{ij} = \sigma_{\varepsilon}^2/2\sigma_{\varepsilon}^2 = 0.5, \quad i,j \neq g \qquad (6)$$

with the equal-size and equal idiosyncratic proportional shock variances ($\sigma_{\varepsilon i}^2 = \sigma_{\varepsilon}^2$ ▼i) assumptions. The upshot is that the replacement of German political dominance, here assumed, by joint management in the best interest of the area as a whole will eliminate the positive correlation of residual disturbances of one half for the other members of the euro area that were all being affected by the same policy that was optimal only for Germany. Such a beneficial effect for the area as a whole would be associated with a *decline* in the correlation of the income disturbances that remain.

III. Conclusions

This study considered monetary union as a way to manage vulnerability and to equip countries and markets for achieving greater income and price security by focusing on monetary-policy, insurance, and other financial sector effects. These effects add to the benefits to be expected from monetary union. They also change the signs by which benefits are to be recognized in relation to the canon of OCA criteria first established in the1960s by Mundell (1961), McKinnon (1963) and Kenen (1969). Even contemporary benefit-cost analyses of monetary union (e.g., DeGrauwe, 2000, and Willett, 2002) do not take account of the financial deepening effects of an institutionally developed and firmly anchored monetary union in this regard. Yet these effects can give results which should

be interpreted in an manner quite opposite to that suggested by traditional OCA criteria of fitness for monetary union which, of course, is much more than a mere currency union.

Consider just this example: If U.S. monetary dominance were to express itself just as portrayed for German dominance prior to the formation of EMU, unilateral dollarization of much of the Western Hemisphere would increase the correlation of the income disturbances generated for all other countries in the region on account to their common exposure to the monetary policy of and for the United States. Greater endogenous satisfaction of a traditional OCA criterion would be inferred from the greater correlation of residual income disturbances of all other countries in the Western Hemisphere. Multilateral monetary union on the European model, on the other hand, would reduce both the size of the common disturbances and the correlation across members of what disturbances remain precisely because it would do better for the whole area. This conclusion does not require the single monetary policy of a multilateral monetary union to be completely effective but only that it not be systematically less effective in stabilizing its area of application as U.S. monetary policy is in stabilizing the economy of the United States.

Viewed in this new way, the ultimate stabilization success of monetary union through its single monetary policy and integrated financial services is a reduction first of all in the co-movement resulting from union-wide disturbances through the monetary policy channel. Secondly there is a reduction in member-country-specific idiosyncratic income variability through the insurance channel that is enlarged by monetary and financial union. If the monetary channel reducing σ_η^2/N^2 is proportionately stronger than the insurance channel reducing σ_ε^2 for the representative member country, the end result

is a *lesser* degree of symmetry or "correlation" inside a functioning monetary union than would be observed for the same group of countries in the absence of such a union. Thus it is not valid to judge directly from statistics on the ex post pattern of income-disturbance correlations whether monetary union has added to its own justification ex post by raising the observed correlations and to expect that endogenous justification will be forthcoming *by this criterion* wherever monetary union is contemplated.

Empirical evidence (e.g., IMF, 2001, p. 66) suggests that in the euro area the symmetry-enhancing effects arising from a combination of industrial-structure integration, trade expansion and irrevocable exchange-rate stabilization among members may have won out, at least narrowly, during the stages leading up to EMU. However, they need not continue to win out once the monetary policy of the ECB has become more credible and hence more usable for income stabilization. Furthermore, what has happened after joining in monetary union to the residual income correlations and covariances among members can not be attributed exclusively to forces arising outside the financial sector in any event: Monetary union is bound to have a strong effect on the objectives of monetary policy and the capabilities of finance and insurance in its region.

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Table 1. Utility Gains from International Credit and Insurance Compared

Internat. Financial Market:	**Closed, Autarky**	**Riskless Bonds Only**	**Spanned by Contingent Claims**
Contingent Int. Fin. Claims:	**None**	**None**	**Complete Market**
Home Country			
(1) E_1U (expected utility[1])	-200	-199.29	-195.16
(2) C_1 (date 1 consumpt'n)	100	94.68	93.94
(3) $C_2(1)$ (C date 2, state 1)	100	106.76	93.94
(4) $C_2(2)$ (C date 2, state 2)	100	106.76	140.91
(5) r (real interest rate)	0%	27.13%	38.46%
Foreign Country (*)			
(6) E_1*U	-175	-174.45	-172.86
(7) C^*_1	100	105.32	106.06
(8) C_2*(1)	100	93.24	106.06
(9) C_2*(2)	200	193.24	159.09
(10) r* (=r except in autarky)	60%	27.13%	38.46%
Financial Asset Trade			
(11) B_2 (riskless bond)[2]	-	-6.76	-
(12) $B_2(1)$ (pay B_2 in state 1)[3]	-	-	6.06
(13) p(1) (state 1 price)[4]	-	-	0.6923
(14) $B_2(2)$ (pay B_2 in state 2)[3]	-	-	-40.91
(15) p(2) (state 2 price)[4]	-	-	0.3077
Memorandum[5]			
(16) $p(1)B_2(1)/(1+r)$	-	-	3.03
(17) $p(2)B_2(2)/(1+r)$	-	-	-9.09

Notation: Subscripts indicate dates 1 or 2, while alternative states (s) at date 2 are identified by suffix (1) or (2). All quantity variables (upper case), except for U, are in percent of Y_1, with $Y_1 = Y_1^* = Y_2(1) = Y_2^*(1) = Y_2(2) = 100$, and $Y_2^*(2) = 200$.

Source: Original problem solved in the appendix with the use of relations derived in Obstfeld and Rogoff (1996, Chapter 5) for parameter values and endowment income levels also specified in the appendix.

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[1] The expected utility function with constant relative risk aversion is of the form $E_1U = 10{,}000(1-\rho)^{-1}\,[C_1^{1-\rho} + E_1(C_2^{1-\rho})]$, where $E_1(C_2^{1-\rho}) = \Sigma_{s=1,2}\,\pi(s)C_2(s)^{1-\rho} = 0.5[C_2(1)^{1-\rho} + C_2(2)^{1-\rho}]$, and the CRRA coefficient, ρ, is taken to be 2.

[2] Discount security issued for $B_2/(1+r)$ at date 1 by home (foreign) country, if B is positive (negative).

[3] Pay to foreign {home}country if $B_2(s)$ is positive {negative}, meaning that the home {foreign} country had sold {bought} insurance on that state (home-country capital import {export}) at date 1and the respective state occurs.

[4] The date 1 price of a pay-off of one unit, conditional upon the occurrence of state s=1,2 at date 2, is $p(s)/(1+r)$.

[5] The date 1 price (positive if sold by home to foreign country, negative if bought by home from foreign country) of insurance contract paying the amount $B_2(s)$ at date 2 if state s=1,2 occurs.

Appendix: Income Insurance Aspects of Monetary Union

Glossary

ß Gross time-preference discount factor

B_2 Time t=2 maturity value of riskless bond issued as discount bond, $B_2/(1+r)$, at t=1, with B_2 signed positive if representing a capital import by home country i

$B_2(s)$ Insurance sold at a fractional price of $p(s)/(1+r)$ at t=1 per unit payoff in state s=1,2 at t=2, with the amount of the contingent payoff or settlement value, $B_2(s)$, signed positive if the insurance contract is sold by country i to foreign country j

C_1 Consumption in period t=1; numeric subscripts refer to time throughout

$C_2(s)$ Consumption in period t=2 in state s=1,2

$\pi(s)$ Probability of state s=1,2 occurring at time t=2 so that $\pi(1) + \pi(2) = 1$

p(s) Implied t=2 price per unit of insurance on state s=1,2 sold at t=1, see $B_2(s)$

ρ Constant relative risk aversion (CRRA) coefficient

r Riskless real interest rate or net interest return compounded from time t=1 to t=2

Y Endowment income for each of the different periods and states

u Utility of consumption in the given period and state as in $u(C_1)$ and $u(C_2(s))$

U Expected utility function, with utility that is additive over the two periods

w Subscript on variables when they refer to the sum of i and j representing "world"

W Wealth defined as the sum of current (Y_1) and contingent future income valued at its current insurance sales price, $p(s)Y_2(s)/(1+r)$.

Exogenous variable levels and parameter values

$\beta = 1$; $\pi(1) = \pi(2) = 0.5$; $\rho = 2$; $Y_{1i} = 100$, $Y_{1j} = 100$, $Y_{1w} = 200$; $Y_{2i}(1) = 100$, $Y_{2j}(1) = 100$, $Y_{2w} = 200$; $Y_{2i}(2) = 100$, $Y_{2j}(2) = 200$, $Y_{1w} = 300$.

Representative-Agent Model for a Closed Country and Two Open Countries

I. Expected Utility Function

(1) $U = u(C_1) + \pi(1)\beta u(C_2(1)) + \pi(2)\beta u(C_2(2))$

Where u has the specific (s) CRRA form :

(1s) $u = C^{1-\rho}/(1-\rho)$

II. Budget Constraints for Individual Countries

II.A Case a: Riskless International Bond with Maturity Value B_2 Only

(2a) $Y_1 = C_1 - B_2/(1+r)$

(3a) $C_2(s) = Y_2(s) - B_2, \ s=1,2$

II.B Case b: Complete Markets for Contingent Claims on Uncertain t=2 Income

(2b) $Y_1 = C_1 - p(1)B_2(1)/(1+r) - p(2)B_2(2)/(1+r)$

(3b) $C_2(s) = Y_2(s) - B_2(s), \ s=1,2$

III. Expected Utility Function Incorporating the Resp. Budget Constraints

(1a) $U = u[Y_1 + B_2/(1+r)] + \pi(1)\beta u[Y_2(1) - B_2] + \pi(2)\beta u[Y_2(2) - B_2]$

(1b) $U = u[Y_1 + p(1)B_2(1)/(1+r) + p(2)B_2(2)/(1+r)] +$

$\pi(1)\beta u[Y_2(1) - B_2(1)] + \pi(2)\beta u[Y_2(2) - B_2(2)]$

IV. FOCs w.r.t. B_2 and Solutions Under Autarky and Bond Financing

(4) $u'(C_1)/(1+r) = \beta[\pi(1)u'(C_2(1)) + \pi(2)u'(C_2(2))],$

With u of form (1s), $\beta = 1$, $\pi(1) = \pi(2) = 0.5$, and $\rho = 2$, the specific numerical form of the first-order condition (4), for each of the two countries is :

(4s) $C_{1k}^{-2}/(1+r_k) = 0.5[C_{2k}(1)^{-2} + C_{2k}(2)^{-2}], \ k = i,j,$ or, in case a:

(4as$_i$) $[Y_{1i} + B_2/(1+r_i)]^{-2}/(1+r_i) = 0.5[(Y_{2i}(1) - B_2)^{-2} + (Y_{2i}(2) - B_2)^{-2}]$

(4as$_j$) $[Y_{1j} - B_2/(1+r_j)]^{-2}/(1+r_j) = 0.5[(Y_{2j}(1) + B_2)^{-2} + (Y_{2j}(2) + B_2)^{-2}]$

Specific Solution under Autarky ($B_2 = 0$)

In autarky $C_{1k} = Y_{1k}$ and $C_{2k}(s) = Y_{2k}(s)$ where real endowment incomes are pregiven and nonstorable in each of the two countries, i and j. Hence substituting the matching values of Y for C in (4s) solves for the real interest rate r_k in the first column of Table 1.

Specific Solution under Riskless Bond Financing Only ($B_{2i} = -B_{2j}$, $r_i = r_j = r$)

The specific first-order conditions for the two countries ($4as_i$) and ($4as_j$) are solved for the two unkowns in those equations, r and B_2. As shown in the second column of Table 2, $B_2 = -6.76$ and r = 27.13% compounded over the length of the multiyear periods t = 1,2. Hence the home country (i) lends $B_2/(1+r) = 5.32$ at t=1 to the foreign country (j) at an interest rate that lies between the autarky rates of $r_i = 0\%$ and $r_j = 60\%$ after the integration of the capital market between the two countries.

V. FOCs with Complete Markets for Contingent Claims

Differentiating equation (1b) w.r.t. $B_2(1)$ and $B_2(2)$ for each of the two countries and solving the resulting four first-order conditions for the respective value of $C_{2k}(s)$ yields :

(4b) $\quad C_{2k}(s) = [\pi(s)\beta(1+r)/p(s)]^{1/\rho}C_{1k}, \quad s = 1,2; \ k = i,j$

The nonstorability constraint implies that world income and output, $Y_{1w} = Y_{1i} + Y_{1j}$ and $Y_{2w}(s) = Y_{2i}(s) + Y_{2j}(s)$, must be equal to the corresponding world consumption, C_{1w} and $C_{2w}(s)$, at each date t = 1,2 and state s=1,2. Hence adding the two equations obtained from (4b) for i and j, given s, yields:

(5b) $Y_{2w}(s) = [\pi(s)\beta(1+r)/p(s)]^{1/\rho}Y_{1w}$, $s = 1,2$

Dividing the two equations obtained from (4b) for s = 1,2, given k, yields:

(6b) $C_{2k}(1)/C_{2k}(2) = \{[p(2)/p(1)][\pi(1)/\pi(2)]\}^{1/\rho}$, $k = i,j$

Equation (6b) holds equally for country i and j, so that the ratio of consumption in t=2 states 1 and 2 is the same in each. Hence, for global consistency, that common consumption ratio must also equal the ratio of world incomes in the two states. Hence the logical implication of the pair of equations (6b), and the direct mathematical implication of dividing the two equations obtained from (5b) for s=1,2, is:

(7b) $Y_{2w}(1)/Y_{2w}(2) = \{[p(2)/p(1)][\pi(1)/\pi(2)]\}^{1/\rho}$

VI. Solutions for Countries i and j with Complete Insurance Markets

Equation (7b) shows that market-clearing insurance prices would be actuarially fair, so that $p(2)/p(1) = \pi(2)/\pi(1)$, only if the ratio of world incomes in the two states were unity. Furthermore, the ratio of insurance prices on the two states, p(2)/p(1), also determines their individual levels, p(1) and p(2), since the following arbitrage condition holds in efficient markets:

(8b) $p(1)/(1+r) + p(2)/(1+r) = 1/(1+r)$

The reason is that buying a unit of insurance on every state at price p(s)/(1+r) this period, in t=1, must yield with certainty (assuming no uncertainty about insurers honoring claims against them) a unit payoff next period, in t=2, whose present value is 1/(1+r). Now with $\pi(1) = \pi(2) = 0.5$ and $\rho = 2$ and with $Y_{2w}(1)/Y_{2w}(2) = 200/300$, as before, equation (7b) yields $p(2)/p(1) = (2/3)^2 = 2.25^{-1}$. Hence $p(1) = 1/[1 + p(2)/p(1)] = 0.6923$ and $p(2) = 0.3077$

using equation (8b). We can now select either s=1 or s=2 to solve for r from equation (5b). This in turn allows the two possible consumption levels at t=2 to be determined for each of the two countries once the consumption level at t=1, C_{1k}, has been obtained for each of them. This is the final task laid out separately below. Once it has been solved, substituting the consumption levels $C_{2i}(s)$ for $C_2(s)$ in constraint (3b) yields $B_2(s)$, s = 1,2 with the desired sign for the home country.

Finding C_{1k} from the Wealth (W) Equation for Country k

As explained in the glossary at the beginning of this appendix, wealth is defined as the present value of current and state-contingent future income valued at the current market prices for a unit of insurance. Having already found r and p(s), it is determined for given values of Y from the equation:

(9b) $W_k = Y_{1k} + p(1)Y_{2k}(1)/(1+r) + p(2)Y_{2k}(2)/(1+r),\ k = i,j$

Substituting for the different values of Y using equations (2b) and (3b) yields:

(10b) $W_k = C_{1k} + p(1)C_{2k}(1)/(1+r) + p(2)C_{2k}(2)/(1+r),\ k = i,j$

Using equation (4b) to substitute further for $C_{2k}(1)$ and $C_{2k}(2)$ yields:

(11b) $C_{1k} = \{1 + [p(1)/(1+r)][\pi(1)\beta(1+r)/p(1)]^{1/\rho} +$

$$[p(2)/(1+r)][\pi(2)\beta(1+r)/p(2)]^{1/\rho}\}^{-1} W_k,\ k = i,j$$

The last column of Table 1 shows the results.

Acknowledgment: Extracted from Chapter 5 in Obstfeld and Rogoff (1996) to fit the case presented. Their notation has been kept except that B_2 and $B_2(s)$ are signed positive if representing a t=1 capital import (from international borrowing or sale of insurance) by the home country i.