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Optimum currency area theory: A selective review

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Contents

Julius Horvath*

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Abstract

The first part of this paper is a review of significant papers in the vast literature on optimum currency area (OCA) theory. The author focuses on the main classical contributions, then considers modern treatment of OCA theory. The second part considers empirical literature on the types of geographical areas that might constitute optimum currency areas, particularly with respect to asymmetry and symmetry of shocks.

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Julius Horvath

Optimum currency area theory: A selective review

Tiivistelmä

Tutkimuksen ensimmäisessä osassa käydään läpi sitä laajaa kirjallisuutta, joka käsittelee optimaalisen valuuttakurssialueen teoriaa. Tutkimuksessa kuvataan sekä alueen klassisia kirjoituksia että uudempia näkökulmia aiheeseen. Toisessa osassa tarkastellaan optimaalista valuuttakurssialuetta käsitteleviä empiirisiä tutkimuksia. Pääpaino on sokkien symmetrisyyttä koskevissa tutkimuksissa.

Asiasanat: optimaalinen valuuttakurssialue, epäsymmetrinen sokki

1   Introduction

Optimal currency area (OCA) theory deals with complicated, inter-mingled issues at the core of international macroeconomics. OCA theory's main applications are found, to my best knowledge, in three areas.

First, OCA theory has reshaped the discussion on selection of an exchange rate regime for a given country. Although the criteria developed under OCA theory are not easily put into practice, the substantial literature on selecting exchange rate regimes well documents the rise to prominence of OCA theory in the analysis used in selection of an exchange rate regime. Second, OCA theory provides considerable insight into the role of exchange rate adjustment under balance of payment disequilibria. The extensive empirical literature on measuring the symmetry and asymmetry of shocks to countries and regions well documents this impact. Third, OCA theory has contributed to the theory of monetary integration and has been fundamental in the design of Europe's Economic and Monetary Union (EMU). It also provides a standard point of departure in discussions of dollarization and creation of new monetary unions.[1]

Broadly speaking, optimum currency area theory deals with relationships among countries, regions, and currencies. The world is not a unity in a political sense; it is divided into almost two hundred independent countries, most of which are further divided into distinct regions. Currency considerations may take a fairly low priority at the time a new state is formed. For example, the dozens of new countries that emerged after the collapse of colonial empires, as well as those created after the collapse of the Soviet Empire, all belong to currency areas. Yet, despite this foreseeable economic consequence of independence, there is surprisingly little discussion of optimal currency area issues preceding the disintegration of former colonial or socialist countries.[2]

On the other hand, optimum currency area criteria have been (and to some extent still are) at the core of the discussion on Western European integration. Questions, for example, as to the degree Western Europe was an optimal currency area were at the forefront of the integration debate.

For a country like the United States with relatively permanent political borders, the discussion of optimal currency areas might appear moot. In fact, several studies consider whether the US constitutes an optimum currency area. Ghosh and Wolf (1994), for example, conclude the US is not an optimum currency area and tentatively suggest separate currencies for different parts of the United States.

One needs to limit the currency area before considering its optimality. A currency area is an area in which exchange rates are fixed, or which has a common currency. Under the modern concept of "one country, one currency," practically any country can be considered a currency area. A currency area thus corresponds to optimum currency area to the extent as the political considerations for creation of the country correspond to the economic considerations of currency optimality. This brings up the Mundell's great question as to

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[1] This view concurs with Bofinger (1994), who, despite his criticism of the theory, writes that OCA theory "seems to be almost generally accepted as the main touchstone of the advantages of EMU and as the theoretical basis for all empirical tests in this area."

[2] Willett (2001, p. 3) writes, "It is true that common currency areas are sometimes split apart as nations split apart, as has occurred recently with Czechoslovakia and Yugoslavia, but there is little reason to think that OCA considerations played any role in their desolution." As few studies look at the disintegration effects from the currency perspective. See Fidrmuc, Horvath, and Fidrmuc (1999) on the breakup of Czechoslovakia.

what is the appropriate domain of a currency area: How large should the territory using a single currency be?

The Mundellian question is traditionally framed in two ways. First, is a country, say x, an optimum currency area? Does x possess such characteristics that allow it to use its currency optimally throughout the country or would separate parts (regions) of x be better off with their own regional currencies? Second, there is the supranational perspective. Would x be better off as part of a larger currency area and without a separate currency?[3]

One can also approach the Mundellian problem from another angle. It is commonly accepted that monetary exchange is more advantageous than barter, so if it is advantageous to use monetary exchange (currency) in a small territory, why not to enlarge this territory to gain the advantages of money over barter in a larger space. How far is appropriate in the territorial enlargement of a currency?

The ideal search methodology would consider the world economy and indicate how to divide it into optimum currency areas. Grubel (1970, p. 319) notes that this would require determining the levels of world welfare under different currency arrangements so that the optimum currency area would be an area where this welfare is maximized. Mundell (1961) and the subsequent literature dealt with more tractable problems. The interest moved toward the search for criteria that would "define the optimum currency area, within which the exchange rates should be pegged immutably, but whose rates should fluctuate, or at least be varied, vis-à-vis the outside world."[4]

Usage of the terms "optimal" and "optimum" in the context of OCA theory varies. McKinnon (1963) writes that optimum applies to a currency area where three objectives are sustained: full employment, a stable price level, and a balanced external account. The first two objectives pertain to internal equilibria, the last to external equilibrium.[5] Kenen (1969) offers a similar definition: "If the prevailing exchange-rate regime, fixed or flexible, can maintain external balance without causing unemployment (or, on the other side, demand-induced wage inflation), that regime is optimal."[6] Grubel (1970) explains that "optimal" is used in to describe "the union between a number of regions or countries, which improves welfare of the population resident within these territories above the level enjoyed when each was a separate currency area."[7] Allen and Kenen (1980) write that "optimal" in OCA theory indicates a minimization of the costs of balance-of-payments adjustment.[8] Melitz (1995) argues that it makes sense to speak about optimality when the question is "what the optimum enlargement of the currency area would be from the standpoint of the individual country or region in question." However, he argues that if we take the size of a currency area as given we already cannot speak about optimality, but only about welfare improving.[9] Ricci asserts, "The nature of the issue makes it impossible to find a rule of thumb for the identification of an optimum currency area (defined as a currency are in which all members expect positive net benefits from their participation)."[10]

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[3] Melitz (1995, p. 496). Demopoulos and Yannacopoulos (1999, p. 290) argue these two approaches are not in conflict and each serves its own purpose.

[4] Kenen (1969, p. 41).

[5] McKinnon (1963, p. 717).

[6] Kenen (1969, p. 41). Kenen (1969) notes that optimality should be judged from both the global viewpoint and the viewpoint of the individual country.

[7] Grubel (1970, p. 319). Grubel (1970) also considers the welfare of residents in a particular country as a function of the level and stability of the real income and the level of national economic independence.

[8] Allen and Kenen (1980, pp. 381-396).

[9] Melitz, (1995, p. 496).

[10] Ricci (1997, p. 33).

Rather than attempt to classify these definitions, I defer to the early observation of Mundell (1961, p. 717): "The idea of optimality … is complex and difficult to quantify precisely."

Such non-rigorous theorizing partly explains the disparate views about OCA theory. Ingram observed, "I confess that I do not think the question of an optimum currency area is any longer a very interesting one."[11] Johnson dismisses the theory as "something of a dead-end problem."[12] Niehans claims the theory attempts to solve a "prohibitively difficult problem," noting that "the problem is logically similar to the problem of how a country should be divided into voting districts in such a way that the parliamentary seats for a given party are maximized. In its full generality, it is obviously a prohibitively difficult problem, so it is hardly surprising that twenty years of academic efforts have brought little progress toward its solution. What we have is a variety of suggestions about certain elements that may play a role in the solution."[13] Vaubel argues, "There is no operational scientific method of measuring and comparing the costs and benefits of currency unification for a given group of countries. For the same reasons, as we shall see, there is no operational scientific method of defining optimum currency areas."[14] Willett (1994) states that "the theory of optimum currency areas points to many relevant considerations, but not with a level of operational precision that would lead informed economists to always reach the same conclusions."[15] Bofinger (1994, p. 15) writes, "Taking into consideration the obvious flaws of this [OCA] theory, it is surprising that it could experience such wide-spread revival in the early 1990s." Buiter (1995, p. 30) reflects that "the optimal currency area literature is woefully inadequate and confused on the issue what policy institutional or other behavioral changes are necessary in order to compensate for the loss of the nominal exchange rate instrument." Goodhart (1996, p. 1984) simply states, "I do not find this theory [optimum currency area] particularly helpful." Finally, we have the distinctly different view of Krugman (1994): "I would suggest that the issue of optimum currency areas, or, more broadly, that of choosing an exchange rate regime, should be regarded as the central intellectual question of international monetary economics."[16]

With more than forty years of the literature on optimum currency areas to consider, I pursue a selective approach. In Section II, I selectively review the classical contributions of OCA theory. These involve the groundwork of searching for characteristics (criteria) that could be used to define an OCA. Next, I selectively review some of the modern contributions that reflect developments in international macroeconomics in the last twenty years or so. I emphasize the empirical literature in Section III. Section IV concludes.

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[11] Ingram (1969, p. 96).

[12] Johnson (1973, p. 395).

[13] Niehans (1984, p. 291).

[14] Vaubel (1990, pp. 174-176).

[15] Willett (1994, p. 207).

[16] Tavlas (1993, p. 663).

2 Theoretical contributions to optimum currency area theory

2.1 Classical contributions

2.1.1 Mundell (1961) and the labor mobility criterion

In the 1950s, a series of papers questioned Bretton-Woods exchange rate arrangements under which fixed, but adjustable, exchange rates prevailed. These publications identified adjustment problems under fixed regimes and argued in favor of flexible rates. Mundell (1961) summarizes the argument of proponents of flexible exchange rates: "Depreciation can take the place of unemployment when the external balance is in deficit, and appreciation can replace inflation when it is in surplus."[17] If flexible exchange rates are more advantageous than fixed rates, Mundell asks, does it follow that all currencies in the world should be flexible? Furthermore, he inquires, are countries the proper units to take advantage of different exchange rate arrangements?

Mundell observes that there would be a major difference "between adjustment within a currency area which has a single currency and a currency area involving more than one currency; in other words there will be a difference between interregional adjustment and international adjustment even though exchange rates, in the latter case, are fixed."18 To illustrate this he introduces three examples of adjustment in different areas affected by asymmetric demand shocks. The first example considers two independent countries with national currencies, where each country is also a region. The second considers a country with one currency and two distinct regions. The third involves two countries with independent currencies and two regions, where both regions run across countries.

He begins with the two countries, assuming that an asymmetric demand shock negatively affects country B: "To the extent that prices are allowed to rise in A, the change in the terms of trade will relieve B of some of the burden of adjustment."19 However, it is possible that the unemployment pressure in B cannot be eased by increasing prices in A, if A's central bank will tighten credit to restrain inflationary pressure. Thus, the adjustment falls on B itself, if prices in B cannot decrease then the adjustment happens through decrease in employment.

He next discusses the impact of asymmetric demand shock on two regions in the same country. An asymmetric demand shock affects negatively region B. As a consequence, inflationary pressure occurs in A and creates unemployment pressure in B. The central bank can ease the pressure in B by increasing money supply in the country as a whole. This aggravates inflationary pressures in A, but may turn the terms of trade against B and correct the employment problem in B.

In the inter-regional adjustment the trade-off between inflation and unemployment ensures that unemployment in region B is prevented by the willingness of central bank to inflate in region A. In the inter-national example, unemployment in country B cannot be prevented as long as country A is unwilling to inflate. Mundell warns this logic only stretches so far, i.e. it does not follow that if the world consisted of one country with one

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[17] Mundell (1961, p. 657).

[18] Ibid. (p. 658).

[19] Ibid. (p. 658).

currency that unemployment could be prevented by the pro-inflationary policies of a world central bank. The world as a whole is not an optimum currency area.[20]

In the international adjustment example, assuming the other adjustment mechanism does not work, flexible exchange rates, i.e.equilibrium could be returned with a depreciation in B and an appreciation in A. But one may ask whether flexible exchange rates help to ease the adjustment costs of asymmetric demand shock in all cases when national currencies are involved, in other words are optimum currency areas identical with countries?[21]

Mundell responds that optimum currency areas are identical with economic regions, when defined by inter-regional labor mobility.[22] In support of this argument, he brings up the third example of adjustment to asymmetric shock. Here, we assume two countries, the US and Canada and two regions East and West, so that the regions run across these countries. East in both countries produces timber, while West makes cars. As a result of an asymmetric shock, there is a pressure for unemployment in the East, which central banks in both countries attempt to relieve. This strengthens the inflationary pressures in the Western regions. If inflation is prevented in both countries, unemployment in both cannot be avoided. The reverse also applies. In this example, however, it is not clear which country should devalue, so flexible exchange rates do not necessarily bring back the equilibrium. Mundell concludes the two countries do not form optimum currency areas.

While this example weakens the case for the flexible exchange rates, the argument remains valid when currencies are organized at a regional, rather than national, basis. This is the core of Mundell's argument; flexible exchange rates between two countries are preferable to fixed exchange rates, unless the countries themselves do not form optimum currency areas.

If the sole goal pursued is economic stability, the greater the number of currency areas connected with flexible exchange rates the better. But should every little place with immobile labor be considered an optimum currency area with its own currency? Again, the answer is yes if stability (low adjustment costs to asymmetric shocks) is the sole criterion for judging the usefulness of a currency. Mundell writes, "...if then, the goals of internal stability are to be rigidly pursued, it follows that the greater is the number of separate currency areas in the world, the more successfully will these goals be attained."[23] However, if we consider the costs of having many currencies, some tradeoff must be found. Mundell sets forth additional arguments against an extremely large number of currency areas. Besides money-changing costs, a large number of currency areas means that market for foreign exchange would be very thin. Moreover, in very small currency areas, imports are likely to play a huge role in regional consumption, which in turn weakens the possibility for money illusion.

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[20] If one considers the "inconvenience of money-changing" as the only cost of the existence of multiple currencies, then the world is an optimum currency area. With one world currency, the "inconvenience" disappears. Before OCA theory emerged, proponents of a single world currency frequently offered this argument. The Mundellian argument that the world is not an optimum currency area, in contrast, recognizes the stabilizing function of the exchange rate.

[21] The argument for flexible exchange rates builds on the notion that people are unlikely to accept variation in their real income, or variations in the money wage or price level, yet readily accept variations in real income through changes in the rate of exchange. McKinnon (1963) develops this idea extensively.

[22] Mundell defines region in terms of factor mobility. Internal factor mobility and external factor immobility characterize an economic region.

[23] Mundell (1961, p. 662).

In summary, the argument for flexible exchange rates rests on the closeness with which countries correspond to regions. If a nation is an economic region with internal factor mobility and external factor immobility, the argument for flexible exchange rates holds. If nations are dissimilar to regions, fixed exchange rates may do as well as flexible exchange rates. In Mundell's words,

> "I have argued that the stabilization argument for flexible exchange rates is valid only if it is based on regional currency areas. If the world can be divided into regions within each of which there is factor mobility and between which there is factor immobility, then each of these regions should have a separate currency which fluctuates relative to all other currencies."[24]

2.1.2   Discussion of Mundell's contribution

Mundell's seminal paper remains a pleasure to read.[25] As with most frame-breaking contributions, it received a thorough peer review and raised several controversial points.

The first point of contention is Mundell's definition of region, which is neither geographical nor political. As Kenen (1969, p. 44) points out, "perfect interregional labor mobility requires perfect occupational mobility. And this can only come about when labor is homogenous." If one sticks to this interpretation of Mundell's original definition, an optimum currency area always has to be small. On the other hand, if there were perfect labor mobility around the world, a single currency would suffice for the whole world. Kenen (p.113) continues,

> "We do not have perfect mobility because perfect interregional mobility implies perfect occupational mobility and the latter does not prevail. The labor force is not so homogeneous that it is possible to talk about perfect mobility, or even hope to delineate a region over which there is perfect mobility, unless that region is a single-product region."

McKinnon (1963) also qualifies Mundell's concept of labor mobility. If each region contains specialized industry, it may be difficult to distinguish between low geographic and low inter-industrial labor mobility. For example, if a negative asymmetric shock affects region B and there is a possibility in region B to develop A-type industries, the "need for factor movement between A and B is not great. … But if B cannot easily develop A-type industries, then factor movements to A may be the only thing that will prevent a large fall in the unit incomes of potentially mobile factors of production in B." (p. 724)

Grubel (1970, p. 321) argues Mundell's definition of region is inapplicable to real world problems, because Mundell does not distinguish between different degrees of labor mobility. Grubel writes that Mundell's definition of regions, i.e. "regions are areas within which there is factor mobility, but between which there is factor immobility" (Mundell, 1961, p. 658) is too broad and has little practical application.

Giersch (1973) reasons that Mundell's concept of factor mobility implies that in the long run the world is an optimum currency area. In Mundell's view, labor mobility justifies fixed exchange rates, since sufficiently mobile labor weakens the need for flexible exchange rates. But "since mobility is a function of time and hence very high in the long

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[24] Ibid. (1961, p. 663).

[25] Mundel received the 1999 Nobel Prize for Economics "for his analysis of monetary and fiscal policy under different exchange rate regimes and his analysis of optimum currency areas."

run, even over large distances, the logical conclusion seems to be that in the long run the optimum currency area must be the whole world." Giersch (1973) also points out to situation in which migration could be the worst response to balance of payments adjustment since migration is very likely irreversible.

Corden (1973) is rather skeptical concerning the importance of labor mobility in the adjustment to asymmetric shocks. He writes,

> *"Can it really be imagined that a U.K. depressed-area problem could be solved by the large-scale migration of British workers to Germany? It is conceivable; but when Britons are reluctant even to move from Scotland or Tyneside to the south, though the language is almost the same, it takes some imagination to conceive of labor mobility solving the central problem of monetary integration."[26]*

Corden (1973, pp.168-169) argues that short-run capital mobility can be helpful, but in the long-run capital mobility cannot solve the adjustment problem for two countries affected by asymmetric shocks.

> *"No country or region can borrow indefinitely on a private market, however, open and efficient the market is, to sustain levels of real wages, and hence real consumption levels which are too high, bearing in mind the productivity of the country or region. ... Furthermore, as its debt obligations increase, the country will become less credit-worthy. Obviously, there is no long-term solution here. Of course, a country can borrow on the capital market indefinitely, or for long periods, if new productive investment opportunities are opening up, but that is another matter."[27]*

Corden (1973) also argues that Mundell's adjustment mechanism impliedly assumes countries are on a wage standard, i.e. a country has a certain level of money wages that

> *"together with levels and rates of increase in productivity, determine levels of monetary demand required for full employment. Appropriate monetary and fiscal policies are then implemented to validate the money wage level. The crucial assumption is that governments are committed to full employment and that money wages are not sufficiently flexible downwards."*

Ingram (1969) notes that in defining regions Mundell emphasizes labor, instead of capital, mobility. He further argues that Mundell's analysis in a multi-region area leads to the conclusion that "when one region has unemployment, other regions will have to accept inflation in order to relieve the unemployment. Thus, we expect differing degrees of inflation in the regions." Ingram then adds that the empirical evidence does not apparently support this inference.

Melitz (1995) observes:

> *"It would require a very restrictive macroeconomic model to conclude that geographical labor mobility between regions is the critical variable in adjusting to*

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[26] Corden (1973, p. 168).

[27] Salant (1973, pp. 201-202) writes, "Corden's rationale for a deficit region not being able to borrow indefinitely to finance its deficit depends on the assumption that such borrowing absorbs an increasing proportion of financial resources available to the region from outside. This is not necessarily true in a growth situation; if the growth of financial resources available to the region is greater than the rate of growth of its borrowing, then the process could continue indefinitely."

a trade shock. On the other hand, the assumption of no international labor mobility would obviously not yield the result that all countries are already optimal currency areas…. Of course, people change locations more readily within countries than between them. But whether they should also have a separate currency is precisely what the analysis of the optimum currency area is supposed to examine. The role of geographical labor mobility in any well-tested, well-specified theory of the optimum currency area remains to be seen."[28]

Bofinger (1994) counters Mundell's argument with an example that considers a country affected by a negative demand shocks to a good, which constitutes only a minor portion of country's production and which is not produced in other member-countries.

"In order to over come such a shock without undesired effects on output and employment, it would be necessary that the relative price of this good decreases (in comparison with all other goods be they produced abroad or at home). Under these assumptions the exchange rate would obviously be an inappropriate adjustment instrument, because it can only shift the whole price level of one country vis-à-vis the price level of another country. …Thus, if economies are highly diversified, exchange rate changes have to be regarded as a therapy that is associated with very negative side effects."[29]

There is also skepticism as to whether exchange rate adjustment to asymmetric shocks is the least costly way of adjustment in the case of sticky prices, low labor mobility and no fiscal transfers. De Grauwe (1994, pp. 37-44) summarizes some of the theoretical objection to this view:

"In the long run nominal exchange rate changes do not affect the real exchange rate of a country. Structural differences should be tackled with structural policies. Manipulating money (its quantity or its price) cannot change these real differences."

Another argument may be made that devaluation does not always have a positive effect on output, and sometimes this effect is contractionary.[30] Bofinger (1994, p. 11) puts it in a very direct way: "Therefore, the empirical evidence for a reliable reaction of flexible exchange rates to asymmetric real shocks is simply not existent."

Mundell's basic argument survives despite these valid criticisms. Mundell's labor mobility is today understood as a criterion of defining an optimum currency area. Subsequent research puts forward additional criteria, some of which I review below.

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[28] Melitz (1995, p. 499).

[29] Bofinger (1994, p. 8). He further argues that thinking based on a "one-country, one-sector" model with an adjustment mechanism dependent on downward inflexibility of prices and wages and money illusion led economists to the fallacy that the nominal exchange rate is useful for changing relative prices. Furthermore, he sees as misplaced the emphasis on the real asymmetric shocks, since asymmetric monetary shocks have far wider reaching consequences for highly diversified economies.

[30] Krugman and Taylor (1978) initiated the contractionary devaluation debate. For an excellent review, see Agenor and Montiel (1996). Furthermore, countries with firms that have large currency liabilities may force such firms into bankruptcy in the event of a large-scale devaluation (Calvo, 1999). Other researchers argue that the exchange rate follows a random walk, i.e. there is no reliable relation between fundamentals and exchange rates.

2.1.3   Degree of openness

McKinnon (1963) considers the openness of economy, defined as the ratio of tradables to non-tradables, as the crucial criterion of optimality of currency areas. His argument is that the more open the economy, the more it will be inclined to use fixed exchange rates, i.e. flexible exchange rates are more advantageous for fairly closed economies.

Consider a small country in which the ratio of exportables, X_1 and importables, X_2 to non-tradables X_3 is rather high. Under flexible exchange rate arrangements price of exportables, P_1 and importables, P_2 expressed in domestic currency varies with the exchange rate, while P_3 may be assumed constant. Consequently, in small open economy, fluctuations in the exchange rate contradict to efforts to maintain stable price level. The picture is different in a large country with sizable production of non-tradable goods. The devaluation would have an effect on P_1 and P_2 but the effect on the general price index will be lower than in the case of small open economy. In McKinnon's words (p. 719), "...if we move across the spectrum from closed to open economies, flexible exchange rates become both less effective as a control device for external balance and more damaging to internal price level stability."

Thus, small open economies may find it beneficial to join larger currency areas.[31]

McKinnon (1963) makes a case that economies with high ratio of tradables to non-tradables should rely more on fiscal and monetary policies than on exchange rates to cure the balance of payments disequilibra.

> "When a trade deficit exists only a relatively small reduction in spending will be necessary to bring adjustment, when the economy is open. As exportables and importables are a large part of total spending, a relatively small reduction in demand, for example, would be sufficient to release exportables from domestic consumption and to reduce imports, thus improving the trade balance."[32]

Thus, small countries that trade extensively find it beneficial to form currency areas. Ishiyama (1975) notes that McKinnon (1963) assumes that the outside world price level is stable. Otherwise, his argument could be completely reversed, since "external instability would be directly propagated to the domestic economy through fixed exchange." Giersch (1973) makes a similar point: the more open is the economy the more it may need exchange rate flexibility, since it may be more exposed to cyclical disturbances from the outside world from which it wants to isolate itself.

McKinnon (1963) raises another point which favors fixed exchange rates in small open economies: the higher probability of the absence of money illusion. The presence of money illusion is what allows flexible exchange rates to perform their stabilizing function. McKinnon argues the money illusion is lowest in highly open economies. In a dynamic framework, this argument is hardly valid. The more times the country devalues, the more likely the devaluation will have inflationary consequences, and therefore decrease the probability of a future devaluation. As Mundell (1997, p. 34) puts it,

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[31] Ishiyama (1975) comments that similar results are obtained using foreign trade multiplier analysis with constant prices. Here openness would be measured as the ratio of trade to income. Thus, the more open the economy, the larger the variation in income under flexible exchange rates. Tower and Willett (1976) maintain the view that the benefits from a monetary union increase with the degree of openness.

[32] Presley and Dennis (1976, p. 19).

"The first devaluation may work without too much inflation; the second invites a wage response; and the third provokes compensation demands."

There is an additional argument that connects the size of a country with optimum currency area issues. In a large area, it may be easier to keep the value of money "in terms of a representative bundle of economic goods." "If the area under consideration is sufficiently large so that the body of non-tradable goods is large, then pegging the value of the domestic currency to this body of non-tradable goods is sufficient to give money liquidity value in the eyes of the inhabitants of the area in question."[33]

Thus, the existence of stable large countries is required for small countries to efficiently peg their currencies. [34]

2.1.4   Degree of product diversification

Kenen (1969) suggests production diversification as a characteristic for optimum currency areas. He writes that a well-diversified economy will rarely confront changes in demand for its export products.[35] In well-diversified economies, the importance of asymmetric shocks would be of lesser significance than in less-diversified economies.

> *"A country that engages in a number of activities is also apt to export a wide range of products. Each individual export may be subject to disturbances, whether due to changes in external demand or in technology. But if those disturbances are independent, consequent on variations in the composition of expenditure or output, rather than massive macroeconomic swings affecting the entire export array, the law of large numbers will come into play. At any point in time, a country can expect to suffer significant reversals in export performance, but also enjoy significant successes. ... From the standpoint of external balance, taken by itself, economic diversification, reflected in export diversification, serves, ex ante, to forestall the need for frequent changes in the terms of trade and therefore, for frequent changes in national exchange rates." (p. 49).*

Kenen argues that product diversification decreases the likelihood of asymmetric shocks and alleviates their negative effects. Thus, fixed rates are "most appropriate − or least inappropriate − to well-diversified economies."

The core of this argument rests on the idea that "positive changes with respect to some exports will be offset by negative changes with respect to others; as demand for some increases, the demand for others falls. The more diversified are export products, the greater will be this offsetting mechanism."[36] A country that produces a wide variety of goods will experience a slower decrease in overall production, if in the outside markets the demand for its goods decreases. Thus, a country with a low degree of product diversification needs flexible exchange rates to cushion it from outside shocks, while a highly diversified economy may find it beneficial to form a currency area.

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[33] McKinnon (1963, p. 722).

[34] Bofinger (1994) raises an argument against small currency areas, whereby transferring monetary policy-making to supranational authorities decreases the influence of national politicians, i.e. the smaller the currency area, the more serious the political interference with monetary policy-making.

[35] "... a well diversified national economy will not have to undergo changes in its terms of trade as often as a single product national economy." Kenen (1969, p. 49).

[36] Presley and Dennis (1976, p. 24).

Mundell (1969, p. 111) responds that if one follows Kenen's criterion of the optimum currency area then "the most highly diversified economy is the world economy. Then, in terms of an insurance principle and from the point of view of hedging against risks of fluctuation, a world currency is the best solution."

McKinnon (1969, p. 112) makes another point.

> *"Kenen's main conclusion could be put as follows: the more diversified an economy the stronger the case for fixed exchange rates. However, the more diversified an economy, the larger it is, and, because it is diversified, the smaller the foreign trade sector. Therefore, Kenen's conclusions imply that a large diversified economy with a small foreign sector should have fixed exchange rates whereas small open economies should adhere to floating rates."*

Melitz (1995, pp. 498-499) doubts Kenen's argumentation implies that a country with not diversified production structure benefits from exchange rate flexibility.

2.1.5 Policy oriented criteria

The above-mentioned contributions deal with criteria that depend on the state of the economy (labor mobility, openness, and product diversification). The discussion later moved toward criteria that depend on desired policy tradeoffs. Ishiyama (1975) reviews these criteria thoroughly, so I only mention those criteria that still seem to play a role in the discussion about monetary integration. These include similarity of rates of inflation, degree of policy integration, degree of price and wage flexibility, and real exchange rate variability.

If the criterion is the similarity of inflation rates, then the concept is simple: it is difficult to fix an exchange rate if one country inflates and the other does not. Fleming (1971) notes a danger in the fixed exchange rate area originating from "the relative cost levels of the participating countries [being] out of line."[37] He also points to the danger that being in a fixed exchange rate area may force a country to accept a higher level of unemployment and a lower rate of inflation "that would correspond to their preferred compromise between the two." (p. 468) Haberler (1970) raises the point that it is not the characteristics of the economy, but the similarity of policy attitudes, which creates the conditions for a flourishing currency area. Fleming (1971) argues that flexible adjustment of prices and wages to excess demand and excess supply would bring automatic adjustment to asymmetric shocks, so the need for exchange rate adjustment simply would not be there. If real exchange rate adjustment is needed, it does not matter whether the required adjustment will happen through prices, wages, or exchange rates. However, collective bargaining, monopolistic and oligopolistic markets, and natural or state-induced monopolies reduce the extent of wage and price flexibility. Vaubel (1990) proposes the real exchange rate as an optimum currency area characteristic, arguing that it is a more comprehensive criterion than the traditional criteria of labor mobility, diversification, and openness.

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[37] Fleming (1971, p. 468). In Fleming's view, this can happen when there are differences among countries in unemployment preferences, in productivity growth rates and/or in trade union aggressiveness.

2.1.6   Political commitment to exchange rate decisions

A part of the OCA literature posits that an optimum currency area may be more about long-term political commitment than economic criteria. Ingram (1969) claims that economic considerations take a back seat in choosing exchange rate arrangements, so it is somewhat futile to stress definitions of optimal currency area characteristics. What matters is a government's commitment to such a decision.

> *"It seems to me that the geographic extent of a currency area … can be whatever we want it to be, large or small, although I do agree that when the currency area becomes very small we lose the advantages of the use of money. I do not think the optimum size of a currency area can be discovered by looking for real economic determinants of it, such as degree of labor mobility or homogeneity of output, although these factors may certainly affect the speed and ease of adjustment. I think the efficacy of a currency area depends on policy positions taken by governments and on the firmness of their commitment to them, on attitudes of the population toward the adjustment processes involved, on the nature of financial and other institutions, and on some economic considerations that are largely omitted from much present analysis."[38]*

Mintz (1970) also emphasizes the political willingness of the central authorities to pursue monetary unions as the most important factor for forming currency areas.
Along similar lines, Machlup (1977, p. 71) argues:

> *What ultimately counts, however, is that all members are willing to give up their independence in matters of money, credit, and interest. Pragmatically, therefore, an optimum currency area is a region no part of which insists on creating money and having a monetary policy of its own."*

This seems to be the opinion also of some authors in the 1990s. Goodhart (1995) argues that any currency union formation is primarily governed by political concerns.[39]

2.2   Recent developments in OCA theory

International macroeconomics has gone through substantial changes in the last two decades. These changes are reflected in the discussion on optimum currency area theory and in discussions on choosing an optimal exchange rate regime. A crucial change has occurred since the early 1960s in the understanding of the inflation-unemployment trade-off as confidence in permanent trade-off has broken down. Tavlas (1993) says OCA theory has largely been modified as the discussion has turned to expectation formation, credibility, and time inconsistency. For example, time inconsistency suggests that inflation may increase if policy-makers and wage-setters engage in a game.[40] The costs of decreasing inflation are also lowered as the credibility of the central bank increases. A

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[38] Ingram (1969, pp. 97-98).

[39] Goodhart (1996) writes about EMU aspirations: "I shall argue that attempting to fix even more rigid, and supposedly irrevocable, currency linkages in advance of, and in the absence of, political and fiscal cohesion among the member states, is also a dangerous exercise." (p. 1084). Goodhart continues, "What is clear is that currency union is essentially a function of political cohesion." In this context, Bean (1992) and Feldstein (1997) argue along a similar line.

[40] See Barro and Gordon (1983).

traditionally high inflation country can gain credibility by "tying its hands," i.e. pegging its exchange rate to a low inflation country. Thus, joining a currency union provides an important benefit to a potential member-country.

> *"The surrender of all national monetary policy responsibilities to a supranational central bank system is the most obvious signal that a country is no longer attempting to make use of surprise inflation. Of course, this requires that the central bank which in charge of the common currency has a higher credibility than the national central bank."*[41]

One can see the discussion on the optimum currency areas as a part of the problem of how to choose optimum exchange rate regime. It should be noted, however, that OCA theory is typically concerned with the choice between the pure float and fixed exchange rate regime, while the economic policy-making is usually concerned with the subtler problem of choosing among intermediary types of regimes. Apart from the attitude rooted in the classical theory of optimum currency areas, one can distinguish three approaches in the literature on the search for an optimum exchange rate regime. The first approach considers a macroeconomic model and evaluates which exchange rate regime could ease the response of the economy to different disturbances.[42] Thus, a country exposed to external nominal shocks should typically use flexible rates to insulate its domestic economy. On the other hand, a fixed regime can be useful when dealing with domestic nominal shocks, while domestic real shocks are best handled under a flexible regime.[43]

Buiter (1995) presents a thorough analytical discussion of the theoretical issues of forming currency areas in the context of a seven-equation model of what he terms a "semi-small" open economy with perfect capital mobility. In this model, Buiters distinguishes the character of shocks that affect the economy. He identifies an important role for nominal exchange rate flexibility in adjustment to real shocks. In the case of financial shocks, however, the model indicates that exchange rate flexibility is undesirable.[44]

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[41] Bofinger (1994, p. 21). In the same paper, Bofinger labels capital movements unconnected to macroeconomic fundamentals as asymmetric and makes an argument that "the complete avoidance of such [asymmetric monetary] shocks constitutes a very fundamental benefit of any monetary union." (p. 25) Furthermore, he makes a case in favor of larger currency areas, arguing that money demand is more stable in large currency areas, since "intra-regional shifts occurring within a common currency area only affect the regional money demand functions but not the national demand function." (p. 26)

[42] Following Poole (1970), this literature includes among others Fischer (1977), Flood (1979), and Frenkel and Aizenman (1982). Aizenman and Flood (1993) present a two-country, one-good, one-factor model with nominal wage rigidities. Productivity shocks in this model hit asymmetrically the two member-countries of a currency union. Migration brings efficient adjustment through equalizing the marginal productivity of labor across both countries. The model of Aizenman and Flood (1993) accentuates the insight that under sticky wages and low labor mobility, a floating exchange rate may help the economy toward an efficient allocation of resources.

[43] See Argy (1990) for a review of this literature.

[44] Real shocks are "IS" shocks, shocks to the private or public demand for goods and services, while financial shocks are for example liquidity preference (money demand) shocks or shocks to the domestic money supply process. "Nominal exchange rate flexibility will cause financial shocks and other nominal shocks to result in temporary changes in international relative prices and costs – changes that are unnecessary and harmful from the point of view of the underlying real fundamentals and that involve real, albeit transitory, adjustment costs." (p. 23).

The second approach deals with the problem of the exchange rate regime in the context of stabilization plans.[45] This approach considers a country with high inflation that wishes to stabilize with minimal costs of adjustment. As Bruno (1991) shows, in the absence of money illusion, when money is neutral and nominal-real dichotomy holds, the general equilibrium analysis determines a unique solution for the real variables. The price level, however, remains indeterminate unless another nominal variable is fixed, i.e. correction of fundamentals is usually insufficient. Bruno (1991) shows that the corrected system can be consistent with different inflation rates.[46] For this reason, a clear signal (such as firm nominal anchor) of a shift in policy is needed. In a closed economy, the typical nominal anchor is the level of the money supply or in some cases nominal wage. In the open economy, the exchange rate is another possible nominal anchor. In the 1990s, country-specific discussions of optimum exchange rate regimes were, to a large extent, framed in this context, particularly in transition economies.[47]

As the third approach, I consider modern theoretical contributions in the context of general-equilibrium models and based on microeconomic foundations.[48] Helpman (1981) and Kareken and Wallace (1981) show that in an environment where asset markets are complete and money is neutral, the exchange rate regime has no social welfare impact. Helpman (1981) concludes that the method for choosing among different exchange rate regimes depends on the given rigidities and imperfections.

> *"There are various rigidities and imperfections (e.g. wage contracts, market imperfection) whose existence may have a bearing on the relative desirability of alternative exchange-rate regimes. Thus, it is possible that a particular exchange-rate regime performs better than others under certain types of imperfections. A characterization of imperfections under which each exchange-rate regime performs best will be valuable."[49]*

The question thus becomes which regime is preferable under a given type of friction. Subsequent work introduces various rigidities and imperfections into the modeling of currency areas. Bayoumi (1994) and Ricci (1997) represent the literature in which wage and price rigidities are the frictions, while in Helpman and Razin (1982), and in Neumeyer (1998) the nature of the friction is represented by financial market incompleteness.

Helpman and Razin (1982) in a two-period general equilibrium model show that the incompleteness of financial markets is complemented by channels through which nominal variables have real effects, which allow them to provide a set of sufficient conditions under which a floating regime is preferred to a fixed regime. In their model, a floating exchange rate regime dominates a fixed regime, since the latter reduces the number of assets in the economy.

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[45] See e.g. Dornbusch (1986), Fischer (1986), Dornbusch et al. (1990), Bruno (1991), Blanchard et al. (1991), and Edwards (1993).

[46] Bruno (1991) argues that what needs to be done first is to remove the real source of the disequilibrium. However, it may happen that the correction of the macroeconomic fundamentals will not suffice to eliminate inflation. Inflation has a life of its own, i.e. a corrected real system can be consistent with more than one inflation rate. If, say, wages are backward indexed, i.e. even if inflation stops, lagged indexation may cause a large increase in real wages. In that case, the past is not forgotten. Now, even if the economy is de-indexed, there is still the problem of the credibility of the authorities, who are attempting to decrease inflation. Thus, a clearly identifiable nominal anchor must be introduced to signal of a shift in policy.

[47] See e.g. Guitián (1994), Bofinger, Flassbeck and Hoffmann (1997), and Horvath and Jonas (1999).

[48] For an excellent detailed review of these contributions see Lafrance and St-Amant (1999).

[49] Helpman (1981, p. 887). Kareken and Wallace (1981) indeterminacy result about the equilibrium exchange rates may be interpreted in the similar way.

Bayoumi (1994) presents a model with regionally differentiated goods in which wages are downwardly rigid. Each region can choose to have its own currency or join a union. He presents a framework that allows him to incorporate several typical OCA factors as the size and correlation of the disturbances, the costs of transactions between different currencies, the level of factor mobility across regions and the inter-relationship of demand among regions. However, Bayoumi (1994) assigns no role for financial assets or government policy; in his model, each region is fully specialized in production of one specific good.

Bayoumi (1994, p. 552) then makes the surprising insight:

> *"A currency union can raise the welfare of the regions within the union, it unambiguously lowers welfare for regions outside the union. This is because the gains from the union, in the form of lower costs of transacting business, are limited to the members of the union, while the losses from the union, in the form of lower output due to the interaction between the common exchange rate and the nominal rigidity, affect everybody."*[50]

Another insight from Bayoumi (1994) concerns the fact that the incentives for a region to join a currency union may be different from the incentives to admit a region into a currency union. Bayoumi (1994, p. 552) next states the reasons:

> *"The entrant gains from lower transaction costs on trade with the entire existing union, while the incumbent regions only gain on their trade with the potential entrant. As a result, a small region will always have a greater incentive to join a union than the union will have an incentive to admit the new member. A corollary of this is that, even if a country would prefer a free float across all regions, it may still have an incentive to join a currency union with other regions if it is going to be formed."*

Ricci (1997) presents a model of optimum currency areas in a two-country trade regime with nominal rigidities that allows for consideration of monetary and real variables. Preferences differ in the two countries, which makes it possible to analyze the degree-of-openness effect and symmetry of shocks in the creation of currency unions. In his model, the net benefits from participation in a currency union increase with the following variables: the correlation of real shocks between countries, the degree of adjustment of labor and fiscal policy instruments, the difference between the inflationary bias of the domestic monetary authority and that of the currency union, the variability of domestic monetary shocks (which, in part, are transmitted to other countries inside the currency union), and the size of efficiency losses eliminated through the adoption of a common currency. Those factors that tend to diminish the benefits of monetary union include the variability of real and foreign monetary shocks and the correlation of monetary shocks between countries. In contrast to prevailing OCA opinion, Ricci (1997) shows ambiguous effects for the degree of openness when both real and monetary shocks are taken into account.

Canzoneri and Rogers (1990) develop a two-country model similar to the cash-in-advance model of Lucas and Stokey (1987). In this model, they consider the issue of the optimum currency area from the perspective of public finance. The optimal spreading of tax distortions may require different inflation in different regions, so each region would

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[50] However, as Bayoumi himself writes, this result is model dependent. One can therefore imagine circumstances in which a currency union benefits those outside the union.

need its own currency to have its own inflation. They provide a formal definition of the optimum currency area problem: the policy-maker must choose the optimal number of currencies to maximize the weighted sum of the utilities of households of the two countries.

In a general equilibrium model with incomplete asset markets, nominal securities and mean-variance preferences, Neumeyer (1998) shows that adoption of a currency union is the result of a trade-off between the benefits of reducing excessive volatility of exchange rates and the costs of reducing the number of assets in the economy. Neumeyer (1998) differentiates between the economic and political shocks. While the fluctuation in exchange rates that reflect economic shocks may seem excessive, they help allocate resources efficiently. On the other hand, exchange rate volatility caused by non-economic (political) shocks reduces the efficiency of financial market.[51] He argues interestingly that "currency unions and permanently fixed exchange rate regimes can be viewed as monetary rules that attempt to improve welfare by insulating money from domestic politics."[52] On the other hand, fluctuation in the value of money reflecting economic shocks maybe "good," as it increases the insurance opportunities available through trade in nominal assets. As he puts it, "the loss of monetary independence … is socially costly because it makes the real payoff of assets denominated in different currencies equivalent, effectively reducing the number of financial instruments with which economic agents can share risks."[53] The main result of Neumeyer (1998) is that adoption of a common currency increases welfare when the gain from "eliminating excess monetary volatility exceeds the cost of reducing the number of financial instruments in the economy."

2.2.1   The endogeneity problem

Frankel and Rose (1997) build an argument that the international trade pattern and international business-cycle correlation is endogenous, i.e. countries with closer trade links tend to have more tightly correlated business cycles.[54] In their opinion, joining a currency union moves countries closer to meeting the optimum currency area criteria. In other words, "a naïve examination of historical data gives a misleading picture of a country's suitability for entry into a currency union, since the OCA [optimum currency area] criteria are endogenous."(p. 2) Entering a monetary union increases the symmetry in the business cycle of the prospective member-country due to common monetary policy and closer international trade ties.[55]

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[51] Neumeyer (1998, p. 246) writes that "Political interference in monetary affairs implies that given the realization of an economic shock, there still is uncertainty about the future actions of monetary authorities since such actions will be influenced by future political events. For example, the timing of monetary stabilizations in inflationary economies, the value at which currencies enter a fixed exchange rate regime, and exchange rate realignments are instances of monetary policy decisions that depend on the realization of political shocks."

[52] Neumeyer (1998, p. 247).

[53] Neumeyer (1998, p. 247).

[54] Frankel and Rose (1997, p. 4) propose that "the more highly correlated the business cycles are across member countries, the more appropriate a common currency." If shocks are not correlated, but the cycle is correlated between two countries, then, most likely, the propagation mechanism transfers idiosyncratic shocks into positive co-movements of real variables.

[55] Frankel and Rose (1997) argue that the relationship between international trade and symmetry of business cycles is primarily an empirical one. If a closer trade relationship results in countries being more specialized, then one should expect more idiosyncratic cycles. If a closer trade relationship results in an increase in intra-

Corsetti and Pesenti (2002) take the endogeneity argument a step further. They use a general-equilibrium two-country, choice-theoretic, stochastic setting with imperfect competition in production, nominal rigidities in the goods markets and forward-looking price-setting by firms. They show that common monetary policy can be self-validating,

> *"when the private sector chooses pricing strategies that are optimal in a monetary union, such strategies make a currency area the optimal monetary regime from the vantage point of the national policymakers as well. In other words, there is no incentive for monetary authorities to pursue independent strategies of national output stabilization. As a result, even if there is no structural change in fundamentals (e.g. no increase in intra-industry trade), national outputs become more correlated."(p. 2)*

All in all, "the best institutional device to guarantee a credible policy commitment to a monetary union is to have the monetary union itself in place." (p. 22)

3   Empirical evidence on optimum currency areas

I now selectively review some of the empirical evidence presented in the literature, which in some way was written in the context of OCA theory. I begin with a snapshot of OCA studies and the world and then take a more detailed look at optimal currency areas in Western and transitional Europe.[56]

3.1   OCA and the world

To my knowledge, only two studies apply the theory of optimum currency areas on a worldwide basis.

Ghosh and Wolf (1994) find little correlation between geographical proximity and the grouping of countries into optimum currency areas. Thus, their model suggests that restricting monetary unions into geographically neighboring areas implies high costs. Their results also suggest that adopting a single currency is very costly for most regions in the world and that most of the stabilization benefits across regions can be captured by a relatively small number of currencies. Their results further indicate that adopting a single currency around the world may be prohibitively costly, and imply that neither Europe nor the United States form an optimum currency area, because, for both regions, the costs of adopting a single currency exceeds estimates of the transaction cost savings.[57] Finally, they

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industry trade, then cycles may become less idiosyncratic. The authors present empirical evidence supporting the latter view.

[56] For analysis of shocks outside Europe, see Bayoumi and Eichengreen (1994), Horvath and Grabowski (1997), Grabowski and Horvath (1999), Yuen (2000), Mkenda (2001), and Grandes (2003).

[57] For example, they argue that for the US, G-7 or western European countries maintaining a single currency would amount (or amounts to) around 2.5% of GDP yearly (ignoring the transactions benefits). "With five currencies among the fifty US states, and three currencies among the twelve European Union countries, the stabilization costs fall to less than 1.5% of GDP. For other regions we consider, the CFA countries, the states of the former Soviet Union, and the world at large, the costs of adopting a single currency are significantly higher."

argue that there is no advantage for Germany and the United States to join any monetary union.

Artis, Kohler and Melitz (1998) taking two criteria of OCA literature (high level of bilateral trade and symmetry of shocks) identify four large optimum currency areas in the world, "Of these four large union, one covers virtually all of Western Europe; a second encompasses all of Mesoamerica and the Northern ridge of South America; a third occupies a good part of the Middle East, and a fourth englobes the entire ASEAN area, including China and Australia."[58]

3.2   OCAs and western Europe

I next consider the exposure of an area to different shocks, and, to a lesser extent, the question of labor mobility and production diversification.

3.2.1   Asymmetric shocks

The emphasis on asymmetric (country-specific) shocks is natural, since it seems that these shocks represent a crucial component in the choice of the exchange rate regime as viewed from the optimum currency area perspective. Is Western Europe a region where country-specific, idiosyncratic shocks prevail, or it is a region where shocks affect all the countries similarly? The earliest papers to tackle this issue were written in the late 1980s.[59] Bayoumi and Eichengreen (1992) performed measurement of the incidence of shocks using a structural vector auto-regressive model in an effort to identify supply and demand shocks influencing output fluctuations in EC and some US regions in the period 1960-88.[60] Bayoumi and Eichengreen (1992) measure how the supply and demand shocks of different countries in the EC and different regions of the US correlate with benchmark regions (Germany for Europe and the mid-Atlantic for the United States). For Europe, they identify a core and periphery, based on the idea that if the country belongs to the core, then its shocks are correlated with the shocks to Germany. As Table 1 below indicates, supply shocks are highly correlated with Germany in such countries as France, Denmark, Belgium, and the Netherlands, while for other countries (England, Portugal, Ireland, Spain, Greece, and Italy) the correlation is lower. In this respect the situation in the United States regions is rather similar. There are regions with high correlation with the anchor region, the core, and regions with lower correlation, the periphery. However, the economic weight of the European periphery is greater. There is a noticeable difference between the correlation of demand shocks with the anchor region in the US and Europe. In Europe the correlation of demand shocks in EC countries with demand shocks of Germany is very low (higher for

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[58] Unlike Ghosh and Wold (1994), their program for finding optimum currency areas "displays a marked tendency to identify monetary unions on a geographical basis." (p. 27)

[59] Cohen and Wyplosz (1989), Weber (1990), and the EC Commission (1990) were the first to attempt to measure the symmetry of shocks in Europe.

[60] Minford (1993, pp. 236-237) argued that what their structural vector-autoregressive model really obtains is not the demand and supply shocks, but permanent and temporary shocks in terms of their effect on output. Buiter (1995, p. 28) writes that it is not sufficient to "identify demand and supply shocks and decompose them into idiosyncratic vs. common shocks. Demand shocks in turn have to be decomposed into financial (or LM) and goods market (or IS) shocks for it to be possible to draw sensible inferences about the appropriate exchange rate regime."

Denmark, France and Belgium, almost zero for Greece, Italy and Netherlands, and a slight negative correlation for Ireland and Spain).[61] Bayoumi and Eichengreen (1993) extend this analysis to the EFTA countries and show that Austria, Sweden, and Switzerland also belong to the European core.

Chamie, DeSerres and Lalonde (1994) decompose shocks to real supply, real demand, and nominal shocks in a vector auto-regressive system using the growth rates of output, prices, and money. They obtain monetary shocks by imposing the restriction of long-term money neutrality. Their results indicate that in Europe only Germany and Switzerland are strongly related to the symmetrical component of shocks. Other countries (Greece, Italy, Norway, Portugal, and Sweden) are not statistically related to the common component of the shocks. Also relative to US regions, these countries face highly asymmetric supply and real demand shocks. From this, they deduce that some European countries could face significant adjustment costs when joining a monetary union.

Whitt (1995) obtained supply and demand shocks from different data than Bayoumi and Eichengreen (1992). Instead of real GDP and GDP deflator he used monthly data for industrial production and price index. His analysis indicates that only France, Italy, and the Netherlands show substantial positive correlation of shocks with the anchor region (Germany). He also concludes that Canada and the United States may be the best candidates for monetary union, since they exhibit substantial positive supply and demand shocks.

Bayoumi and Prasad (1995) compare eight US regions with eight Western European countries. They find that "the relative importance of aggregate, industry-specific, and country- or region-specific shocks in explaining output growth fluctuations is roughly similar in Europe and the United States, with each of these types of shocks playing an important role." (p. 22)

Dibooglu and Horvath (1997) identify the shocks as supply, nominal, and real fiscal. Using data for 20 European market economies, they compare original members of the European Community to new members and non-members. Shocks are mostly country-specific, particularly for newer members and non-members, suggesting the importance of alternative adjustment mechanisms other than national monetary policies after the introduction of a single currency. Funke (1997) shows that the correlation of shocks among the EU countries is much lower than within Germany. [62]

Table 1 below compares these results.

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[61] Bean (1992, p. 37) provides an interesting conjecture concerning the lower correlation of shocks in Europe relative to the US. "One would expect the cross-country correlation of demand shocks to be lower in Europe than in the United States, because there were periods in the sample when European countries pursued largely independent monetary policies and because the federal income tax and social security system in the United States ensures that the fiscal shocks are correlated across regions."

[62] Lafrance and St-Amant (1999, p. 7) comment on these empirical results: "Although the contemporaneous correlation of shocks might be relatively low, the two economies could still be in similar positions in the business cycle and not require divergent monetary policies or an exchange rate adjustment. On the other hand, while the correlation of shocks might be very high, the transmission mechanisms might be sufficiently different to justify an exchange rate adjustment." Willett (2001, p. 14) critically asserts that "simple statistical tests of past patterns of shocks, despite their recent popularity in the literature, are unlikely by themselves to offer good guidance to future patterns of shocks." Boone (1997) questions the exogeneity of these shocks by arguing that parameters change over time. Melitz and Weber (1996) examined the correlation of the structural components of output, and found more symmetry between the French and German economies than was typically found by structural shocks.

Table 1 Correlation of exogenous shocks between Germany and selected
western European countries

	Supply Shocks			Demand Shocks			Fiscal Shocks
	A	B	C	A	B	C	C
France	0.54	0.26	0.37	0.35	0.14	0.07	0.37
United Kingdom	0.11	0.45	0.36	0.16	0.31	0.00	0.11
Italy	0.23	-0.05	0.35	0.17	-0.28	0.09	0.38
Netherlands	0.59	0.51	0.45	0.17	0.47	0.32	0.05
Belgium	0.61	0.40	0.21	0.33	0.18	0.04	0.20
Denmark	0.59	0.31	0.42	0.39	0.24	-0.04	-0.13
Ireland	-0.06	-0.04	0.07	-0.08	0.16	-0.09	0.12
Spain	0.31	-0.25	-0.02	-0.07	0.10	-0.12	-0.01
Portugal	0.21	0.14	0.01	0.21	0.22	-0.02	-0.07
Greece	0.14	0.21	0.13	0.19	0.22	0.15	0.08
Austria		0.62	-0.26		0.34	0.17	0.12
Finland		0.22	0.12		-0.01	0.11	0.00
Norway		-0.06	-0.25		0.12	0.22	0.16
Sweden		0.35	0.20		-0.09	0.26	-0.01

Results of structural vector autoregressive estimations

Sources: A. Bayoumi and Eichengreen (1992) based on yearly data for the period 1960-1988.
B. Funke (1997) based on yearly data for the period 1964-1992.
C. Dibooglu and Horvath (1997) based on yearly data for the period 1950-1994.

These measurements, which focus on the contemporaneous correlation of shocks, appear to indicate that symmetry prevails for a sub-group of countries. It also appears that asymmetry prevails for some countries at the geographical periphery.[63]

3.2.2 Labor mobility and product diversification

One important message of OCA theory is that countries affected by asymmetric shocks need substantial flexibility in their labor markets. A high degree of labor mobility may serve as a channel through which adjustment to shocks occurs.

Blanchard and Katz (1992) present empirical evidence that labor mobility in the United States has played an important role in adjustment, substituting to a large extent for price flexibility. Masson and Taylor (1994) compare the dispersion of unemployment rates across both the US and Canadian regions with European countries. Their results show that dispersion of unemployment is lowest in the US, higher in Canada, and highest in European countries. In Europe, the higher dispersion of unemployment rates reflects the fact that migration among European countries is clearly lower than among US regions or Canadian provinces.[64]

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[63] Goodhart (1996) writes: "There is, however, a reasonable case that some of the core countries of north-west Europe are so alike in structure, facing similar shocks, with inter-twined economies, that a single central policy would closely mimic their preferred national policies. But that is hardly the case for the peripheral countries in Europe." (p. 1086)

[64] Labor mobility in the United States is roughly two to three times higher than in Europe; Masson and Taylor (1994, p. 25).

De Grauwe and Vanhaverbeke (1991) measure regional and national labor mobility across several western European countries. They show that the yearly flow of migrants among EC countries is less than one tenth of the yearly flow of migrants between regions. They compare the nature of the adjustment to shocks between regions of the same country and between countries in Europe by computing different measures of real exchange rate variability for different regions and countries for the period 1977-85. They observe, "The variability of the real exchange rates of nations is about twice as large as the one observed at the regional level." (p. 4) The variability was lower in the EMS countries than in non-EMS countries. Southern countries had a much lower degree of interregional mobility than core countries, even if in Southern countries the regional differences in per capita income were higher than in the core.

Bayoumi and Prasad (1996) investigate the degree of labor market integration for eight US regions and eight EU countries. Their results indicate that the region-specific shocks are more important in the non-traded goods sector in the US, while in the EU country-specific shocks prevail in the traded goods sectors. The US has a more integrated labor market, and in Europe labor flows do not seem to facilitate adjustment.

Fatas (1997) uses employment growth rates to approximate business cycle movements and presents results, which indicate "national borders have seen their economic significance reduced over time as the process of integration has increased cross-border correlations and reduced within-border comovements." (p. 743) Puhani (1999) estimates the elasticity of migration with respect to changes in unemployment and income on the basis of regional panel data for Germany, France and Italy. His results show that the labor mobility is the highest in Germany, followed by France and Italy, but even in Germany the accommodation of a shock to unemployment by migration takes several years. Puhani (1999) concludes, "Labor mobility is extremely unlikely to act as a sufficient adjustment mechanism to asymmetric shocks in Euroland."

Buiter (1995) questions the relevance of these endeavors:

> *"While it is correct that the US has more mobile labour than the EU, I would argue that even the US does not have the kind and degree of inter-state labour mobility that would be required to make up for the loss of an independent currency. The international factor mobility that is required to compensate fully for the loss of the ability to vary the nominal exchange rate, is a strictly temporary (that is reversible) migration. The fact that there is little or no permanent international migration among the EU member states is irrelevant from the point of view of EMU, just as the fact that there is rather more permanent or long-term inter-state labour mobility in the USA is irrelevant to the issue as to whether or not the USA is an optimal currency area. Permanent international factor mobility is not a substitute for nominal exchange rate flexibility." (pp. 30-31)*

One may argue as Krugman (1993) that greater integration among countries and regions increases their specialization and thus the potential for asymmetric shocks. The counter-argument here stresses that greater integration increases intra-industry trade and thus the possibility for symmetry of shocks.[65] Kim (1997) brings evidence about long-run trends in regional specialization in the United States for the period 1840-1987. Prior to the early twentieth century, regional specialization was on the rise; but since the 1950s, the

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[65] This argument would be more in line with the message of Kenen (1969). European Commission (1990) also argues that in the future European Monetary Union a reduction of asymmetries between member countries may be expected.

decreased significance of agriculture and manufacturing and the rising importance of the third sector have led to convergence in regional economic structures. Fontagne and Freudenberg (1999) distinguish between horizontally differentiated goods (two-way trade in varieties) and vertically differentiated products (two-way trade in different qualities). They show that only a part of intra-industry trade will increase symmetry of shocks, because "a distinction must be made between greater horizontal and vertical differentiation of production: growth in the latter process is not necessarily associated with more symmetric shocks." Their empirical evidence, however, favors the view that "the empirical evidence of structural asymmetries between core and periphery countries no longer justifies fears of cumulative divergence between members, within the EMU." (p. 279)

3.3   OCA and transition countries in Europe

In the late 1990s, numerous papers appeared dealing with the issue of optimum currency areas in the context of transition European economies.[66] This interest naturally reflected the interest in these countries into the costs, as well as benefits, of joining European structures. Several of the studies discussed below consider the issue of the symmetry of shocks affecting transition economies. Horvath (2000) writes that idiosyncratic shocks prevail between western EU members and the accession countries. Fidrmuc and Korhonen (2001) assert that the correlation of supply shocks differs greatly from country to country, although some accession countries are "at least as well correlated with the euro area shocks as are many current members of the monetary union." (p. 24) Frenkel and Nickel (2002) conclude their study that "there are still differences in the shocks and in the adjustment process to shocks between the euro area and the CEECs. However, several individual CEECs exhibit shocks and shock adjustment processes that are fairly similar to some euro area countries." Table 2 summarizes the empirical results of these studies.

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[66] In one of the first studies, written at the beginning of transition, Goldberg (1999) argued that the optimum currency area considerations should not be taken into consideration when transition economies decide about their exchange rate regimes. She argues, "The supply elasticities required for the exchange rate to be an effective stabilization tool may not be present during the early stages of economic transition. Employment is not likely to rapidly adjust and even the (foreign and domestic) elasticities of demand for goods are undetermined. In such an economic environment, the traditional optimal stabilization policy criteria applied to output and/or balance of payments targets may not be relevant for the transition economy's decision about whether or not to implement or maintain an independent currency. Thus, it does not matter whether transition economies satisfy the reference criteria that point to optimum conditions for introducing independent currencies. The traditional optimum currency area criteria, interpreted in terms of optimal real stabilization policy, are only useful if the exchange rate is able to effectively perform the task of short-term stabilization (output or balance-of-payments) to which it is assigned."[italics in original] (p. 3)

Table 2   Correlation of exogenous shocks between EMU, Germany and selected transition economies

| | Supply Shocks | | | | Demand Shocks | | | |
| | Germany | | EMU | | Germany | | EMU | |
	A	B	C	A	A	B	C	A
Czech Republic	0.538	-0.05	0.04	0.052	0.321	0.10	-0.15	0.213
Poland	-0.494	0.00	0.08	-0.690	-0.200	0.14	0.28	0.217
Slovak Republic	0.384	-0.04	0.05	0.182	-0.097	0.04	-0.05	-0.433
Hungary	0.263	0.28	0.46	0.726	-0.197	-0.40	0.25	0.122
Slovenia	0.434	0.02	0.15	0.658	0.049	0.03	-0.18	-0.147
Estonia	0.036	0.08	0.25	0.339	0.343	0.05	0.12	-0.241
Latvia	0.022	-0.07	0.30	0.333	0.260	0.11	-0.49	-0.428
Lithuania	---	-0.16	-0.11	----	---	0.33	-0.49	---
Bulgaria	0.462	---	-0.03	0.280	0.250	---	0.03	-0.224
Romania	---	---	0.02	----	---	---	0.03	---

Based on structural vector autoregressive estimations.

A. Frenkel and Nickel (2002); quarterly data for the period 1993:1-2001:4.

B. Horvath (2000); quarterly data for the period 1993:1-2000:3, for Hungary 1995:1-2000:3.

C. Fidrmuc and Korhonen (2001)

Babetski, Boone and Maurel (2003) instead of measuring the correlation of shocks as done as in above papers introduce time varying correlation, thus they differentiate between the overall transition period and the most recent period. Their results show an ongoing process of demand shock convergence and supply shock divergence. Babetski (2003) finds that an increase in trade intensity and a decrease in exchange rate volatility is associated with demand shocks convergence, and he interprets his result as in support of the endogeneity of the optimum currency areas.

4   Summary

In this paper, I reviewed select literature on optimum currency areas. The message of this theory can be summarized as follows: "There are costs and benefits to both fixed and flexible exchange rate regimes and [that] these may vary substantially across countries based on a number of characteristics."[67] Fixed exchange rates or a single currency may be more efficient than a flexible exchange rate arrangement for a small, open country with diversified production structure and integrated within a given geographic area in factor mobility.[68] The criteria suggested in the OCA literature give no clear-cut guidance for choosing an exchange rate regime. Moreover, political factors seem to play important role in such decisions. The theoretical considerations stemming from OCA theory are not easily translated into practical procedures.[69] Nevertheless, this theory and its modifications form the intellectual foundation of any discussion on currency unions. Concurring with Willett (2001), I conclude that optimum currency area theory is essentially an approach to thinking about exchange rate regimes. As such, one should not expect it to produce any single quantifiable criterion.[70]

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[67] Willett and Wihlborg (1999, p. 61).

[68] Tavlas (1993).

[69] Masson and Taylor (1993, pp.17-18) also write, "there is no single over-riding criterion that could be used to assess the desirability or viability of a currency union."

[70] Swoboda (1999) also considers OCA theory "an analytical framework" for debates on creation of currency unions.

References

Agenor, Pierre-Richard and Peter J. Montiel, *Development Macroeconomics*, Princeton University Press, 1996.

Aizenman, Joshua and Robert P. Flood, "A Theory of Optimum Currency Areas: Revisited," International Monetary Fund 1992, Working Paper WP/92/39, May 1992.

Allen, Polly Reynolds and Peter B. Kenen, *Asset Markets, Exchange Rates, and Economic Integration. A Synthesis*, Cambridge University Press, 1980.

Argy, Victor, "Choice of Exchange Rate Regime for a Smaller Economy: A Survey of Some Key Issues," in Argy, Victor, and Paul de Grauwe, *Choosing an Exchange Rate Regime: The Challenge for Smaller Industrial Countrie*s. International Monetary Fund, Katholieke Universiteit Leuven, Macquarie University 1990, 6-81.

Artis, Michael, Marion Kohler, and Jacques Melitz, "Trade and the Number of OCA's in the World," European University Institute, 1998, Economics Department, Working Paper ECO No. 98/16.

Babetski, Jan, "EU Enlargement and Endogeneity of OCA Criteria: Evidence from the CEECs", March 2003, University of Paris, mimeo.

Babetski, Jan, Laurence Boone and Mathilde Maurel, "Exchange Rate Regimes and Supply Shocks Asymmetry: The Case of the Accession Countries," Discussion Paper No. 3408, CEPR London 2002.

Barro, Robert and Gordon, David, "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy* 91, August 1983, 589-610.

Barth, Richard C. and Chorng-Huey Wong (eds.), *Approaches to Exchange Rate Policy. Choices for Developing and Transition Economies*, IMF Institute, 1994.

Baxter, Marianne and Stockman, Alan C., "Business Cycles and the Exchange-Rate Regime, Some International Evidence," *Journal of Monetary Economics* 23, 1989, 377-400.

Bayoumi Tamim, "A Formal Model of Optimum Currency Areas," International Monetary Fund, Working Paper, April 1994.

Bayoumi, Tamim and Barry Eichengreen, "Shocking Aspects of Monetary Unification," National Bureau of Economic Research, Working Paper # 3949, January 1992.

Bayomi, Tamim and Barry Eichengreen, "Is There a Conflict between EC Enlargement and European Monetary Unification," *Greek Economic Review*, Vol. 15, 1, 1993.

Bayoumi, Tamim and Barry Eichengreen, "One Money or Many? Analyzing the Prospects for Monetary Unification in Various Parts of the World," *Princeton Studies in International Finance*, No.76, September 1994.

Bayoumi, Tamim and Barry Eichengreen, "Ever Closer to Heaven? An Optimum-Currency-Area Index for European Countries," *European Economic Review* 41, 1997, 761-770.

Bayoumi, Tamim and Eswar Prasad, "Currency Unions, Economic Fluctuations and Adjustment: Some Empirical Evidence," Centre for Economic Policy Research, Discussion Paper Series, No. 1172, May 1995.

Bean, Charles R., "Economic and Monetary Union in Europe", *Journal of Economic Perspectives*, Vol. 6, Number 4, Fall 1992, 31-52.

Bini Smaghi, Lorenzo and Silvia Vori, "Rating the EU as an Optimal Currency Area," Banca d'Italia, Discussion Paper, No. 187, 1993.

Blanchard, Olivier, Jean and Lawrence F. Katz, "Regional Evolutions," *Brookings Papers on Economic Activity*, 1, 1992.

Blanchard, O., R. Dornbusch, P. Krugman, R. Layard, and L. Summers, *Reform In Eastern Europe*, MIT Press, 1991.

Bofinger, Peter, "Is Europe an Optimum Currency Area?" Centre for Economic Policy Research, Discussion Paper Series, No. 915, February 1994.

Bofinger, Peter, Heiner Flassbeck and Lutz Hoffmann, "Orthodox Money-Based Stabilization (OMBS) versus Heterodox Exchange Rate-Based Stabilization (HERBS): The Case of Russia, The Ukraine and Kazakhstan", *Economic Systems*, Vol. 21, No.1, March 1997.

Boone, L., "Symmetry and Asymmetry of Supply and Demand Shocks in the European Union: A Dynamic Analysis," 1997, Document de travail CEPII, 97-03.

Boone, L. and Mathilde Maurel, "An Optimal Currency Area Perspective of the EU Enlargement to the CEECs," *CEPR* London, Discussion Paper No. 2119, 1999.

Bruno, Michael, "High Inflation and the Nominal Anchors of an Open Economy," *Essays in International Finance*, No. 183, Department of Economics, Princeton University, June 1991.

Buiter, Willem, H., "Macroeconomic Policy During a Transition to Monetary Union," Centre for Economic Policy Research, No. 1222, August 1995.

Calvo, Guillermo A., "On Dollarization," University of Maryland, April 1999, mimeo.

Canzoneri, Matthew B. and Carol Ann Rogers, "Is the European Community an Optimal Currency Area? Optimal Taxation versus the Cost of Multiple Currencies," *American Economic Review*, Vol. 80, No. 3, June 1990.

Chamie, Nick, Alain DeSerres, and René Lalonde, "Optimum Currency Areas and Shock Asymmetry. A Comparison of Europe and the United States," Bank of Canada, Working Paper 94-1, 1994.

Cohen, D. and Charles Wyplosz, "The European Monetary Union: An Agnostic Evaluation," Discussion Paper No. 306, Centre for Economic Policy Research, London, 1989.

Commission of the European Communities, "One Market, One Money," *European Economy*, 44, 1990.

Corsetti, Giancarlo and Paolo Pesenti, "Self-Validating Optimum Currency Areas," Federal Reserve Bank of New York, May 2002.

Corden, Max, "The Adjustment Problem" in Krause and Salant (eds.), *European Monetary Unification and its Meaning for the United States*, Washington, Brookings, 1973, 159-184.

Demopoulos, George D. and Nicholas A. Yannacopoulos, "Conditions for Optimality of a Currency Area," *Open Economies Review*, 10, 1999, 289-303.

Dibooglu, Selahattin and Julius Horvath, "Optimum Currency Areas and European Monetary Unification," *Contemporary Economic Policy*, 1997, Volume 15, Number 1, 37-49

Dornbusch, Rudiger, "Inflation, Exchange Rates and Stabilization" *Essays in International Finance* No. 165, Princeton University, International Finance Section, October 1986.

Dornbusch, Rudiger, F. Sturzenegger, and Holger Wolf, "Hyperinflations: Sources and Stabilization," *Brookings Papers on Economic Activity*, 2, 1990.

Edwards, Sebastian, "Exchange Rates as Nominal Anchors," *Weltwirschaftliches Archiv*, 1993, Band 129, Heft 1, 1-32.

Fatas, Antonio, "EMU: Countries or Regions? Lessons from the EMS Experience," *European Economic Review*, 1997, 4, 743-751.

Feldstein, Martin, "Why Maastricht Will Fail," *The National Interest*, 1993, No. 32, Summer.

Feldstein, Martin, "EMU and International Conflict," *Foreign Affairs*, November-December, 1997, 60-73.

Fontagne, Lionel and Michael Freudenberg, "Endogenous Symmetry of Shocks in a Monetary Union," *Open Economies Review*, 1999, 10, 263-287.

Fidrmuc, Jan, Julius Horvath and Jarko Fidrmuc, "Stability of Monetary Unions: Lessons from the Break-up of Czechoslovakia," *Journal of Comparative Economics*, Vol. 27, No. 4, December 1999, 753-81.

Fidrmuc, Jarko and Iikka Korhonen, "The Euro Goes East: Implications of the 2000-2002 Economic Slowdown for Synchronisation of Business Cycles between the Euro Area and CEECs," BOFIT Discussion Papers, Bank of Finland, 2003, No. 6.

Fidrmuc, Jarko and Iikka Korhonen, "Similarity of Supply and Demand Shocks between the Euro Area and the CEECs," BOFIT Discussion Paper 13, Bank of Finland, Institute for Economies in Transition, Helsinki, 2001.

Fidrmuc, Jarko, "Endogeneity of the Optimum Currency Area Criteria, Intraindustry Trade, and EMU Enlargement," Discussion Paper No. 106/2001, Centre for Transition Economics, *Katholike Universiteit, Leuven*, 2001.

Fischer, Stanley, "Stability and Exchange Rate Systems in a Monetarist Model of the Balance of Payments," in Robert Z. Aliber, Allanheld, Osmun and Co. (eds.), *The Political Economy of Monetary Reform*, 1977.

Fischer, Stanley, "Exchange Rates versus Money Targets in Disinflation," in Stanley Fischer, ed., *Indexing, Inflation, and Economic Policy*, MIT Press, 1986, 247-262.

Fleming, Marcus J. "On Exchange Rate Unification," *Economic Journal*, Vol. 81, 1971, 467-88.

Flood, Robert F., "Capital Mobility and the Choice of Exchange Rate System," *International Economic Review*, Vol. 20, 1979, 405-16.

Frankel, Jeffrey A. and Andrew K. Rose, "The Endogeneity of the Optimum Currency Area Criteria," revised draft, 1997, mimeo.

Frenkel, Jacob A. and Joshua Aizenman, "Aspects of the Optimal Management of Exchange Rates," *Journal of International Economics*, Vol. 13, 1982.

Frenkel, Michael and Christiane Nickel, "How Symmetric are the Shocks and the Shock Adjustment Dynamics between the Euro Area and Central and Eastern European Countries," Working Paper No. 02/222, International Monetary Fund, 2002.

Funke, Michael, "The Nature of Shocks in Europe and in Germany," *Economica*, 1997, 64, 461-69.

Ghosh, Atish R. and Holger C. Wolf, "How Many Monies? A Genetic Approach to Finding Optimum Currency Areas", *National Bureau of Economic Research*, 1994, July, Working Paper # 4805.

Giavazzi, Francesco and Alberto Giovannini, *Limiting Exchange Rate Flexibility, The European Monetary System*, MIT Press, 1989.

Giavazzi, F., and M. Pagano, "The Advantage of Tying One's Hands: EMS Discipline and the Central Bank Credibility," *European Economic Review*, 1988, Vol. 32.

Giersch, Herbert, "On the Desirable Degree of Flexibility of Exchange Rates," *Weltwirtschaftliches Archiv*, 1973, Band 109, 191-213.

Goldberg, Linda S., "Is Optimum Currency Area Theory Irrelevant for Economies in Transition?" in R.J. Sweeney, C. Wihlborg and T.D. Willett (eds.), *Exchange Rate Policies for Emerging Market Economies*, Westview Press, 1999, 45-60.

Goodhart, Charles, "Economists' Perspectives on the EMS. A Review Essay," *Journal of Monetary Economics*, 26, 1990, 471-487.

Goodhart, Charles, "The Political Economy of Monetary Union," in Peter B. Kenen (ed.), 1994, 450-505.

Goodhart, Charles, "European Monetary Integration," *European Economic Review*, 1996, 40, 1083-1090.

Grabowski, Richard and Julius Horvath, "Economic Integration in Central America and the Caribbean," *Journal of Economic Development*, 1999, Volume 24, Number 1, 121-132.

Grandes, Martin, "Southern Africa's Monetary Area: an Optimal Currency Area?" *DELTA,* École des Hautes Études en Sciences Sociales/École Normale Supérieure, July 2003

Grauwe, Paul de and Wim Vanhaverbeke, "Is Europe an Optimum Currency Area? Evidence from Regional Data," Centre for Economic Policy Research, Discussion Paper Series, No. 556, 1991.

Grauwe, Paul de, *The Economics of Monetary Integration*, Second Revised Edition, Oxford University Press, 1994.

Grubel, Herbert G. "The Theory of Optimum Currency Areas", *Canadian Journal of Economics*, 1970, May, 318-324.

Guitián, Manuel, "The Choice of an Exchange Rate Regime," in Barth and Wong (eds.) *Approaches to Exchange Rate Policy*, IMF Institute, 1994.

Haberler, Gottfried, "The International Monetary System: Some Recent Developments and Discussions," in *Money in the International Economy,* Halm (ed.), 1970.

Halm, George, (ed.), *Approaches to Greater Flexibility of Exchange Rates: The Burgenstock Papers*, Princeton University Press, 1970.

Hagen von, Jürgen and Manfred J.M. Neumann, "Real Exchange Rates within and between Currency Areas: How Far Away Is EMU?" *Review of Economics and Statistics*, 1994 August, 236-244.

Helpman, Elhanan, "An Exploration in the Theory of Exchange-Rate Regimes," *Journal of Political Economy*, 1981, vol. 89, No.5, 865-890.

Helpman, Elhanan and Assaf Razin, "A Comparison of Exchange Rate Regimes in the Presence of Imperfect Capital Markets, " *International Economic Review*, Vol. 23, No. 2, June 1982.

Horvath, Julius and Richard Grabowski, "Prospects of African Integration in Light of the Theory of Optimum Currency Areas," *Journal of Economic Integration*, 1997, Volume 12, Number 1, 1-25.

Horvath, Julius and Jiri Jonas, "Exchange Rate Regimes in the Transition Economies: Case Study of the Czech Republic: 1990-1997," ZEI University of Bonn, Policy Paper B-11, 1998.

Horvath, Julius, "Supply and Demand Shocks in Europe: Large-4 EU Members, Visegrad-5 and Baltic-3 Countries, Central European University, 2000, mimeo.

Horvath, Roman and Lubos Komarek, "Optimum Currency Area Theory: An Approach for Thinking about Monetary Integration," *Warwick Economic Research Papers*, Department of Economics, No. 647, August 2002.

Ingram, James C., "Comment: The Currency Area Problem." in *Monetary Problems of the International Economy*, Robert A. Mundell and Alexander R. Swoboda (eds.), The University of Chicago Press, Chicago and London, 1969.

Ingram, James C., "Comments," in Krause and Salant (eds.), *European Monetary Unification and its Meaning for the United States*, Washington, Brookings, 1973, 184-191.

Ishiyama, Yoshihide "The Theory of Optimum Currency Areas: A Survey," *Staff Papers International Monetary Fund*, 1975, Vol. 22, pp.344-83.

Johnson, Harry G., "The Case for Flexible Exchange Rates, 1969," in Halm (1970), 91-111, Reprinted in Johnson, 1973.

Johnson, Harry G., *Further Essays in Monetary Economics*, Harvard University Press, 1973.

Kareken John, and Neil Wallace, "On the Indeterminacy of Equilibrium Exchange Rates," *The Quarterly Journal of Economics*, May 1981, pp. 207-222.

Kenen, Peter, "The Theory of Optimum Currency Areas: An Eclectic View," in Mundel and Swoboda (eds.) *Monetary Problems in the International Economy*, University of Chicago Press, 1969.

Kenen, Peter, *Economic and Monetary Union in Europe*, Cambridge University Press, 1995.

Kenen, Peter, ed. *Understanding Interdependence: the Macroeconomics of the Open Economy*, Princeton University Press, Princeton, New Jersey, 1994.

Krause, Lawrence B. and Walter S. Salant ed. *European Monetary Unification and Its Meaning for the United States*, The Brookings Institution, Washington, 1973.

Krugman, Paul, *Geography and Trade*, Cambridge, MIT Press, 1991.

Krugman, Paul, "Lessons of Massachusetts for EMU," In F. Torres and F. Giavazzi ed. *Adjustment and Growth in the European Monetary Union*, 1993.

Krugman, Paul, "What Do We Need to Know about the International Monetary System?" in Kenen ed. 1994

Krugman, Paul and Lance Taylor, "Contractionary Effects of Devaluation," *Journal of International Economics*, 1978, 8, August, 445-56.

Krugman Paul and Anthony Venables "Integration and the Competitiveness of Peripheral Industry." In Bliss and de Macedo, eds. *Unity with Diversity in the European Community*, Cambridge University Press, 1990, 56-75.

Lafrance, Robert and Pierre St-Amant, "Optimum Currency Areas: A Review of the Recent Literature," Bank of Canada Working Paper, 1999, 99-16.

Lucas, Robert and Nancy Stokey, "Money and Interest in a Cash-in-Advance Economy," *Econometrica*, May 1987, 55, No. 3, 491-513.

Machlup, Fritz, *A History of Thought on Economic Integration*, Columbia University Press, 1977.

Masson, Paul R. and Mark P. Taylor, (eds.), *Policy Issues in the Operation of Currency Areas*, Cambridge University Press, 1993.

Masson, Paul R. and Mark P. Taylor, " Optimal Currency Areas: A Fresh Look at the Traditional Criteria", in Siklos (ed.), *Varieties of Monetary Reforms*, Kluwer Academic, 1994.

Masson, Paul R. and Mark P. Taylor, "Currency Unions: A Survey of the Issues," in Masson and Taylor (eds.), *Policy Issues in the Operation of Currency Unions*, Cambridge University Press, 1993, 3-51.

McKinnon, Ronald I., "Optimum Currency Area," 4, *American Economic Review*, 1963, September, 717-725.

McKinnon, Ronald I., "Comment" in Mundel and Swoboda (eds.), *Monetary Problems in the International Economy*, University of Chicago Press, 1969.

Melitz, Jacques and Axel A. Weber, "The Costs/Benefits of a Common Monetary Policy in France and Germany and Possible Lessons for Monetary Union," European University Institute, Florence, Robert Schuman Centre, 1997, Working Paper RSC No. 97/37.

Mélitz, Jacques, "The Current Impasse in Research on Optimum Currency Areas," *European Economic Review*, 1995, 30, 492-500.

Minford, P. "Discussion of Bayoumi and Eichengreen," in Torres and Giavazzi (eds.) *Adjustment and Growth in the European Monetary Union*, Cambridge, Cambridge University Press, 1993.

Minford, Patrick, "Other People's Money: Cash-in-Advance Microfoundations for Optimal Currency Areas," *Journal of International Money and Finance*, 14 1995, 3, 427-440.

Mintz, Norman N., "Monetary Union and Economic Integration", *The Bulletin,* New York University Graduate School of Business Administration, Institute of Finance, No.64, April 1970.

Mkenda, Beatrice Kalinda, "Is East Africa an Optimum Currency Area?" Working Paper No. 41, Department of Economics, Göteborg University, April 2001.

Mongelli, Francesco Paolo, "'New' Views on the Optimum Currency Area Theory: What is EMU Telling Us," European Central Bank, Working Paper Series, April 2002, Working Paper No. 138.

Mundell, Robert A., "A Theory of Optimum Currency Areas," *American Economic Review*, 1961, 657-665.

Mundell, Robert A., "Comment" in Mundel and Swoboda (eds.), *Monetary Problems in the International Economy*, University of Chicago Press, 1969.

Mundell, Robert A., "Updating the Agenda for Monetary Union," in M. I. Blejer, Jacob A. Frenkel, Leonardo Leiderman, and Assaf Razin (eds.), *Optimum Currency Areas, New Analytical and Policy Developments*, International Monetary Fund, 1977, 29-48.

Neumeyer, Pablo Andres, "Currencies and the Allocation of Risk: The Welfare Effects of a Monetary Union," American Economic Review, Vol. 88, No.1, March 1998, 246-259.

Niehans, Jürgen, *International Monetary Economics*, John Hopkins University Press, 1984.

Poole, William, "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model," *Quarterly Journal of Economics*, Vol. 84, May 1970.

Presley, John R. and Geoffrey E.J. Dennis, *Currency Areas, Theory and Practice*, MacMillan Press, 1976.

Puhani, Patrick A., "Labour Mobility – An Adjustment Mechanism in Euroland? Empirical Evidence for Western Germany, France, and Italy," Discussion Paper No. 34, March 1999, IZA, Bonn.

Ricci, L., "A Model of an Optimum Currency Area," International Monetary Fund, 1997, Working Paper 97/76.

Rose, Andrew K., "After the Deluge: Do Fixed Exchange Rates Allow Inter-Temporal Volatility Trade-Offs?" 1995, CEPR Discussion Paper 1240.

Rose, Andrew K., "One Money, One Market: Estimating the Effect of Common Currencies on Trade," University of Berkeley, Haas School of Business, February 2000, mimeo.

Salant, Walter S., "Discussion" in Krause and Salant (eds.), *European Monetary Unification and its Meaning for the United States,* Washington, Brookings, 1973, 201-202.

Siklos, Pierre L. (ed.), *Varieties of Monetary Reforms: Lessons and Experiences on the Road to Monetary Union*, 1994, Kluwer Academic Publishers.

Sweeney, Richard, Clas G. Wihlborg, and Thomas D. Willett (eds.), *Exchange Rate Policies for Emerging Market Economies*, Westview Press, 1999.

Swoboda, Alexander, "Robert Mundell and the Theoretical Foundation for the European Monetary Union," *Views and Commentaries,* International Monetary Fund, December, 1999, www.imf.org /external/np/vc/1999/121399.htm

Tavlas, George S., "The 'New' Theory of Optimum Currency Areas", *The World Economy*, Vol. 16, 1993, 663-685.

Tower, E. and T. D. Willett, "The Theory of Optimum Currency Areas and Exchange-Rate Flexibility: A More General Framework," *Special Papers in International Economics* 11, Princeton University, 1976.

Vaubel, Roland, "Currency Unification, Currency Competition, and the Private ECU: Second Thoughts," in *International and European Monetary Systems*, Emil-Maria Claassen (ed.), Praeger, 1990.

Vaubel, Roland, "The Centralization of Western Europe, The Common Market, Political Integration, and Democracy," Institute of Economic Affairs, Hobart Paper 127, 1995.

Vinals, Jose, "European Monetary Integration: A Narrow or a Wide EMU?" *European Economic Review*, 1996, 40, 1103-1109

Weber, Axel A., "EMU and Asymmetries and Adjustment Problems in the EMS: Some Empirical Evidence," CEPR, Centre for Economic Policy Research, 1990, Discussion Paper No. 448.

Whitt, Joseph A. Jr., "European Monetary Union: Evidence from Structural VARs", Federal Reserve Bank of Atlanta, Working Paper Series, 1995-1, March 1995.

Willett D. Thomas, "Some Often Neglected Aspects of the Political Economy of European Monetary Integration in Abegaz et al. (eds.), *The Challenge of European Integration*, Westview Press, 1994.

Willett, D. Thomas and Clas Wihlborg, "The Relevance of the Optimum Currency Area Approach for Exchange Rate Policies in Emerging Market Economies," in Sweeney, Wihlborg, and Willett (eds.), 1999, 61-79.

Willett, D. Thomas, "The OCA Approach to Exchange Rate Regimes: A Perspective on Recent Developments," prepared for conference on "Should Canada and the US Adopt a Common Currency," Western Washington University, April 1999, mimeo version 2001.

Yuen, Hazel, "Is Asia an Optimum Currency Area? 'Shocking' Aspects of Output Fluctuations in East Asia," Department of Economics, National University of Singapore, August 2000, mimeo

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