

markets. Another up-dated estimation was performed by Ngiam and Yuen (2006) using the data up to 1997 and adding some other countries. According to their empirical investigation, they found that supply disturbances were correlated for eight clusters of countries, but they suggested that only three of them were plausible candidates: (1) Brunei, Singapore, and Malaysia, (2) Japan and Korea, and (3) Taiwan and Hong Kong.

A slightly different approach has been adopted to examine the similarity of supply shocks directly by Chow and Kim (2001), Maskey (2003), and Sato and Zhang (2006). Since the appropriate data for an AD-AS model were not available for the structural VAR estimation, these authors utilized the disturbances obtained from a simpler time-series model of real GDP growth. Chow and Kim (2001) constructed a three-equation structural VAR model with changes in global, regional, and local outputs which were driven by the corresponding three disturbances. In order to recover the underlying coefficients, they imposed the identification restrictions that neither regional nor domestic shocks have long-run effects on global output, and country-specific shocks have no long-run effects on regional output. After performing several robustness tests, they concluded that dominant shocks were country-specific and regional shocks were far less important, implying that a monetary union would be more costly in East Asia. Maskey (2003) examined the shock similarity for the seven SAARC (the South Asian Association for Regional Cooperation) countries for the period from 1980 to 2000 with residuals of the growth regressions taken to represent the underlying disturbances. He found that quite a few correlations were statistically significant, suggesting that the SAARC countries did not face symmetric patterns of shocks required for a monetary union. Another pessimistic statistical conclusion was reported by Sato and Zhang (2006) using the Johansen cointegration test for 11 countries (8 ASEAN countries plus China, Japan, and the U.S.) with the quarterly output series for 1978-2004. They found that the long-run output co-movement existed for only three clusters of countries: (1) Japan, Korea, Taiwan and Hong Kong, (2) Singapore, Thailand, and China, and (3) Malaysia and Thailand.

A general consensus drawn from these empirical investigations is that the countries in East Asia would seem to be "more or less as plausible candidates for internationally harmonized monetary policies as the members of the European Union", based on the so-called OCA index estimation (E=B, 1999, p.360). However, if we take a closer look at one of the OCA criteria, the similarity of shocks, which is thought to be crucial for the cost side of a monetary union, the matter is not so simple. At the present moment, only a few clusters of Asian countries were identified as suited to form small, intermediate monetary unions. This implies that a monetary union encompassing the entire East Asian region might be an overzealous prospect (Tan, 2003, p.397). The problem seems to be boiled down to a question of how significant the criterion of shock similarity is among the OCA criteria.

On the one hand, B=E (1994) and Masson and Taylor (1993, p.17) consider that the similarity of shocks is the most important OCA criterion, because it eliminates the problems arising from conflicting policy prescriptions about the country's optimal exchange rate policy.

On the other hand, Ngiam and Yuen (2001, p.397) cast some doubt on its importance, based on their observation of the monetary union between Brunei and Singapore (MUBS). Although the vast divergence in economic structure in Asian countries has been well-documented by Ngiam and Yuen (2001), the MUBS has been well-functioning and relatively stable, notwithstanding the dissimilarity of supply shocks (Tan, 2003, pp.396-397). Hence, Ngiam and Yuen (2001) proposed a gradual approach to undertake a monetary union encompassing the entire East Asian region. It remains to be seen whether this symmetric property of shocks is actually important, or whether some other factors or the OCA criteria override the importance.

#### 4.1.4.b Endogeneity in Asia

What has been a relevant issue for the importance of shock similarity could again be seen as the *endogeneity* issue of monetary integration discussed in Section 4.1.1. If a monetary union endogenously foster sectoral specialization of production for some member countries, then it would not be difficult to imagine that eventually their shocks would likely be *asymmetric*. Thus, the Krugman specialization hypothesis would likely support Ngiam and Yuen (2003).

Several important empirical contributions have been found for promoting future monetary integration in Asia. Using a data set of annual real GDP for 12 Asian countries over the period 1976-1997, Shin and Wang (2003) found that intra-industry trade, rather than inter-industry or the volume of trade itself, is the major channel through which their business cycles become synchronized. Girardin (2004) hypothesized that business cycle synchronization is dependent on the phases of the cycles, and thus employed a regime-switching VAR model to examine correlations of income, exports, and capital flows between 9 Asian countries against Japan with data covering 1975:Q2-2002:Q2. He found that foreign direct investment from Japan was shown to be "a major engine for inter-industry trade" (p.151) in East Asia, both inside the region and with the outside world, and hence contributed to higher business cycle synchronization.

If a monetary union is formed by a group of Asian countries, the problem of exchange rate pass-through disappears because the exchange rate is irrevocably fixed among the member countries. Thus, a natural question arises as to how serious the pass-through effects are at present among Asian countries. According to a recent empirical study by Parsons and Sato (2006), pass-through is "far less prevalent, and indeed may be virtually non-existent" in some East Asian countries. They attributed this lack of pass-through not to the segmented markets or price discrimination, but rather to the fact that the sample countries are all small and export to relatively integrated world markets. Another reason suggested by them is the widespread use of US dollar invoicing. This suggests that maintaining a stable exchange rate value against the US dollar is an utmost necessity in a monetary union by Asian countries.

As a final word of warning, we should mention again that these empirical literatures have never examined whether each candidate country could have positive (or at least non-negative) net benefits from monetary integration as a whole. Their interests have rested on whether only the "OCA index" with some or just one of the OCA criteria, has been at the stage of being at a comparable level with those of the EU or Euroland, or some other monetary integration (e.g. the United States). However, it should be mentioned that the OCA index (the forecasted standard deviation of bilateral exchange rate) itself is subject to "endogeneity". In other words, the OCA index itself may be influenced by monetary integration (S-3), which has also been approximated by the degree of "financial deepening" (or financial or monetary "depth") in the literature. A quick glance at the following Figures 3.a and 3.b yields interesting preliminary insights for this endogeneity for a sample of 15 European countries and 9 Asian countries examined by Bayoumi and Eichengreen (1997) and Aminian (2005), respectively.

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 Insert Figures 3.a and 3.b around here  
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In the Figures, "financial depth" is proxied by the ratio of money plus quasi money to GDP, as in the conventional literature, e.g. Aminian (2005), Levy Yeyati (2006), and De Nicoló, Honohan, and Ize (2005). The figures suggest that the OCA index would be positively but negatively influenced by monetary depth in Figure 3.a and 3.b, respectively, implying that monetary integration being approximated by "financial depth" due to, say, an increase in local intermediation (e.g. Levy Yeyati, 2006) would increase or decrease the OCA index. Thus, Figures 3.a and 3.b cast some doubts on deducing empirical messages from the results of the "reduced form" regressions for the OCA index in the literature, and call for future research that could cope with the endogeneity. While Figure 3.a suggests that financial depth seems to promote specialization in Europe, Figure 3.b implies that, on the contrary, financial depth seems to advance more business cycle synchronization in Asia. This difference in endogeneity between Europe and Asia seems to suggest that specialization would be eventually more likely as countries' financial depth proceeds in a form of, say, an increase in local intermediation, as the degree of financial integration is higher in Europe than in Asia.<sup>72</sup>

A more fundamental issue for Asian countries to form a monetary union is probably whether it is possible to establish a regional central bank that assumes the role of the lender of the last resort (LLR) without at the same time pursuing a broader process of political integration for which there is little appetite in Asia. Aminian (2005) is more specific about Asian monetary cooperation, and mention two "crucial" issues; one is the LLR and the other

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<sup>72</sup> Aminian (2005, p.95) mentions that, in East Asia, contrary to a traditional trend, "the financial proposals are moving faster than any serious intention of trade and investment cooperation." Thus, as Gounder and Sen (2005) implies, if the Asian foreign exchange markets have long been integrated, specialization in production may not be a necessary consequence for Asia.

is the choice of the common currency (S-5). Both are concerned with the problem of which country assumes the leadership: Japan “is not ready to assume the role of” LLR, but “China is believed to be opposed to Japan’s leadership” (p.107). There are two options for the anchor currency; one is the Japanese yen, and the other is a basket of regional currencies (p.108). Although the choice of yen as the anchor seems to be gaining more interest, it “is not yet internationalized enough”(p.108). Because of the “fear of Japanese hegemony” by Asian countries, and the differences in “diverse interests and prospects” between China and Japan (Mundell, 2000, p.289), “a basket only on the basis of regional currencies (Asian Currency Unit)” might be a more appropriate alternative (Aminian, 2005, p.108).<sup>73</sup> In sum, as Eichengreen and Razo-Garcia (2006) also suggest, the Asian monetary union may not be on the agenda in the near future, because of the complex and unfortunate historical developments and political experiences in Asian countries since the last century. While monetary and political integration have gone hand in hand in Europe (see Baldwin and Wyplosz, 2004, chap. 1 for the process of cooperation towards European integration by France and Germany), Asia has not been ready for such cooperation. Put differently, monetary union in Asia would be difficult, if not impossible, unless Asian countries satisfy the necessary condition (N-9), political intention.<sup>74</sup>

## 4.2 Remaining Issues

As Mundell (2000) stressed, unless the world is “ruled by a single power or a world government”, a world currency would not be possible. The real world “is divided into economies and currency areas of greatly different sizes”, with different national currencies or common currencies. Along with this line of reasoning, several outstanding issues are apparent, and we will discuss these in this subsection. Specifically, we will focus on issues such as changes in welfare for countries both inside and outside of the monetary union, the optimum number of currencies in the world, and integration processes after monetary union.

### 4.2.1 Welfare implications

This section reviews the literature on changes in the social welfare, since the non-negativity of net benefits being the necessary *and* sufficient condition for creation of monetary union is equivalent to Pareto-improvement of the social welfare. Table 5 summarizes several recent articles analyzing the welfare effects of monetary union. Several

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<sup>73</sup> A similar problem of the choice of the anchor currency for the CEEC countries is examined by B nnasy-Qu  r   and Lahr  che-R  vil (2000).

<sup>74</sup> See also Eichengreen (2006, p.16) who mentioned recent tensions between China and Japan over the Yasukuni Shrine as an example of the lack of the requisite political solidarity in Asia.

noteworthy characteristics in the table attract our attention. First, the recent analytical models are dominated by the so-called New Open Economy Macroeconomic (NOEM) model which incorporates some nominal rigidities due to market imperfectness (e.g., monopolistic competition). This model is necessarily highly non-linear which makes it almost impossible to derive the solutions in clear-cut closed forms. Thus, these studies are obliged to rely on a calibration of the approximated solutions, and therefore, these calibrated results may, unfortunately and unintentionally, reflect errors or noises. Therefore, we have to interpret the calibrated results with utmost caution.

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 Insert Table 5 around here  
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Secondly, they focused on one of the *necessary* or *sufficient* conditions of the OCA theory independently, and examined whether it would enhance the social welfare after forming or joining a monetary union. This means that possible changes in the welfare level are investigated on a *ceteris paribus* base. Thus, we could think of a large, positive, overall effect of monetary union by summing up those independent effects, unless they cancel out each other.<sup>75</sup>

Thirdly, almost all of the models considered 2 or 3 *large* countries, and differences in welfare were examined and compared between the floating exchange rate system and the monetary union (or the fixed system). The difference in the model constructed with 2 or 3 countries rests on a fact that at least 3 countries are necessary to identify the welfare level of the member countries of monetary union (“ins”) and the non-members (“outs”).

This last characteristic emphasizes the costs and benefits of which model to employ for the welfare implication of monetary union. Put differently, it calls attention to the limitations of calibrated results from another aspect of interaction between large entities. As emphasized in the international economics literature, the main driving force for most of the large country models is the (net barter) terms of trade. Although the NOEM describes an important phenomenon of imperfect competition in the modern economies, the main driving force of the adjustment mechanism through changes in the terms of trade is lost in all of the calibrated literature using the NOEM simply because they lack closed-form solutions.<sup>76</sup>

The welfare aspect of monetary union has been stressed from one of macroeconomic efficiency gain in macroeconomic sufficient conditions, i.e., condition (S-9). We have already reviewed, as Rose and van Wincoop (2001) implies, that there exist clear gains from trade (the Rose effect). The welfare levels of “ins” necessarily increase, simply because the increased volume of trade after monetary union are more than three times the volume before

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<sup>75</sup> Deltas and Tavlas (2005b) is exceptional, as their finding that “the benefits are greater when the degree of nominal rigidity is high” (p.917) contrasts with the conventional view discussed in section 2.

<sup>76</sup> Akiba (2007) uses a conventional Heckscher-Ohlin model to emphasize the effects of terms of trade for monetary union with the closed-form solutions.

monetary union, as empirically shown by, e.g. F=R (2002). However, since a monetary union is considered as a “large country”, a natural question is raised as to whether such an increase in trade for “ins” has had an adverse effect on “outs”. Put differently, whether the gains for “ins” have been reaped with the sacrifice (impoverishment) of “outs” by changing the terms of trade. If the terms of trade are changed by monetary union, then the change would necessarily entail the trade creation and the trade diversion effects.

From empirical investigations for the samples of over 200 countries in F=R (2002, p.461), 22 industrial countries in Faruquee (2004, p.11), and 7 south Asian countries in Saxena (2006, p.646), they reported that there is no evidence of trade diversion effects, but that the move to a currency union is more likely to lead to trade creation. According to year by year estimates by Baldwin and Taglioni (2004), it seems that trade creation for pairs of EMU countries has been boosted more than for pairs of EMU countries with other countries.<sup>77</sup> This is a surprising finding. Since, according to a conventional textbookish explanation for economic integration (e.g. K=O, 2003, pp.243-246), the gains are tied to trade creation, and the losses are tied to trade diversion, these empirical investigations suggest that there are only the welfare gains for monetary union. However, to the authors’ knowledge, no one has considered how those gains have been redistributed among “ins” and possibly “outs”.<sup>78</sup>

The bottom line of the finding that countries in monetary union reap tremendously (i.e. 3 times) large gains from trade only through “trade creation” casts some light on the so-called Pricing-to-Market phenomenon (e.g. Obstfeld, 2002) and the Home Bias puzzle (Obstfeld and Rogoff, 2001). Because there should be no exchange rate “Pessimism” (Obstfeld, op.cit. p.24) and no exchange-rate risk for Home Bias (Artis and Fellow, 2006, pp.250-251; Obstfeld and Rogoff, op.cit. pp.341-349) in monetary union, we would expect an increase in bilateral trade among “ins”.<sup>79</sup>

#### 4.2.2 The Optimum Number of Currencies

The preceding investigation on the endogeneity of the OCA theory is also applied here to

<sup>77</sup> Langhammer and Schweickert (2006) mentioned, however, that trade diversion (discrimination effect) was, although likely to be small, observed in the European countries in the past. M=S=O (2003) also found no evidence of trade diversion in the 15 EU countries, but Baldwin (2006a) mentions that the trade diversion effect is not fully controlled for in M=S=O. Lane (2006, p.57) succinctly summarizes possible reasons offered in recent empirical research.

<sup>78</sup> As mentioned before, Aristoteleous (2006) analyzed the differences between the gains from trade by joining a monetary union for 11 EMU countries (i.e., among “ins”) from 1992 to 2003, and found that the differences were in fact significant. The gains from trade for several countries (Austria, France and Greece) are even “negative and statistically significant” (p.24).

<sup>79</sup> Recall an important contribution by Kalemli-Ozcan, Sørensen and Yosha (2001) mentioned in section 4.1.1 who stressed the importance of gains from consumption risk-sharing, implying that countries facing more asymmetric business cycles may gain most from consumption *risk-sharing*. See also Demyanyk and Volosovych (2005).

the global economy for the long-standing issue of the optimum number of currencies in the world (Mundell, 1961), which has still not yet been resolved. We will show below that the empirical finding of endogeneity (or specialization) in monetary union has potentially significant implications on this issue. McCallum (2003, p.8) summarizes “the crucial tradeoff identified by Mundell” (ibid.). The tradeoff means the balance between the efficiency benefits from money and the costs of tailoring monetary policy (see Figure 4).

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Insert Figure 4 around here

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In the figure, the horizontal axis measures the number of currencies, while the vertical axis measures the efficiency benefits of money and the costs of stabilization by money. The former is depicted by the downward sloping BB curve, because “the wider the area, the greater the efficiency benefits” (McCallum, 2003, p.8). The latter is depicted by the upward sloping dotted line, reflecting the fact that “the smaller the area, the greater are the possibility of tailoring monetary policy to (temporary) local needs” (ibid. p.8). The tradeoff is balanced at the intersection at point C that determines the optimum number of currencies in the world.<sup>80</sup>

If the number of currencies in the world corresponds to the inverse of the integration (or disintegration), we notice that Figure 4 is nothing but the mirror image of Figure 1 around the vertical axis. We have already discussed for Figure 1 that the downward slope of the LL curve turns to an upward slope after the threshold level of integration, because deeper integration may encourage local *specialization* that makes monetary union vulnerable to asymmetric shocks and hence costly. If so, the upward sloping CC curve in Figure 4 also turns to a downward sloping curve as integration deepens (i.e., towards the origin). Figure 4 depicts a case where BB and CC curves intersect twice, at points A and B.

Thus, we realize that at least the following three messages are drawn from the modified figure incorporating the possibility of *specialization*. First, only in between A and B, does the benefits exceed the costs of the monetary union. Second, we can also confirm that, while B is a stable tradeoff point, A is unstable. Third, as a result of point A being unstable, once integration deepens and reaches the level corresponding to point A, it seems there are at least two scenarios at present. On the one hand, still further integration would drive the number of currencies in the world to the minimum, i.e. one. The last case of course corresponds to the world “ruled by a single power”, and thus “a world currency would be all but inevitable”. Mundell (2000, p. 282) regards this situation as “ideal” where the efficiency benefits from money are maximized. However, we also know from Figure 4 that the ideal situation ironically implies that the costs of tailoring monetary policy, which exceed the efficiency benefits, are maximized. Thus, whether the “ideal” situation is the same as the “optimal” situation must be reconsidered.

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<sup>80</sup> McCallum (ibid, p.8) also pointed out that the intersection point may not be unique, since BB and CC curves take only integer values, and thus both are essentially step functions. Those curves depicted in Figure 4 are therefore linear approximations.

However, on the other hand, in the second scenario put forth by Buiter (2000) and Rogoff (2001), the former confesses that the answer is hard to give, but based on the trends during the past couple of decades of the advanced industrial countries, he concludes that the number of currencies will be 2.5 among them: "the Euro, the US\$ and something around the Yen or the Yuan" (p.3). The latter, Rogoff, summarizes his predictions over the next two decades in stating that "it would be preferable to retain at least, say, three or four currencies, if not  $n$  currencies", based on the explicit ground that, "when monetary policy is governed by a rule-based environment" in monetary union, "then the gains to international monetary cooperation are not necessarily very large" (p.246).

If monetary integration proceeds further (i.e., deeper and broader) in the future, which of the two scenarios would be more plausible in the long-run poses an interesting future research opportunity.

Let us consider here, as in Figure 1, the effects of an increase in the size and frequency of sudden shocks such as, say worldwide bad harvest due to El Niño or La Niña. Since such an increase pushes the CC schedule upward to CC', the intersection points also move to A' and B'. If the degree of integration is represented by the number of currencies somewhere in between points A and A', say  $n_0$ , *before* the shift of CC schedule, it implies the optimum number of currencies as being more than one,  $n^*$ , in the world. *After* the shifts, however, the optimum number may become one, the "ideal" situation according to Mundell (2000), since the costs now exceed benefits. We would expect that, since the negative net benefits would set inertia in motion toward deeper integration (i.e. smaller number of currencies), the world would eventually arrive at the "ideal" situation advocated by Mundell (ibid.), if we could totally disregard the costs of stabilization by money.<sup>81</sup>

By now it may be clear that the answer to the question raised in section 4.1.1 is affirmative. If the degree of economic integration,  $\theta$ , in Figure 1 is approximated by number of currencies in Figure 4, the upper bound of  $\theta$ , say  $\theta'$ , should correspond to  $n=1$  in Figure 4, *provided* that the costs of monetary integration are totally disregarded.

Before concluding this section, one more thing should be pointed out: Practically speaking, the optimum number corresponding to point B has not yet been known, simply because there has been no agreed welfare measure for the empirical application of the OCA theory.<sup>82</sup>

#### 4.2.3 Moving Forward

<sup>81</sup> If the CC and BB lines happen to intersect at point A on the vertical line starting from 1 (the single currency case), the benefits are equal to the costs. But, as we have discussed, such a point is unstable. If the CC line happens to be tangent to the BB line, the tangential point determines the (unique) optimal number of the world currencies with zero net benefits.

<sup>82</sup> There are no explicit discussions so far about network externalities, although the externalities suggests there should only be one international currency (the euro or the U.S. dollar?) (Eichengreen and Razo-Garcia, 2006; Panel discussion section).



After reviewing and assessing the existing literature on monetary integration, this subsection considers the future course of theoretical developments of monetary union, and predicts some possible alternative paths. Returning to Table 1 (the extended Balassa Stages of Economic Integration), several alternative routes seem to exist in the future.

Specifically, this subsection considers the alternative integration routes of the Euroland in the EU, which has been regarded as one of the representative monetary union at present: Will they go on to the next Stage of integration, or stop at the present Stage forever? If the answer to the former inquiry is affirmative, then will they move on to Fiscal Union first, and then proceed to Political Union? Will Political Union after Fiscal Union be possible? May the process be the other way round; Political Union first, and then Fiscal Union?<sup>83</sup> There are many possible linkages of stages in principle, but to the authors' knowledge, Crowley (2006, p.5) is the first who analyzes these plausible stages, recognizing that integration stages are "path dependent" through "spillover effects", and classifies them as having either forward or backward linkages.<sup>84</sup>

He presents the three plausible scenarios of further integration for the EU post-EMU, as he determines that the EU is at an "intermediate stage" with forward linkage to deeper integration: (1) the EU integration ends at the present **monetary union** stage, and fiscal policy independence is largely retained by member states, (2) the integration moves to **fiscal union** and then there are two possibilities, one is to maintain some weaker version of the SGP, with fiscal coordination and harmonization as the final goal, or the other is to deepen integration further through spillover effects to finally attain **political union**, and (3) the integration jumps directly to **political union** by acquiring supra-national fiscal sovereignty, "as politicians would demand some fiscal powers so as to be effective policymakers" (ibid, p.14).<sup>85</sup>

Unfortunately, no clear-cut answer is selected by Crowley (2006) among these three scenarios for the future integration for the EU. The answer he suggested depends on the endogeneity characteristic of integration (which has been particularly emphasized in the

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<sup>83</sup> Although we discussed that the definition of monetary union is elusive in section 2, so are the definitions of fiscal and political unions (De Grauwe, 2006, p.3). Crowley (2006) defined the former with harmonization of taxes and fiscal sovereignty, while the latter with effective and democratic body at supra-national level.

<sup>84</sup> See De Grauwe (2006) in a similar vein. Since we defined a monetary union in a broad sense, we admit that the degree of fiscal or political integration differ between monetary unions. For example, while the USA and the EU have both been recognized as successful monetary unions, they differ in this respect. The two outstanding features from this difference are (1) seceding is possible for the EU but impossible for the USA, and (2) an income redistributive device is present in the USA but not in the EU. Thus, the sustainability costs of the eurozone are much higher.

<sup>85</sup> von Hagen and Brückner (2002) reviewed the experience of EMU, and present empirical assessment of fiscal and monetary policy by the European Central Bank. Lane (2006, p.63) mentions that, according to Wyplosz (1997), "After all, a primary motivation for European monetary union was to foster political integration in Europe".

present survey of monetary union in Section 4.1.1), since spillover effects would work as a driving force of the endogeneity. Although it is interesting to examine backward linkages of integration, i.e. a linkage as a presumption for the next integration stages, a forward linkage seems to be more important for EMU if the integration stages are in fact "path dependent" as Crowley (2006) stated. Nonetheless, further works concerning which scenarios actually come to pass, or what other scenarios exist, or how fast and by whom those scenarios are materialized, etc. are very much interesting and promising research themes. We close this survey by pointing out three issues for future research.

First, it seems that the reasons for path dependence between monetary union and fiscal or political union (and fiscal and political union) are not necessarily clear and convincing in Crowley (2006), as it is hard to imagine more "political science" and "economic" spillovers separately towards political union. De Grauwe (2006, p.9) is more explicit in this respect by emphasizing the existence of "common purpose" or the "deep variable". He takes up an example of the German unification in 1990 as a "comprehensive political union" made possible by a strong national sense of common purpose. Compared with this unification, he observes that such a deep variable is absent at the Euroland level, implying that the road to a political union in Europe is not easy.

Second, in order for monetary union to move on towards fiscal or political union, net benefits (or the sum of "political science" and "economic" spillovers) must be "positive" (or at least non-negative) if measured appropriately. Otherwise, some member countries may secede from those unions in the long-run. Thus, a technical difficulty arises as to how to measure, sum up, and compare those spillovers with those from monetary union measured in monetary units. And finally, once monetary union manifests itself as unsustainable and breaks up because of some of the reasons enumerated in section 4.1.2 or others,<sup>86</sup> then the former member countries would have several alternative choices, depending on the "backwards" linkage. Two of them are suggested by Crowley (2006); one is a common market, and the other is a customs union. But what is not clear is whether the integration stages are in fact backward "path dependent", and whether going back to the previous stages are possible and plausible.<sup>87</sup> Since the possibility, albeit thin, of unsustainability of the existing monetary unions has been stressed in the literature (see section 4.1.2), it seems worthwhile to examine the "backward linkage" of monetary union.

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<sup>86</sup> De Grauwe (2006, p.8) emphasizes the institutional weakness of the present eurozone governance.

<sup>87</sup> If monetary union breaks up because of "political tensions" between member countries, as mentioned by H=H=W (2002) and Thom and Walsh (2002), it would not be plausible to think about common market or customs union by *all* of the former members, although possible by a part of them. For example, Czechoslovakia went through a "velvet divorce", but maintained a customs union between the Czech Republic and the Slovak Republic until they simultaneously joined the EU in 2004.

## 5. Conclusions

Since the latter half of 1980's, the world economy has witnessed the advance in regionalism going hand in hand with globalism. During the advancement process, regional financial integration has also been deepened. However, as we have examined here, we realize that there still remained a large number of unclear and unresolved issues surrounding monetary unions.

This survey started with a discussion of theoretical analyses by examining the costs and the benefits of monetary union. Following conventional arguments for monetary union, we classified several presumptions for monetary union into necessary and sufficient conditions. Although this distinction is somewhat blurred because of the recently found endogeneity characteristic of the OCA criteria, it may still serve as a good starting point to understand monetary union in general. We pointed out that all of the sufficient conditions would give signs of necessary conditions as the endogeneity gradually reveals in the process of monetary integration.

Since there has been no agreed criterion to measure the welfare gains from monetary union as a whole, empirical investigation has inevitably directed to show whether only a part of the benefits and costs, or the OCA criterion, is in fact at an acceptable level that could be loosely defined as the same or equivalent level of the existing monetary unions. Although many of the empirical investigations have contributed to our understanding of monetary union, it is disappointing that not one has successfully calculated the net benefits of monetary union as a whole. However, we could at least know and judge that the rank (or equivalence) of desirability of a group of candidate countries for forming a monetary union could be judged.

In relatively recent empirical investigations, "endogeneity" of the OCA criteria has been formally found. Although this possibility has long been pointed out since the early 1990s both theoretically and empirically, to date the economic significance has not yet been emphasized. We examined the endogeneity and concluded that, if the endogeneity results in local specialization in production, it would require modification of the conventional OCA theory. We emphasized the significant implications of local specialization in the modified figures, Figures 1, 2, and 3. In this sense, endogeneity (i.e. local specialization) has been the most significant finding for monetary union in recent empirical literature.

In future, it is hoped that some important but unresolved issues such as welfare implications of monetary union, the optimum number of currencies in the world, and the "path dependence" of integration stages for the future of the existing union, e.g. EMU, are clarified.

From the standpoint of the world economy, regional integration is at best the "second best" solution. All of what we have examined in this survey of monetary union is boiled down to this characteristic of monetary union being the non first-best solution. Put differently, a final but important message that cautions us is that the formation of or new accession to a

monetary union always has a possibility of harmful adverse effects on "outs". This has been a reasonably standard argument against any kind of local or regional integrations, since a monetary union is nothing but one of the discriminating preferential trading systems. Langhammer and Schweickert (2006, p.399) clearly state that "Discrimination of third country suppliers against member states is the *raison d'être* of regional integration." Our survey on welfare implications of monetary union only gives an ambiguous impression of potential gains for "outs", and thus confirms the resurgence of a long-feared concern that a monetary union as a form of local or regional integrations could potentially work, whether intentionally or not, as a new device of protectionism against the "outs".

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**Table 1 Extended Balassa Stages of Economic Integration**

	No visible trade restrictions	No Common external trade restrictions	No invisible trade restrictions	Free factor & asset mobility	Common currency	Common economic policy	Democratic Supra-national institutions
Free trade area	○						
Customs union	○	○					
Internal commodity market	○	○	○				
Common market	○	○	○	○			
Monetary union	○	○	○	○	○		
Fiscal Union	○	○	○	○	○	○	
Political union	○	○	○	○	○	○	○

Remarks: Extended by the authors from Nielsen, Heinrich, and Hansen (1992, p.4), Crowley (2006), and Jovanović (2006, p.23)

**Table 2 Aggregation and Homogeneity**

Author	Test	Countries
Swofford (2000)	Aggregation	Austria, France, Finland, Germany, Ireland, The Netherlands
Golinelli and Pastorello (2002)	Homogeneity	Austria, France, Germany, Belgium, Spain The Netherlands
Bayoumi and Eichengreen (1994)	OCA criteria	France, Germany, Belgium, Denmark The Netherlands

**Table 3 Endogenous Repercussion of Monetary Union:  
Output and Price Synchronization (Symmetry)**

Monetary Union	Necessary consequence	→ Integration deepens →				Synchronization (S-8)
	Similar Economic Policy <sup>A</sup>	Fiscal Integration (N-8) & Political Intention (N-9) → Stabilization (S-7)				Increase <sup>H</sup>
	<u>Real Effect</u> Lower Trade Barrier (Transactions Costs) <sup>B</sup> ((N-1) and (S-1))	Knowledge & Technology Spillover (Similar Supply) <sup>C</sup> (N-3) & (N-5)	More International Trade "Rose effect" <sup>D</sup> (S-9) & (S-10)	Productivity Convergence (S-11) and Competition and Growth (N-2) & (S-2)	More Similar Supply , Demand and Trade <sup>F</sup>	
	<u>Monetary Effect</u> Lower Exchange Rate Risk (N-1) & (S-4)	More Demand Spillover (N-6)				Industrial Specialization and Trade <sup>G</sup>
		More Financial Arbitrage (N-5)	More Financial Market Integration (N-4) & (S-3) →(N-7)&(S-5)	Risk Sharing (S-6) <sup>E</sup>		

Notes: A and B: See Frankel and Rose (1998)

C: Coe and Helpman (1995)

D: Rose (2000), Rose and van Wincoop (2002), Frankel and Rose (2002)

E : Kalemli-Ozcan, Sørensen and Yosha (2001), Ching and Devereux (2003)

F: Typically, more intra-industry trade

G: Typically, more inter-industry trade

H: the endogeneity of OCA hypothesis: Frankel and Rose (1998)

I: the Krugman specialization hypothesis: Barro and Tenreyro (2007),

Tenreyro and Barro (2003); Bayoumi and Eichengreen (1993)

(Extended by the authors from Kalemli-Ozcan, Sørensen and Yosha (2001, p.109) and de Grauwe and Mongelli (2005, p.23)).



**Table 4 Aggregate OCA and Maastricht Indices for Asian countries**

Author	Target variable	OCA Index <sup>a</sup> (Williamson Basket)	OCA Index <sup>a</sup> (Bilateral)	OCA Criteria	Maastricht Criteria	Samples Time period, etc.
B=E (1994)	Shock Symmetricity (Bilateral)		EU=J/SK/T & HK/TN/M /SP/(T)			Asia+Oceania (11) 1969-1989
E=B (1999)	ER Variability (Bilateral)	< 0.096*	> EU**	Significant		Asia+Oceania (11) 1976-1995
Oh and Harvie (2001)	Fiscal and Monetary (Maastricht)				Fiscal(good) Monetary (poor)	Asia (9) 1992-1996
B=E=Mauro (2000)	Shock Symmetricity (Bilateral)+ OCA Index		EU=M/P/T	IN/M/SP		Asia+Oceania (11) 1968-1998
Ngiam and Yuen (2001)	Shock Symmetricity			Partially signif. B/SP/M, J/K, and TW/HK		Asia+Oceania (14) 1967-1997
Ng (2002)	Shock Correlations			Significant NAFTA > ASEAN = EU S/M/IN		ASEAN (5) <sup>b</sup> 1970-1995
Chow and Kim (2003)	Shock Symmetricity			Insignificant		East Asia (7) 1971-1997
Maskay (2003)	Shock Symmetricity			Insignificant		SAARC(7) <sup>c</sup> 1980-2000
Larraine and Tavares (2003)	ER Variability (Bilateral)	0.058-0.110	> EU Approaching EU(12)	Currently insignificant		East Asia (8) 1970-1997
Karras (2005)	OCA variables (3)			Partially signif. J/SK /TN		Asia+Oceania (18) 1960-2000
Saxena (2005)	OCA variables (4)			Mixed I/PK/SL		SAARC(7) <sup>c</sup> 1970-2003
Aminian (2005)	OCA variables (3)			Partially signif. J/SK/TW/HK/SP C/IN/M/P/T		(Survey)
Sato and Zhang (2006)	Shock Symmetricity, comovement (Bilateral)			Significant SP/T/I, HK/K/C, and J/TW		Cointegration ASEAN (8)+ C/J+U.S. 1978-2004

(ref: Fabella (2002, p.42), Table 4, augmented with recent literature by the authors)

\* Except for Indonesia; \*\* Except for Indonesia, South Korea, Philippines

a: Bilateral exchange rate variability explained by OCA proxies

b: ASEAN (The Association of South East Asian Nations) (5) = Indonesia, Malaysia, Philippines, Singapore, and Thailand

c: SAARC (The South Asian Association for Regional Cooperation) (7) = Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka.

J=Japan, SK=South Korea, IN=Indonesia, I=India, PK=Pakistan, SL=Sri Lanka, TW=Taiwan, HK=Hong Kong, SP=Singapore, C=China, P=Philippines, M=Malaysia, T=Thailand, B=Brunei

**Table 5 Welfare Effects of Monetary Union**

Author	Model classification	OCA Necessary or Sufficient condition	number of countries	Model's Characteristics	Change in Welfare <sup>b</sup>		Method
					ins	outs	
Bayoumi (1994)	Dis-equilibrium model	Transactions costs, wage flexibility & asymmetric shocks	3	uncertain supply shocks	$\Delta U_H > 0$ $\Delta U_F > 0$	$\Delta U < 0$	a formal model analysis
Chaplygin, Hughes Hallet & Richter (2006)	an extended Bayoumi's (2004) model	Transactions costs, wage flexibility & asymmetric shocks	3	uncertain supply shocks	depends on wage flexibility	depends on wage flex.	a formal model analysis
Hughes Hallet & Jensen (2004)	an extended Bayoumi's (2004) model	Transactions costs, wage flexibility & asymmetric shocks & labor mobility	3	uncertain supply shocks	depends on wage & market flexibility	depends on changes in demand	a formal model analysis
Andersen (2002)	Intertemporal 2-country model	Transactions costs	2	trade frictions (iceberg type)	depends on preferences for public good	?	closed-form solutions
Corsetti and Pesenti (2002)	NOEM <sup>a</sup>	Asymmetric shocks	2	Monetary Policy coordination	Pareto-inferior	?	closed-form solutions
Carre and Collard (2003)	NOEM <sup>a</sup>	Asymmetric shocks	2	technological & fiscal policy shocks	$\Delta U_H > 0$ $\Delta U_F < 0$	?	calibration
Kollmann (2004)	NOEM <sup>a</sup>	Openness (UIP)	2	intermediate inputs	$\Delta U > 0$ (low trade) $\Delta U >> 0$ (high trade)	?	calibration
Dellas & Tavlas (2005b)	NOEM <sup>a</sup>	Wage rigidity Asymmetry	3	intermediate inputs wage rigidity	$\Delta U >> 0$ (high wage rigidity)	no change	calibration
Dellas & Tavlas (2005a)	NOEM <sup>a</sup>	Wage rigidity Asymmetry	3	intermediate inputs wage rigidity	decrease in exchange rate variability		calibration
Calmfors & Johansson (2006)	Small country, EMU, and Outsider	Wage flexibility	3	flexibility enhances welfare	$\Delta U > 0$	$\Delta U > 0$	numerical example
Akiba (2007)	Heckscher-Ohlin	Openness (trade)	3	Balassa-Samuelson effects	$\Delta U > 0$	$\Delta U < 0$	closed-form solutions

a: NOEM = New Open Economy Macro model

b:  $\Delta U$  = change in social welfare, Suffix H(F) = home (foreign) country

Figure 1 The Balance between Losses and Gains for a joining country

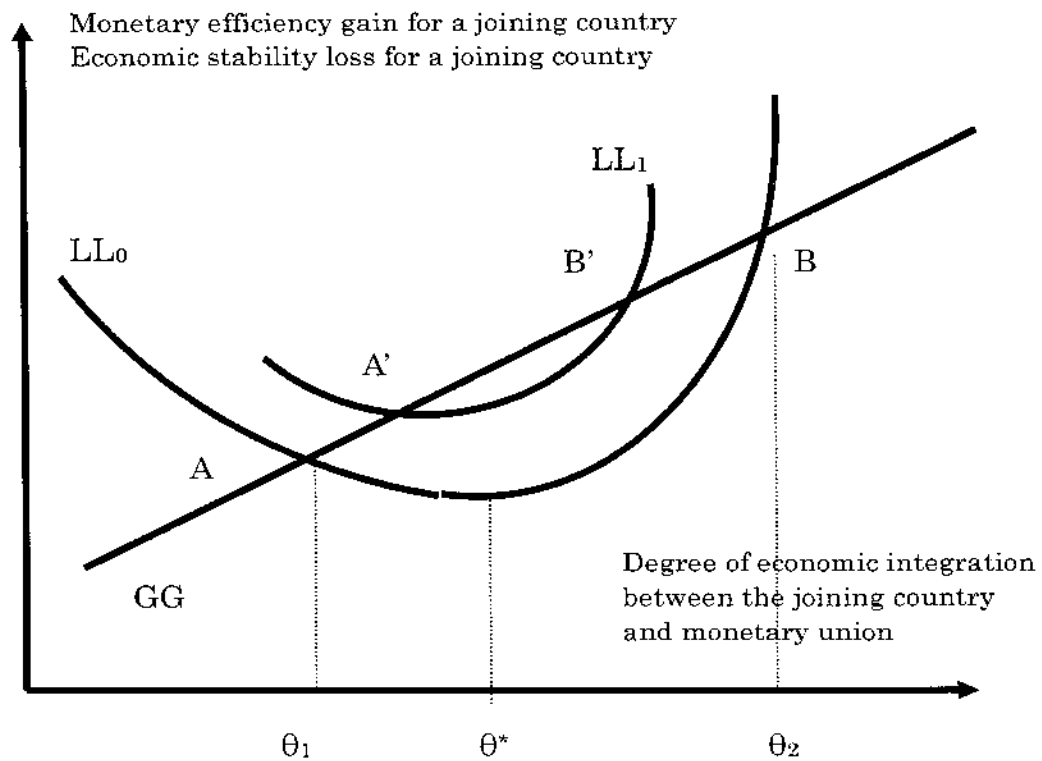


Figure 2 The Effects of Specialization on the "OCA line"

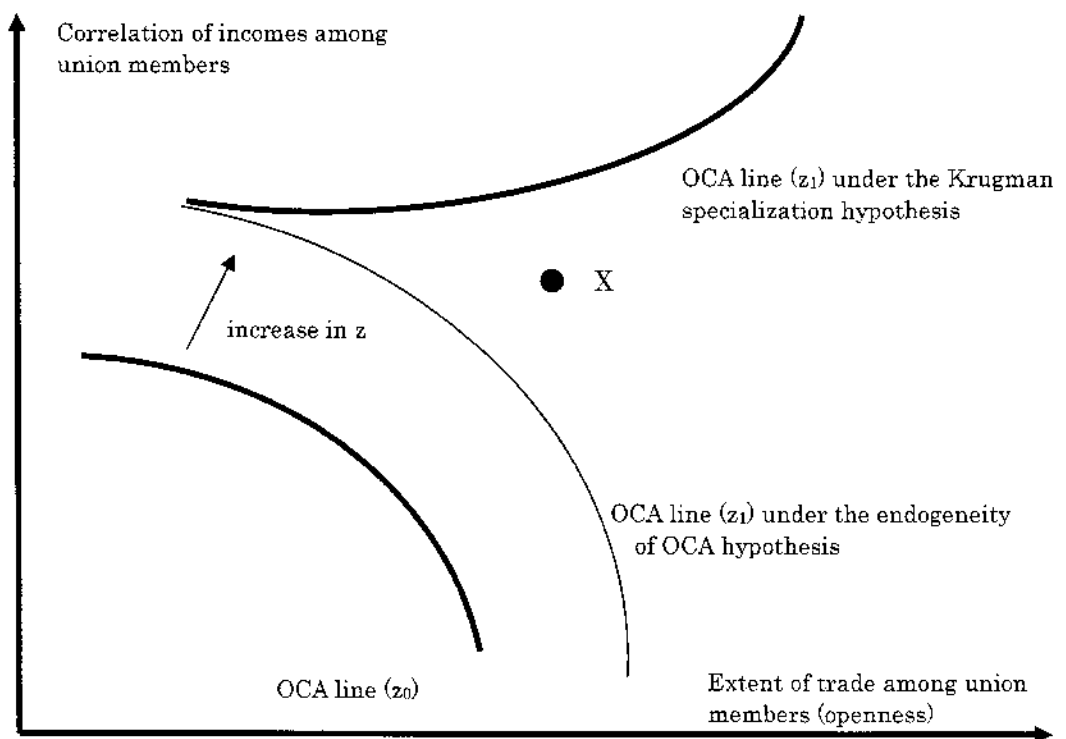
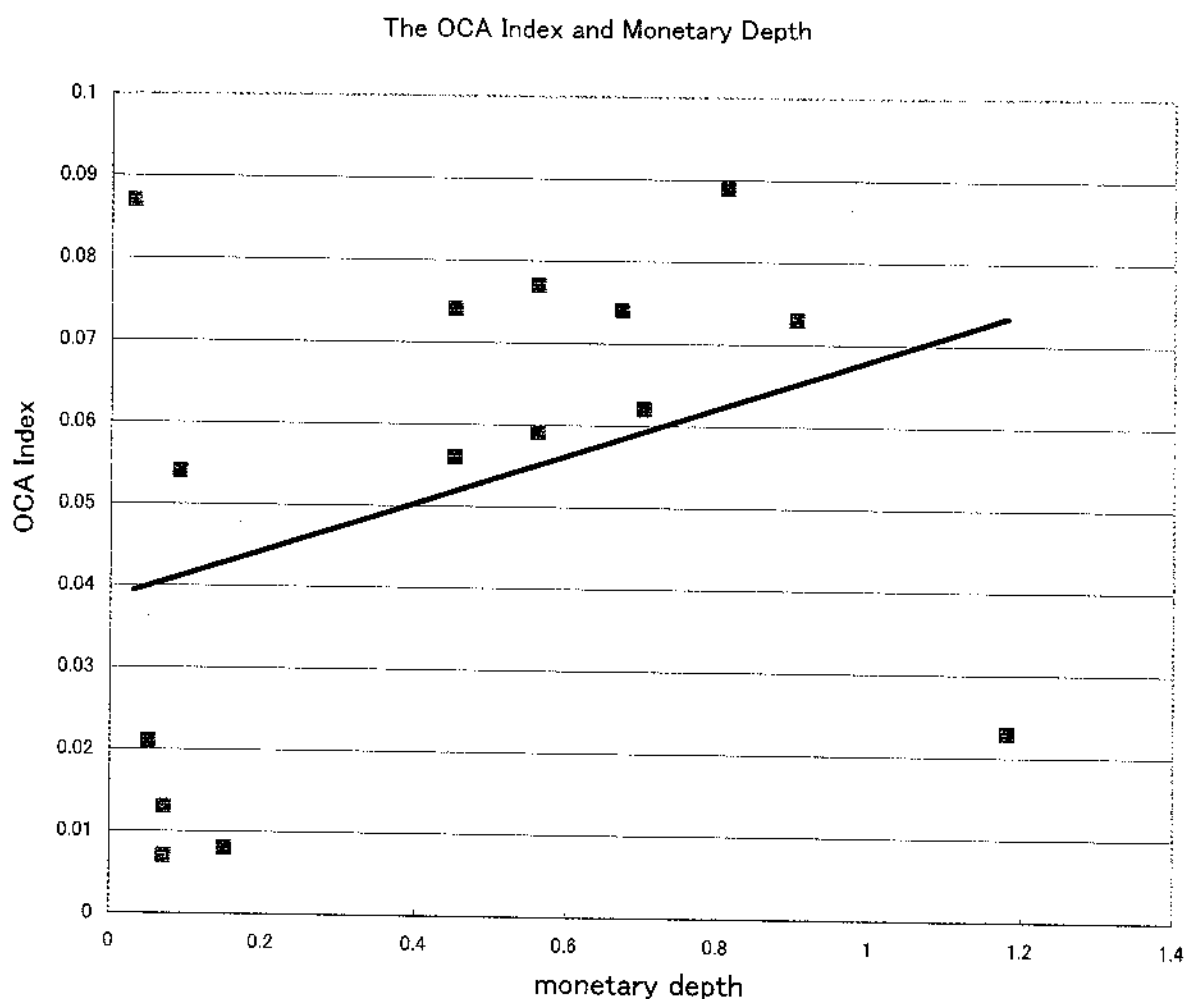


Figure 3.a Monetary Depth and variability of real exchange rate  
European case



Remarks: Vertical axis: OCA Index for 1955, calculated by Bayoumi and Eichengreen (1997, p.765) for 15 European countries against Germany

Horizontal axis: Monetary depth= (Broad Money)/Y (the mean values)

Sample period: 1986-2095, annual samples

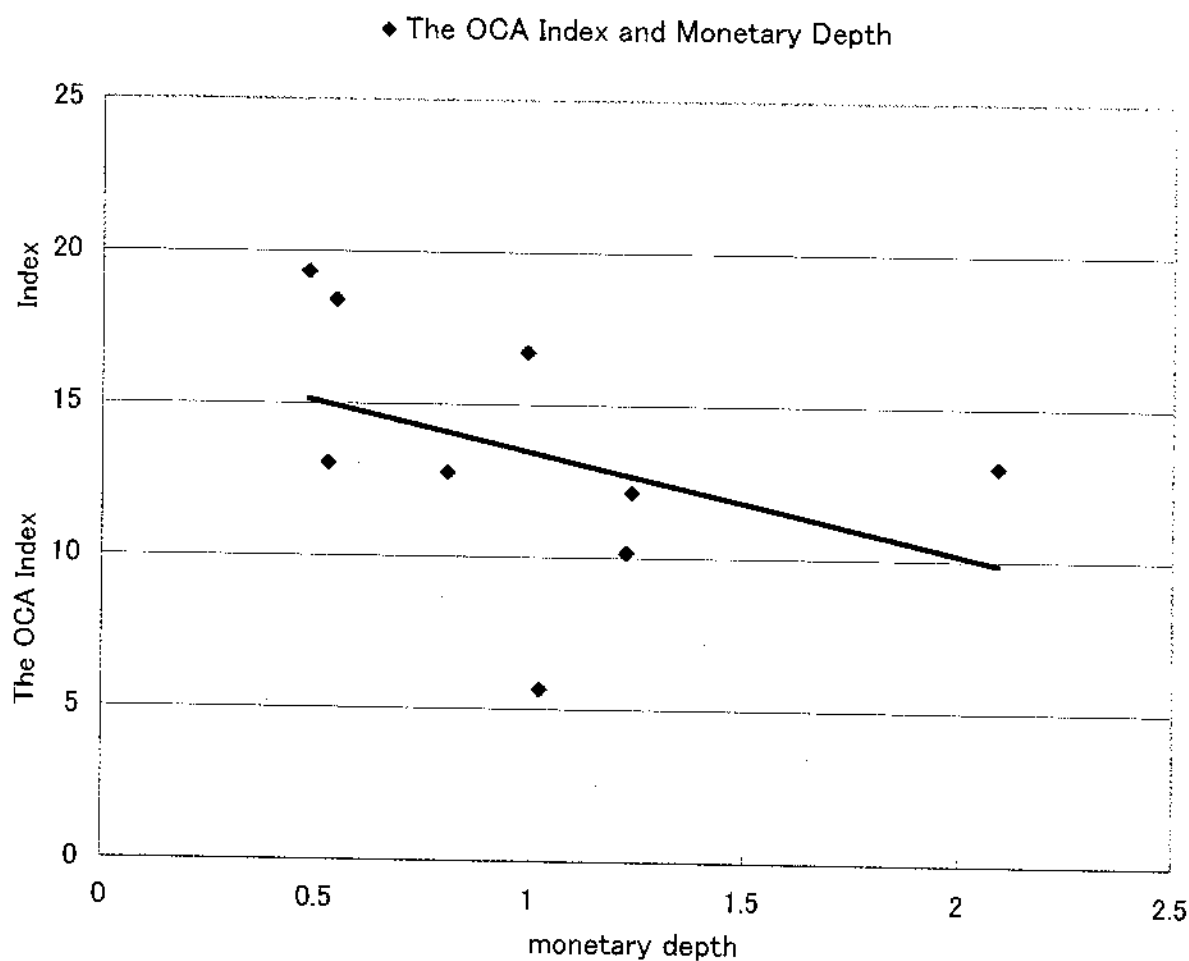
Data source: International Financial Statistics on line (IMF)

Regression result: OCA index = 0.039 + 0.030M/Y

(3.23) (1.42) (t-values in parenthesis)

Source: Authors' own calculation

Figure 3.b Monetary depth and variability of real exchange rate  
Asian case



Remarks: Vertical axis: OCA Index = variability (standard deviation) of real exchange rate (RER)

Horizontal axis: Monetary depth= M2/Y

Sample countries: Nine Asian countries as in the Aminian (2005)

Sample period: 1990-2006(2005, depending on data availability)

Data source: International Financial Statistics on line (IMF)

Regression result:  $\sigma(\text{RER}) = 16.71 - 2.94 \text{ M2/Y}$  (t-values in parenthesis)  
(4.98) (-0.95)

Source: Authors' own calculation

Figure 4 The Optimum Number of Currencies

