East Asian Currency Union

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Abstract

This paper analyzes the feasibility of various types of currency unions, such as a dollar bloc, Euro bloc, Yen bloc, and basket currency bloc in East Asia, and empirically estimates welfare effects of a currency union for East Asian economies. Judging from optimum currency area (OCA) criteria, including the symmetry of output and price shocks across countries, commitment to price stability, and trade and financial integration, East Asia does not appear to have very favorable economic conditions for a currency union, particularly when compared to the euro area. The low political proximity between Japan and other East Asian economies restricts Japan's leadership in the creation of an East Asian currency union. Calibrations of a representative agent model suggest that, for most countries in East Asia, a currency union involving a broad group of economies would generate net welfare gain. However, if the increased volatility due to the loss of monetary policy independence incurs a significantly negative effect on growth, the larger East Asian economies such as China, Indonesia, Japan, and Korea may suffer from net welfare loss. A substantial welfare gain from joining an East Asian currency union would occur if a currency union lowers the probability and size of disasters such as wars and financial crises in East Asia.

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I. Introduction

The choice of an appropriate exchange-rate regime has been one of the most fundamental policy issues in East Asian economies after the 1997 financial crisis. Prior to the crisis, the majority of East Asian economies adopted *de facto* U.S. dollar peg systems for exchange rate arrangements.[1] In the wake of the financial crisis, however, the majority of the crisis-affected East Asian economies, including Indonesia, Korea, the Philippines and Thailand, switched to floating exchange-rate regimes. It is not yet clear whether the new exchange rate system provides enough confidence to these economies and thus in the long run, can serve as a permanent choice. Much concern has been raised on the undesirable aspects of increased instability in the foreign exchange market. Even if formally floating, East Asian countries have kept their exchange rates pegged to the United States so as to moderate excessive volatility of exchange rates due to a 'fear of floating' against the US dollar (Calvo and Reinhart, 2002). Critics also assert that East Asian central banks tend to intervene heavily in the foreign exchange market in order to keep exchange rates undervalued as a pursuit of an 'export-led growth strategy,' which results in accumulating an unlimited amount of low-yielding dollar denominated assets (Dooley, Folkerts-Landau, and Garber, 2003).

This post-crisis experience has provoked calls for alternative exchange rate arrangements in East Asia, which can enhance stability and credibility in the exchange rate system. Dornbusch and Park (1999), Williamson (1999), and Ogawa and Ito (2002)

[1] Prior to the crisis, the Hong Kong dollar and the Chinese yuan were fixed to the dollar. The Thai baht and the Malaysian ringgit were similarly stable against the dollar, although these monetary authorities officially adopted a multiple currency basket system. Singapore, Korea, and the Philippines also targeted their currencies to the dollar, though with some discretion. Indonesia was on a *de facto* crawling peg to the U.S. dollar by sliding the rupiah to offset the inflation gap between home and abroad.

advocate a common-basket exchange rate peg for the East Asian region. They argue that East Asian countries outside Japan can expect to stabilize the overall export competitiveness by pegging their currencies to a basket consisting of the yen, dollar, and euro. This system would not only provide exchange rate stability vis-à-vis major trading partners, but also intra-region exchange rate stability. Others propose the creation of an Asian Monetary System (AMS), in which each currency is pegged to a common currency unit similar to the ECU whose value is based on a basket of specified amounts of Asian currencies and its bilateral exchange rate is allowed to fluctuate within a limited band around a central exchange rate.[2] However, critics argue that even if participating countries could agree on a common basket peg, in reality it would be difficult to decide on a set of specific rules by which exchange rate policy can be managed with adherence to the basket as a numeraire.

On the other hand, there is increasing voice about the need to create a monetary union in the region. Many researchers and policy makers in this region suggest that a monetary union is the ultimate goal to achieve intra-region exchange rate stability and economic integration of East Asia. McKinnon (1999) has proposed a currency union with the US dollar as the common currency. Others suggest that East Asia can emulate the European experience of monetary integration by taking necessary steps to build requisite institutions and policies, which would eventually lead to the formation of an East Asia-wide Monetary Union with a new currency (Kawai and Motonishi 2005).

[2] See Wyplosz (2004) for the discussion of potential benefits of the AMS. In recent years, the idea of an Asia Currency Unit (ACU) has been actively promoted by the Asian Development Bank. See, for instance, a speech by the ADB president (Kuroda, 2006). At the ADB annual meeting of May 2006, finance ministers of 13 East Asian nations including ASEAN plus 3 (China, Japan, and Korea) agreed to launch a research project on the ACU. Eichengreen (2005) argues that the circulation of ACU as a parallel currency alongside with national currencies would be advantageous for East Asian economies.

As pointed out by Alesina, Barro and Tenreyro (2002) and Barro (2004), there has been a trend toward evolution of currency unions in the world. A recent example is the West African Monetary Zone (WAMZ) involving six West African states. It is pointed out that there are several global developments stimulating currency unions around the world. One development is globalization involving integration in trade and financial transactions, which raises the benefits from currency unions. Another development is the growing awareness of the importance of monetary stability. As monetary authorities value price stability increasingly over active macroeconomic stabilization, countercyclical monetary policy becomes less important. Hence, the cost of giving up independent monetary policy decreases. These developments provide a favorable environment for a currency union in East Asia.

The purpose of this paper is to assess the feasibility of a common currency arrangement in East Asia, particularly compared to the euro area, and then gauge the economic impact of a currency union on individual East Asian economies. First, it is asked whether East Asia has favorable conditions to share a common currency. It is empirically investigated whether East Asia meets the criteria for an optimum currency area (OCA) such as the symmetry of output and price shocks across countries, commitment to price stability, and trade and financial integration. The political proximity among the East Asian countries is also discussed, particularly as compared to that of European countries.

There are several studies that have assessed the feasibility of a currency union in East Asia. An earlier study by Eichengreen and Bayoumi (1999) shows that, on pure OCA grounds, East Asia is a plausible candidate for a common currency area, analogous

to the euro area. However, they point out that the lack of political proximity in East Asia may hinder the efforts toward forming a currency union in the region. Other papers such as Kwan (1998), Baek and Song (2002), Lee, Park, and Shin (2004), and Kawai and Motonishi (2005) also used empirical and theoretical analyses to evaluate whether East Asia— either as a whole or as sub-regions— has favorable conditions to form a currency union according to traditional OCA criteria. This paper adopts the approach suggested by Alesina, Barro and Tenreyro (2002) and uses updated data to assess the feasibility of East Asian currency unions. New data are also used to measure political proximity in the region. No empirical paper to date has systematically assessed the degree of political proximity among East Asian economies in the context of a currency union.

Second, welfare effects of various types of currency unions are estimated directly, such as a dollar bloc, Euro bloc, Yen bloc, and basket currency bloc for East Asian economies. The potential benefits of joining a currency union are compared with the potential costs. A currency union increases trade among countries adopting the same currency, contributes to growth of output and consumption, and thereby generates positive welfare effects. However, increasing fluctuations due to the loss of monetary policy independence incur welfare costs. Based on calibrations of a representative consumer model, the welfare gains from increasing consumption growth rates and the costs of increasing aggregate consumption volatility that currency unions are expected to bring about in East Asia are assessed. The model allows rare but large declines in consumption as in Barro (2006a). In an economy where big disasters such as major wars or financial crises can occur, the high volatility from these disasters can generate large welfare costs, compared to that from normal disturbances. The important welfare

consequences of a currency union likely involve its influence on the probability and size of disasters such as wars and financial crises in East Asia.

The remainder of this paper is organized as follows. Section II discusses the benefits and costs of currency unions, and reviews the conditions of the optimum currency area. Section III measures the extent to which the East Asian economies satisfy the optimum currency area criteria, particularly as compared to the European countries. It is then evaluated whether East Asia is an optimum currency area. Section IV adopts a representative agent model to assess the welfare gains from various types of currency unions in East Asia. Concluding remarks are presented in Section V.

II. The Benefits and Costs of an East Asian Currency Union

1. Benefits and Costs of Currency Unions

Each country can decide whether to join a currency union by comparing the associated costs and benefits. Adoption of another country's money as a nominal anchor is an extreme form of a fixed exchange rate system. Frankel (2004) summarizes the four advantages of fixed exchange rate regimes, over floating regimes, as follows: the fixed exchange rate system (i) provides a nominal anchor for monetary policy and thus represents a more credible commitment to fight inflation; (ii) promotes trade and investment by reducing uncertainty and transaction costs; (iii) prevents competitive devaluation, and (iv) avoids speculative bubbles in exchange rates. In addition to these conventional benefits from fixed exchange rate regimes, a currency union would help a developing country increase its access to long-term financing. The typical developing

country cannot borrow internationally on a long-term basis in its currency because foreign investors require a very high risk premium to compensate for the potential loss in real value due to devaluation and domestic inflation. Dollarization would assist in avoiding this 'original sin.'

However, a fixed-exchange rate regime such as a currency union involves costs as follows: the fixed exchange rate system (i) results in loss of independent monetary policy, (ii) hinders automatic adjustment to external shocks since exchange rates cannot respond to adverse developments caused by sticky prices and wages, and (iii) may provide neither seigniorage revenue nor lender-of-last-resort capability.

2. Optimum Currency Area (OCA) Criteria

An OCA can be defined as a region that would be better off using a common currency. The theory of an optimum currency area (OCA), pioneered by Mundell (1961) and McKinnon (1963), lists many important criteria for a common currency area in a region. They include the symmetry of shocks across countries, trade and financial integration, and labor mobility and wage flexibility.

Trade openness

A high degree of trade integration likely increases the efficiency gain from using a common currency to lower transaction costs for trades. In addition, the cost of losing monetary policy independence can be attenuated when the country is more open. As countries achieve higher levels of trade integration, an independent monetary policy plays a more limited role in macroeconomic stabilization.

Symmetry of shocks

As pointed out by Mundell (1961), the major cost of joining a currency union is the loss of an independent monetary policy. This cost is, however, significantly lessened if business cycles are synchronized among member countries, for in this case the common monetary policy can play a stabilizing role as well as individual monetary policy. In this context, the currency union is more attractive if countries have similar production structures, and thereby are subject to common shocks and react similarly to global events. As Alesina, Barro, and Tenreyro (2002) pointed out, what turns out to matter is not the correlation of outputs *per se,* but rather the variance of the ratio of the client country's output to the anchor country's output. This variance depends on the individual variances of outputs in addition to the correlation of outputs. If a client country's variance of output is much greater than that of the anchor country, then the anchor country's monetary policy may not be appropriate for the client country.[3]

Labor mobility

A traditional OCA criterion is the ease of labor movement between the country in question and its potential currency-area partners. If labor is highly mobile between the countries, workers may be able to respond to adverse local shocks by moving across

[3] For example, consider an Asian country whose output fluctuations are closely correlated with those of Japan, but its variance of output is much larger than that of Japan. In this case, the Japanese yen would not be a very attractive anchor for the country despite the high correlation of outputs. The countercyclical monetary policy chosen by the Japanese central bank would (because of the different variances in individual outputs) be of insufficient amplitude to serve the interests of the potential client.

borders to obtain jobs. Then, there is less need for local expansionary monetary policy or currency devaluation**.**

Speed of adjustment

An important criterion for an OCA is the speed of adjustments to shocks. Even if disturbances are asymmetric across economies, a faster adjustment to shocks helps an economy mitigate the costs of relinquishing independent monetary policy.

Financial integration

Countries with close financial linkages benefit from a common currency. As in trade, a common currency brings benefits such as lower transactions costs and elimination of risks of exchange rate changes associated with trading in financial instruments between countries with different currencies. Financial integration among a group of countries could facilitate the formation of a common currency area for the group, as it reduces the cost of adjustment to shocks to demand and supply by facilitating cross-border movements of capital.

However, capital market integration has offsetting effects on forming a currency union. As suggested by Kalemli-Ozcam et al. (2001), better income insurance attained through greater capital market integration may induce higher specialization of production and hence larger asymmetric shocks across countries. If stronger capital-market integration leads to reduced synchronization of business cycles, candidate countries would be less willing to join a currency union. As argued by Imbs (2004), however, if

capital flows are correlated internationally, financial integration may help to synchronize output co-movement.

Anyway, given the extent of asymmetric shocks, greater capital-market integration is more beneficial for the formation of a currency union by facilitating risk sharing among heterogeneous economies.

History of inflation and variability of relative prices against anchor country

Another OCA criterion that has been emphasized in the 1990s is a need to import monetary stability. Alesina and Barro (2002) introduce the feature that a currency union commits clients to a stable monetary policy. Specifically, by adopting the currency of a credible anchor, an inflation-prone country can eliminate the inflation-bias problem that has been discussed in the literature on rules versus discretion in monetary policy. This bias can stem from two primary sources—the desire to use monetary policy to over-stimulate the economy in a cyclical context and incentives to monetize budget deficits and public debts. This kind of commitment was especially important for Argentina in the 1990s—this country was, on other grounds, not a good candidate for linking to the U.S. dollar.

Many governments lack the internal discipline and institutions that can provide a firm domestic commitment to a monetary policy dedicated to price stability. A country's history of inflation is reviewed —in terms of mean and variability—to gauge the extent of these domestic commitment problems.

An important point is that price stability for an anchor country translates into price stability for its clients only to the extent that relative prices do not vary significantly

between countries. That is, a country that joins a currency union receives the inflation rate of the anchor plus a change in the country's price level relative to that of the anchor. Hence, if the variability of relative prices is higher, the benefit of importing monetary stability is smaller.

Political proximity

The creation of a currency union is not only an economic decision, but also a critical political decision of participating countries. The loss of national currency is often regarded as loss of national sovereignty.[4] In reality, participation in a currency union requires the member country to delegate its monetary policy to an anchor country's central bank or a regional central bank. This is bound to raise a number of delicate issues such as provisions of seigniorage sharing, and rules of central bank functions. In this regard, political negotiation to form a currency union would necessitate great political and ideological affinity among participating countries, perhaps to the extent that exceeds that for other types of economic integration such as the formation of a free trade agreement (FTA).

Political proximity between members would help form a currency union by facilitating seigniorage sharing between and, when necessary, fiscal transfer between members. Moreover, if political proximity reflects similar ideological preferences over economic policy objectives, they would be more willing to accept neighbors' policies.

The lack of political proximity would not necessarily be the ultimate barrier to the formation of a monetary union. In Europe, the appeal of economic integration was the

[4] Helleiner (2003) claims that the construction of national currencies, which emerged for the first time in the nineteenth century alongside with the emergence of nation-states, was an outcome of an intensively political process to foster national identities.

promise of peace after the Second World War. Nevertheless, economic and political complexities in the process of monetary integration can be settled down less costly among more intimate countries.

III. Which Currency Unions for East Asia?

Typically, there are two types of currency unions. In the first type, a client country adopts the money of an anchor country as its own currency. Examples are the use of the US dollar in the Bahamas, Bermuda, Panama, and Puerto Rico; the use of the Belgian franc by Luxembourg, the Swiss franc by Liechtenstein, and Italian lira by San Marino. Recently Ecuador and El Salvador have also adopted the US dollar as legal tender. In the second case, a group of countries creates a new currency and a new joint central bank. Examples are the European Monetary Union (EMU), Eastern Caribbean Currency Area (ECCA), and African French Franc zones (CFA). East Asia may either adopt an existing major currency, such as the US dollar, Euro, or Japanese yen, or create a new regional currency.[5] In the latter case, East Asia could create a joint currency, and this new currency would float against the major world currencies.[6] The new joint central bank may then adopt a monetary policy to stabilize the regional average inflation rate at a

[5] It is unlikely that either the Euro or Japanese yen would be adopted as an anchor currency by East Asian economies, considering that the US dollar plays a more important role in trade and financial transactions in East Asia. Dornbusch and Park (1999) suggested refraining from pegging to the Japanese yen for East Asian economies because Yen is an unreliable anchor. In addition, China would not join a yen bloc because of its political rivalry with Japan. A Chinese renminbi bloc is not considered because the Chinese currency has only very limited international convertibility. The political and economic stability necessary for an international anchor currency seem like a long shot for the renminbi. Nevertheless, when considering China's continuing economic growth and international integration, the Chinese renminbi will eventually emerge, though slowly, as a major international currency. See Chinn and Frankel (2005) for an empirical investigation of the determinants of international reserve currency status.

[6] Although it is rare, countries can have a joint currency and then make it tied to a major currency. For example, the CFA franc zone in Africa has a common currency, the CFA franc, and it is tied to the French Franc. However, the CFA franc can be adjusted relative to the French Franc. The member countries obtain seignorage, and they did have a single, large devaluation. France also made some commitments for support in emergencies.

low level (inflation targeting) or may also take into account the fluctuations of regional average GDP.

It is important to evaluate the costs and benefits of joining a currency union from the perspective of a potential client country in East Asia. The OCA criteria discussed in the previous section imply that countries look more favorably on a currency union if they have (i) more integration in trade and financial transactions with currency-union members, (ii) more inclination to high inflation, (iii) higher price and output co-movements with currency-union members, (iv) greater labor mobility between currency-union members, (v) faster adjustment to shocks, and (vi) greater political proximity to currency-union members.

In this paper, empirical measures of trade integration, commitment to price stability, output and price co-movements, financial integration, and political proximity for East Asia are the main focus.[7] For comparison, the data for European countries are presented.

1. Data for East Asia Monetary Union

Data on outputs are from the World Bank's *World Development Indicators* (*WDI*) and Penn World Tables (PWT) 6.1. The combination of these sources provides a panel of 138 countries with yearly data on outputs from 1958 to 2003 (or, in some cases, for shorter periods). Output corresponds to real per capita GDP in 1996 dollars. Inflation is calculated as the continuously compounded (log-difference) growth rate of the GDP

[7] Regarding other conditions such as labor mobility and speed of adjustment to shocks, East Asia is considered to have fairly favorable conditions, at least comparable to those in Europe. See Goto and Hamada (1994) and Athukorala (2004) for the issue of labor mobility in East Asia, and Eichengreen and Bayoumi (1999) and Baek and Song (2002) for the issue of speed of adjustment.

deflator from the *WDI*. The concept of relative prices is a form of real exchange rate based on GDP deflators. The measure is the purchasing-power-parity (PPP) for GDP divided by the U.S. dollar exchange rate, obtained from PWT available for the period from 1958 to 2003. This variable determines the price level in country *i* relative to that of the United States, $P_{it}/P_{US,t}$. The relative price between countries *i* and *j* is then computed by dividing the value for country *i* by that for country *j*.

Following the methodology of Alesina, Barro, and Tenreyro (2002), a second-order auto-regression of relative per capita GDP was estimated using the annual time series for each country from 1958 to 2003. Then the root-mean-squared value of the estimated residual is used as the measure of (lack of) co-movement of outputs: that is, the lower the root-mean-squared value, the greater the co-movement of outputs between countries *i* and *j*.[8] The co-movement of prices is computed in an analogous fashion by running a second-order auto-regression on annual data from 1958 to 2000 for relative prices and then constructing the root-mean-squared value of the estimated residual. Bilateral trade information comes from the International Monetary Fund's *Direction of Trade Statistics*. These data are expressed in U.S. dollars.

The extent to which East Asian economies are financially integrated with the United States, Europe or Japan, or among them is measured by the size of bilateral international financial asset holdings. Data on cross-border holdings of international financial assets including equity portfolio and debt securities come from the Coordinated Portfolio Investment Survey (CPIS). The International Monetary Fund (IMF) conducted

[8] The root-mean-squared (RMS) value is related inversely to the correlation of outputs, and positively to the individual variances of outputs. As discussed in section II, the measure of output co-movement not only involves the correlation of outputs, but also the variance of relative outputs.

this survey for the first time in 1997, and annually since 2001. The first CPIS involved 20 economies and the CPIS 2001 expanded to 67 source economies including several offshore and financial centers. In each case, the bilateral positions of the source countries in 223 destination countries/territories are reported.[9] The CPIS provides a breakdown of a country's stock of total portfolio investment assets by country of residence of the nonresident issuer. Problems of survey methods and under-reporting of assets by participating countries are pointed out as shortcomings of the CPIS data (Lane and Milesi-Ferretti, 2004). Nevertheless, the CPIS survey presents a unique opportunity for the examination of foreign equity and debt holdings of many participating countries.

Political proximity is measured by the extent to which two states have common foreign policy interests. Since the pioneering work of Bueno de Mesquita (1975), the similarity of states' alliance policies is used as a measure. However, Signorino and Ritter (1999) point out that de Mesquita's measure of Kendall's τ_b is inappropriate in gauging the similarity of alliance policies and suggest an alternative measure. It is also suggested that data other than alliance commitments such as UN votes, diplomatic missions, disputes, and trade may more accurately measure the similarity of foreign policy positions.

In this section, the measure of bilateral vote correlation at the United Nations General Assembly is used. The political proximity between two countries is the fraction of the votes that they cast on the same side in the U.N. General Assembly.[10] When the

[9] Refer to the IMF website at http://www.imf.org/external/np/sta/pi/cpis.htm for details.

[10] The data on UN roll-call votes on resolution in the General Assembly is available from on-line data (unbisnet.un.org). The variable that measures the political proximity of two countries is the fraction of times that they voted identically (either both voting yes, both voting no, or both voting abstention or no-voting) in all General Assembly plenary votes in a given year. Barro and Lee (2005) used the measure to

UN voting pattern of nations is more alike, their foreign policy interests would be more common and less conflicting.

Trade Openness

Table 1 lists the average ratio of exports plus imports to GDP for East Asian and European countries over 1990-2003 with four potential anchors for currency areas: the United States, Europe, Japan, and East Asia (including Japan). The GDP value in the denominator of these ratios refers to the country paired with the potential anchor country or region.

The table shows that East Asia looks quite favorable for an OCA in terms of its substantial degree of intra-region trade. For 10 East Asian economies, including Japan, the average trade-to-GDP ratio with other East Asian partners is an average of approximately 29.6%. It reaches 72.0% in Singapore, 63.6% in Hong Kong, and 50.8% in Malaysia. These numbers are much higher than the corresponding figures for European countries. For 18 European economies, the intra-Europe trade-to-GDP ratio is approximately 21.1% on average.[11] In East Asia, Japan has a very low trade-to-GDP ratio with other East Asian countries (3.2%), while it is one of the major trading partners for the other 9 East Asian economies. It is notable that, even excluding Japan, for 9 East Asian countries the average intra-region trade-to-GDP ratio is 23.7%, slightly higher than the average intra-region ratio for Europe, 21.1%.

While the share of intra-regional trade is quite high for East Asia, they also conduct substantial trade with the United States and Europe. In fact, for the 9 East Asian

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investigate the influence of the U.S. and major Western European countries on the IMF's lending decisions. U.N. voting variables have also been used by Alesina and Dollar (2000) to explain foreign-aid patterns.

[11] The number changes little when the 12 European countries that adopted the Euro are used.

economies, except for Japan, on average, the amount of trade is more or less equally dispersed across the US, Europe, and Japan: the trade-to-GDP ratio is 10.1% with the United States, 8.2% with Europe, and 9.0% with Japan. The majority of East Asian economies except Indonesia and Thailand exhibit slightly higher trade-to-GDP ratios with the United States than with Japan. Hence, judging from their trade patterns, East Asian economies can benefit less from adopting any one major currency as an anchor than from forming a broad East Asian currency union.

Price Stability

Table 2 presents the average inflation rates, based on GDP deflators, for East Asian and European economies. The sample period is divided into 1975-89 and 1990-2003, considering that in the 1990s, European countries began to adopt currency arrangements, such as the EMS, that contributed to reduced inflation. Our interest is to capture inflation rates that would occur in the absence of a nominal exchange rate anchor.

In the period 1975-89, several European countries, including Greece, Iceland, Italy, Portugal, and Spain, had double-digit inflation rates. However, in all European countries, average inflation rates fell significantly to lower levels in the 1990-2003 period. The average inflation rates were high for some East Asian economies, such as Indonesia, Korea, and the Philippines for the 1975-89 period. While most East Asian economies maintained lower inflation rates in the second period, average inflation rates were still relatively high in Indonesia (13.8%) and the Philippines (8.2%).

Table 2 also shows inflation variability, gauged by standard deviations. The majority of European and East Asian countries have relatively low inflation variability.

One exception is Indonesia, in which the variability of annual inflation rates over 1990-2003 was 17.8%, far exceeding the regional average of 5.0%.

Since the majority of East Asian economies keep relatively stable prices, it can be considered that gains from enhancing price stability by joining a currency union are not that large, with the likely exception of Indonesia and the Philippines. Furthermore, when a country decides to join a currency union, it is not clear which currency would serve as a better nominal anchor. Over the 1990-2003 period, Japan recorded price deflation (-0.2%). The US seems to maintain stronger price stability (2.2%), but is not much different to the performance of Europe (3.3%). Compared to a currency union that adopts one major currency as an anchor, an East Asian currency union, particularly excluding Japan, would be less desirable in terms of enhancing price stability because the average inflation rate in East Asia is relatively high. Over the 1990-2003 period, the average inflation rates were 4.5% for the 10 East Asian economies and 5.0% for the 9 economies excluding Japan.

Table 3 reports the measures of the co-movements of prices for selected countries with the United States, Europe, Japan and East Asia, for the 1975-89 and 1990-2000 periods. Here a high number implies less co-movement in prices. The table shows that the co-movement of prices in East Asia is relatively lower than that in Europe. The average number for 10 East Asian economies is 0.09 in the 1975-89 period and 0.14 in the 1990-2000 period, while it is approximately 0.06 for Europe in both periods. East Asian economies have a relatively lower degree of price co-movements with all potential anchor countries- the United States (0.12), Europe (0.16) or Japan (0.13). In particular, Indonesia shows the least co-movements of prices with all potential anchor countries.

The high value of the comovement measure for Indonesia is in part the reflection of higher inflation variability, as well as its unique industrial structure such as oil production. A notable feature is that while all European countries have higher co-movements of prices with the other European countries than with the United States, some East Asian economies including Hong Kong, Singapore, and Taiwan have substantially higher co-movements of prices with the United States than with Japan or the rest of East Asia. This pattern may reflect the effects of the existing exchange-rate systems on price comovements.

In summary, based on average inflation rates and price co-movements, the benefit from joining currency unions is relatively low for East Asian economies. Since their average inflation rates are relatively low and the degree of price-comovements is relatively small, East Asian economies, except for Indonesia and the Philippines, would not benefit much from the commitment to a currency union.

Co-Movement of Output

Table 4 shows measures of the co-movements of outputs (real per capita GDP). East Asia has a similar extent of output co-movements with any of the potential anchor countries: Over the 1990-2003 period, the average number is 0.040 with the US, 0.038 with Japan, 0.044 with Europe, and 0.042 with the rest of East Asia. Compared to Europe, East Asia's co-movements of output with any of the potential anchors are relatively lower (a high number implies less co-movement of outputs): the average of output co-movements for Europe is 0.023 with the US, 0.027 with Japan, and 0.026 within Europe over the 1990-2003 period.

The business cycles of East Asian economies appear to be relatively less associated with each other, compared to those of European countries. It is found that the average of the numbers of the intra-region output co-movement for East Asia (0.042) is higher than that for Europe (0.026). The co-movement of output with the rest of East Asia ranges between 0.034 (Malaysia) and 0.052 (Singapore), while the degree of intra-region output co-movement for European countries ranges between 0.019 (Austria) and 0.046 (Luxembourg). The degree of output co-movement within the region is often lower than that with the major anchor country. For instance, China's business cycle is more associated with either the United States (0.040) or Japan (0.040) than with the rest of East Asia (0.050). This pattern may reflect two forces- a high level of integration in trade, particularly in the intra-industry trade and exchange-rate system that was in place.

Overall, based on the criterion of business cycle synchronization, it is not clear which currency would serve as a better nominal anchor for East Asia. There is not much difference in terms of the degree of output co-movements among the various choices of anchor. Losing an independent monetary policy could be potentially costly for East Asian economies compared to Europe, because East Asia's business cycles are less associated with those of potential anchors.

Financial integration

Tables 5 and 6 present the data on bilateral portfolio asset holdings for East Asia compared to that for Europe in 2003. Table 5 summarizes the average ratio of gross portfolio asset holdings to GDP invested by East Asian and European economies in four destinations, that is, the potential anchor country or region: the United States, Europe,

Japan, and East Asia (including Japan). The GDP value in these ratios refers to the East Asian or European economy paired with the potential anchor country or region. In contrast, Table 6 reports data for cross-border portfolio assets invested in East Asian or European economies by the potential anchor country or region. They are expressed as the ratio to the GDP of each East Asian or European economy. Observations for China and Taiwan are missing in Table 5 because they are not in the sample of 67 source countries in the IMF's CPIS survey, whereas Table 6 includes data for China, which is among the 223 destination economies in the CPIS survey.

According to Table 5, small economies with financial and offshore centers have substantially higher ratios of international portfolio asset holdings to GDP. For instance, Hong Kong, Ireland, Netherlands, Singapore, and Switzerland have total assets amounting to several times their own domestic output levels. The ratio of international portfolio asset holdings to GDP amounts to 214% for Singapore and 158% for Hong Kong. In contrast, for a typical East Asian economy, bilateral financial linkages are a relatively small fraction of its GDP. While Japan has a relatively larger cross-border portfolio asset holdings amounting to 40 % of its GDP, other East Asian economies have very low international asset-to-GDP ratios ranging from 0.9% (Indonesia) to 4.6% (the Philippines). The average international asset-to-GDP ratio for 8 East Asian economies is 52.9%. In contrast, for 17 European countries, the average of international portfolio holdings-to-GDP ratios amounts to 108.0%. The majority of East Asian economies except Japan, Hong Kong, and Singapore exhibit relatively low degree of international financial integration, compared to the European economies.

The intra-region asset holding is also much lower in East Asia relative to Europe. The average of intra-East Asia asset holdings-to-GDP ratios for 8 East Asian economies is 8.6%. The comparable average of intra-Europe asset holdings-to-GDP ratios for 17 European countries amounts to 62.1%. East Asian economies are relatively more integrated with global financial markets such as the United States and Europe rather than with each other. For the eight East Asian economies, the average asset-to-GDP ratio for the cross-border asset holdings in Europe is 16.9% and that for the asset holdings in the United States is 9.4%.[12] In particular, Japan has substantially low intra-region financial integration relative to its global integration. Japan's average asset holdings-to-GDP ratio is only 0.5% with East Asia, while it is 14.4% with the United States and 14.1% with Europe.

In Table 6, the general patterns from portfolio asset investment in East Asian or European economies by the potential anchor country or region are similar to those from Table 5. But, small economies with financial and offshore centers are less dominating the representation, by having relatively low asset -to-GDP ratios, compared to those in Table 5. In contrast, the other East Asian economies except Japan tend to have higher ratios for total international assets invested in their economies, compared to the ratios for their international asset holdings outside. A possible explanation is that these East Asian economies are more restrictive in allowing cross-border portfolio investments by

[12] The tendency of global financial integration, rather than regional integration, in East Asia is more conspicuous in terms of the geographical distribution of international assets holdings by East Asia. The total recorded level of portfolio asset holdings of the eight East Asian economies in 2003 is approximately US $2.2 trillion of which 31.5% is held in Europe, 24.1% in the United States, and only 4.9% in East Asia. See Kim, Lee and Shin (2006) for a discussion of the factors contributing to the limited regional integration of East Asian financial markets.

domestic residents, compared to relatively free capital inflows by international investors. It can also reflect higher rates of return in East Asia relative to other regions.

Table 6 also shows that for a typical East Asian economy, the intra-region financial linkage is relatively low. The average of intra-East Asia asset holdings-to-GDP ratios for 9 East Asian economies is 5.0%, compared to 59% for the average intra-Europe asset holdings-to-GDP ratio for 17 European countries.

Overall, the data show that East Asian economies are far less financially integrated within the region, compared to European economies. East Asian economies tend to be more closely financially linked with the United States and Europe rather than with each other.

Political proximity

Table 7 presents the measure of political proximity with potential anchor countries for East Asian economies over the 1985-1990 and 2000-2005 periods, and compares them with those for European countries. According to this UN vote correlation measure, the political affinities between the United States and East Asian economies are relatively low. This pattern reflects, in part, the U.S. tendency to vote independently from the majority of UN member countries on resolutions such as those related to the Israel-Palestine conflicts. East Asia has a relatively lower degree of political proximity with any potential anchor country or region, compared to Europe. Over the 2000-2005 period, the average of political proximity for 8 East Asian economies (except Hong Kong and Taiwan which are not UN members) is 0.166 with the US, 0.638 with Europe, 0.653 with

Japan, and 0.775 with the rest of East Asia. In contrast, for 18 European economies, the average is 0.365 with the US, 0.922 with the rest of Europe, and 0.836 with Japan.

The degree of political proximity among East Asian countries is on average lower than that among European economies. In particular, Japan and Korea have the least political proximity with other East Asian economies, which is around 0.65. In contrast, China and Southeast Asian economies have a higher degree of political proximity, close to that among European economies. The relatively lower political proximity of Japan and Korea with the rest of East Asia reflects in part that they maintain stronger alliance with the United States.[13] Japan and Korea in East Asia have a relatively higher degree of political proximity with the United States than other East Asian economies.

The lower political proximity among East Asian countries may imply that it would be difficult for East Asia to rally their political wills toward formation of a monetary union. In particular, the low political proximity between Japan and other East Asian economies may constrain Japan's leadership for the creation of an East Asian currency union. A currency union for a subgroup of Southeast Asia and China seems to be more appealing from the standpoint of current geopolitical conditions. Figure 1 shows that the political proximity between China and ASEAN members such as Malaysia is quite high.

However, the degree of political proximity among East Asian economies, particularly between Japan and other East Asian economies, has been increasing over

[13] Katzenstein (2005) points out that East Asia and Europe in the early post-war years went through two different experiences. The United States assembled an anti-Communism alliance by creating multilateral institutions such as NATO in Europe, while setting up bilateral defense treaties with Japan, South Korea, and the Philippines in East Asia. He argues that pervasive identification of the United States with Europe in terms of religion, democratic values, and perhaps race contributed to the different military-strategic decisions.

time, from 0.491 in 1985-90 to 0.653 in 2000-05 (see Table 7). The average of intra-region political proximity for East Asia in 2000-05 (0.775) is comparable to that for Europe in 1985-90 (0.776). The political proximity among Europe has continued to increase over time,[14]which may reflect the continuous efforts of European countries toward integration over the period. The political proximity among East Asian economies would also tend to increase over time if they continue to conduct policy dialogue for deeper trade and financial integration.

2. Is East Asia an OCA?

In the previous section, various OCA criteria for forming a currency union in East Asia were evaluated. Overall, it is unclear whether East Asia is suitable for a currency union. A favorable factor is the substantial degree of intra-region trade. Less favorable elements, particularly compared to Europe, involve the degree of financial integration and business-cycle synchronization. East Asian economies are far less financially integrated with anchor countries as well as with each other, compared to Europe. Losing independent monetary policy could be potentially costly for East Asian economies, because East Asia's business cycles are less associated with those of potential anchors.

Another issue is whether East Asian economies have sufficient political proximity to form a currency union. The degree of political proximity within East Asia is lower than that within Europe. In particular, the low political proximity between Japan and other East Asian economies would restrict Japan's leadership in the creation of an East Asian currency union. However, political proximity among East Asian economies, particularly

[14] The averages of political proximity for 18 European economies have increased continuously from 0.727 in 1980-84, to 0.762 in 1985-90, 0.875 in 1991-94, 0.904 in 1995-99, and 0.922 in 2000-2005.

if Japan is omitted, appears reasonably high. Notably, today's levels of political proximity for East Asia are similar to those for Europe in the past. Considering that the political affinity between Japan and the other East Asian economies has been rising over time (Figure 1), East Asia would be able to achieve political cooperation sufficient to advance a currency union in the region.

It is not clear, however, which currency East Asian economies should choose as an anchor if opting for a currency union. While East Asian economies can benefit the most from forming a broad East Asian currency union, a currency union that adopts any major currency as an anchor might also be beneficial. While intra-region trade in East Asia has been rapidly expanding, the business cycles of East Asian economies tend to be more associated with the United States and Europe rather than with each other. East Asian economies also tend to be more closely financially linked with the United States and Europe than with each other.

Overall, at the current stage of economic and political development, East Asia does not appear to be an optimum currency area. More appropriate criteria for a successful currency union, however, involve the pattern of trade and financial integration that would be shaped after the set up of a currency union. Frankel and Rose (1998) raised the issue of endogeineity of OCA criteria. They point out that country characteristics affecting OCA conditions can be endogenously determined. For example, once a group of economies forms a currency union, the degree of intra-region trade and investment and the degree of symmetry of economic shocks can be increased. The endogeineity of OCA criteria implies that a country's decision to join a monetary union should not just consider

the situation that applies *ex ante*, but also the conditions that would apply *ex post*, that is, allowing for the economic effects of a currency union.

There is some evidence that joining a currency union leads to increased trade among member countries, further strengthening the formation of the currency union. In the seminal paper, Rose (2000) reports that bilateral trade between countries that use the same currency is, controlling for other effects, over two-hundred-percent larger than otherwise. The majority of subsequent research also confirmed a significantly positive effect, though smaller than 200%, of a currency union on trade.

Currency union is also likely to reinforce financial integration among member countries. Reduced currency risk among currency union members can lead to enhanced financial integration among them. Fratzscher (2001) provides evidence that the introduction of the Euro has increased the degree of integration among European stock markets. Spiegel (2004) shows that Portugal's accession to the EMU has led to a substantial increase in bilateral borrowing from EMU members.

There is more uncertainty in predicting whether endogenous adjustments of output movements after forming a currency union will act for or against a currency union. Frankel and Rose (1998) argue that increased trade by a currency union can help business cycles to be more synchronized across countries. However, as argued by Eichengreen (1992) and Krugman (1993), an increase in trade linkages may encourage greater specialization of production, resulting in less synchronization of business cycles. Rose and Engle (2002) show that business cycles are more synchronized across currency union member countries than across countries with sovereign monies. In contrast to the findings of Rose and Engle, however, Tenreyro and Barro (2007) and Lee and Shin (2004), by

adopting an instrumental-variable approach, show that currency unions decrease output co-movement.

IV. Quantitative Analysis of the Benefits and Costs of East Asian Currency Unions

In this section, welfare effects of various types of currency unions are calculated. We consider a dollar bloc, Euro bloc, Yen bloc, and a new regional currency bloc for East Asia (with or without Japan). We compare the potential benefits of joining a currency union with the potential costs. In terms of the benefits, we focus on the effects from additional trade between countries that adopt the common currency in East Asia. Increased trade leads to an increase in output and consumption, thereby raising welfare. Currency unions would also assist in providing a credible nominal anchor for monetary policy. As discussed in the previous section, however, the benefits from enhancing price stability by joining a currency union would not be significant for the majority of East Asian economies, because they already tend under present arrangements to keep prices relatively stable.

In terms of costs, the major downside from joining a currency union involves the loss of an independent monetary policy. The loss of monetary policy independence can lead to increasing output and consumption fluctuations, which would incur welfare loss for risk-averse consumers. In conventional models, the costs of business cycles fluctuations tend to be small relative to the benefits from increasing growth rates. Lucas (1987, 2003) find small welfare costs of output fluctuations at business-cycle frequencies based on a representative agent framework in which output is assumed to revert quickly to a deterministic trend. Subsequent studies propose different models and assumptions,

yielding a wide range of estimates of the welfare cost of business cycles. For instance, Imrohoroglu (1989) and Krusell and Smith (1999) introduce heterogeneous agents and uninsurable individual risk, and find a larger welfare cost of business cycles fluctuations. Obstfeld (1994) suggests that the welfare cost of consumption volatility is significantly higher than in Lucas's calculations when the consumption process contains a stochastic trend, so that shocks have permanent effects.

We use calibrations of a representative consumer model to estimate the welfare effects from the implementation of various types of East Asian currency unions. These effects work through changes in consumption growth rates and consumption volatility. The model has two distinct features. First, unlike Lucas, but in line with Obstfeld, the model assumes that consumption is a random walk process. Empirical studies found that output and consumption tend to have a stochastic trend (Cogley, 1990). In particular, the evidence conflicts with rapid reversion to a fixed trend line. The welfare cost from the loss of an independent monetary policy is magnified because shocks have permanent effects on consumption.[15]

Second, the model allows for a small probability of a large drop in consumption, as in Reitz (1988) and Barro (2006). In an economy where big disasters such as major wars or financial crises can occur, the uncertainty implies large welfare costs, compared to that from normal disturbances.

1. Welfare Effects of Consumption Volatility and Growth

[15] Alternatively, the model could introduce a temporary component to the shocks and allow monetary policy to stabilize only this temporary part. Nevertheless, an increase in fluctuations of transitory shocks can have permanent effects on consumer's welfare. Ramey and Ramey (1995) and Barlevy (2004) show that as fluctuations affect growth rates of output, increasing volatility can lead to large welfare effects. Their approaches can be thought to be complementary to ours. See further discussions in section IV.2.

Consider a representative consumer with a conventional constant relative risk aversion (CRRA) utility function.

(1) $U_t = E_t \sum_{i=0}^{\infty} [e^{-\rho i} \cdot (C_{t+i}^{1-\theta} - 1)/(1-\theta)]$,

where $\rho \geq 0$ denotes the rate of time preference and $\theta > 0$ measures the magnitude of relative risk aversion.

It is assumed that the consumer is endowed with a stochastic consumption stream as follows:

(2) $C_t = C_{t-1} e^{\gamma} \varepsilon_t e^{V_t}$,

where two stochastic terms ε_t and v_t are included. The random term ε_t is assumed to be iid log-normal, $\ln(\varepsilon_t) \sim N(0, \sigma^2)$. This term reflects "normal" economic fluctuations, such as those analyzed in Lucas (1987, 2003). The random term v_t reflects low-probability disasters, such as the Great Depression and World War, described in Barro (2006a). The probability of a disaster is the known amount $p \geq 0$ per unit of time, where p is a constant. If a disaster occurs, consumption contracts proportionately by the fraction b. The probability of disaster in a period is small but b is large. The distribution of v_t is given by

probability e^{-p}: $v_t = 0$,

probability $1 - e^{-p}$: $v_t = \log(1-b)$.

Barro (2006a) compiles all episodes of 15% or greater decline in real per capita GDP in the twentieth century for 35 countries in the world. Based on these historical events, the annual probability of disaster and the average size of contraction are estimated

to be 0.017 and 0.29 respectively. The allowance for rare disasters helps to explain a number of asset pricing puzzles (Reitz, 1988 and Barro, 2006a).

In the format of equation (2), volatility shocks from both normal disturbances and disasters are considered to have a permanent effect.

Using equations (1) and (2), expected utility calculated as of period t is expressed by

$$(3) \qquad U_t = (C_t)^{1-\theta}/(1-\theta)\cdot \sum_{i=0}^{\infty} e^{[-\rho-(\theta-1)\gamma+(1/2)(\theta-1)^2\sigma^2+p[(1-b)^{1-\theta}-1]i}$$

As the arbitrary period length approaches zero, equation (3) is rewritten as[16]

$$(4) \qquad U_t = V\cdot(C_t)^{1-\theta}/(1-\theta),$$

$$(5) \qquad 1/V = \rho + (\theta-1)\cdot\gamma - (1/2)\cdot(\theta-1)^2\cdot\sigma^2 - p\cdot((1-b)^{1-\theta} - 1)$$

This risk-averse consumer would prefer a less risky (σ^*) to a risky ($\sigma>\sigma^*$) path. This difference in consumer welfare can be quantified by multiplying the risky path by the constant factor $1+\lambda$ in all dates and states and choosing λ so that the consumer is indifferent between the two cases:

$$(6) \qquad V_{(\sigma)}\cdot((1+\lambda)C_t)^{1-\theta} = V^*_{(\sigma^*)}\cdot(C_t)^{1-\theta}$$

The parameter λ measures the proportional increase in initial consumption (C_t) required to compensate for a rise in σ. The compensation parameter λ is calculated by

$$(7) \qquad \lambda_{(\sigma^*)} = [V_{(\sigma)}/V^*_{(\sigma^*)}]^{1/(\theta-1)} - 1$$

The parameter compensating for the change in p, b, or γ can be also constructed in a similar way.

[16] We assume that the transversality condition is satisfied to guarantee that expected utility, U_t, is finite. The transversality condition requires that the expected rate of return on risky asset exceeds the growth rate of real GDP. See Alvarez and Jermann (2006) and Barro (2006b) for the discussion of the link between business cycle costs and asset prices.

At the margin, from equations (4) and (5), the compensation parameter λ is calculated by[17]

$$\lambda_\sigma = \frac{-\partial U_t / \partial \sigma}{(\partial U_t / \partial C_t) \cdot C_t} = V(\theta - 1)\sigma . \quad (8)$$

The compensation parameter for the changes in the expected growth rate is given by

$$\lambda_\gamma = \frac{-\partial U_t / \partial \gamma}{(\partial U_t / \partial C_t) \cdot C_t} = -V . \quad (9)$$

This expression gives the proportional decrease in C_t that compensates, at the margin, for an increase in γ.

Consider now the welfare consequences from a change in the disaster probability, p, for given disaster size, b.[18]

$$\lambda_p = \frac{-\partial U_t / \partial p}{(\partial U_t / \partial C_t) \cdot C_t} = V \cdot [(1-b)^{1-\theta} - 1]/(\theta - 1) . \quad (10)$$

Similarly, the compensation parameter for an increase in disaster size, b, with holding fixed disaster probability, p, is given by[19]

$$\lambda_b = \frac{-\partial U_t / \partial b}{(\partial U_t / \partial C_t) \cdot C_t} = V \cdot p \cdot (1-b)^{-\theta} . \quad (11)$$

Table 8 presents statistics for the mean and standard deviation of per capita consumption growth rates over the period from 1960 to 1997 for East Asian economies.

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[17] Note that the expected growth rate of the economy depends not only on the growth-rate parameter, γ, but also on σ, p, and b. As the length of the period approaches zero, the expected growth rate of real GDP and consumption, defined to be γ*, is given by $\gamma^* = \gamma + (1/2)\cdot\sigma^2 - pb$. Hence, a change in σ, p, or b has a welfare effect by not just increasing volatility but also changing the expected growth rate. If the expected growth rate is held fixed, the compensation parameter λ_σ is calculated by $V\theta\sigma$. See the discussion in Barro (2006b).

[18] If the expected growth rate is held fixed, the compensation parameter λ_p is calculated by $V \cdot [(1-b)^{1-\theta} - 1 - b \cdot (\theta - 1)]/(\theta - 1)$.

[19] If the expected growth rate is held fixed, the compensation parameter λ_b is calculated by $V \cdot p \cdot [(1-b)^{1-\theta} - 1]$.

The mean growth rate ranges from 0.063 (Taiwan) to 0.014 (the Philippines) and its standard deviation ranges from 0.032 (Japan) to 0.059 (Indonesia). Because there was no disaster during the sample period in East Asia, theses numbers are considered to the estimate of mean growth rate, γ, and the estimate of standard deviation for ε_t shocks, σ, for individual economies.

In order to gauge the probability and size of disaster, we follow the approach of Barro (2006a) which look at disaster events from long-term time-series data on real per capita GDP. Table 9 reports major economic contractions, defined by a decline of 10% or more in real per capita GDP, which took place in 10 East Asian economies over the period from 1915 to 2000. There were 14 major disasters— three associated with the Great Depression, seven with the World War II, and three with major financial crises. Reliable GDP data for Hong Kong and Singapore— former British colonies—, and Thailand are unavailable until after World War II. Based on the frequency of 14 events for the available country- year observations over 1915-2000, the probability of experiencing a major economic contraction for 10 East Asian economies is approximately 1.8% per year. The average contraction size is 0.29.[20]

For the benchmark calibration exercise, we assume a rate of time preference of ρ=0.03 per year, and the relative risk aversion coefficient θ=4. For 10 East Asia economies, the average growth rate, γ, is 0.042 and the standard deviation, σ, is 0.041. By combining these parameters with the disaster probability, p, of 0.018 and the average

[20] The size of contraction is measured by the cumulative decline in per capita GDP during each disaster, corresponding to the measure of the probability, which is the number of wars (rather than fraction of years) during the period of 1915-2000.

contraction size, b, of 0.29, we can calculate welfare effects of changes from various shocks. The assumed parameters yield V =8.6 in equation (5).

Table 10, column 2 reports the numerical values of the formula (8) to (11) for welfare effects at the margin under the parameters specified. The numbers show that, to maintain expected utility, a small increase in σ—for example, by 0.1% per year—requires a rise in the initial level of real consumption by 0.1%. And, a small increase in p—for example, by 0.1%— has to be compensated by a proportionate rise in initial consumption by 0.5%. An increase in b by 0.01 matches up with a proportionate rise in initial consumption by 0.6%.[21]

Equation (9) implies that a small increase in the growth rate γ— for example, by 0.1% per year— has to be compensated by a fall in the initial level of consumption of approximately 0.9%. The marginal welfare effect from a change in growth rate is higher in an economy with a lower growth rate. The cost of forgone percentage point of trend consumption growth is much larger than that from increasing consumption volatility. The relative ratio of welfare benefit of raising trend consumption growth by 1 percentage point per year to that of reducing the standard deviation of normal disturbances by 1 percentage point is calculated by $[(\theta-1)\sigma]^{-1}$, equivalent to 8.1.

We can also consider the welfare effects of eliminating all consumption risk from normal disturbances, σ. This exercise corresponds to setting σ*=0 in equation (7). The formula V in equation 5 implies for this case

$$1/\ V^*_{(\sigma^*=0)} = 1/\ V_{(\sigma)} + (1/2)\cdot(\theta-1)^2\cdot\sigma^2.$$

[21] If the expected growth rate is held fixed, the initial consumption changes compensating for a change of σ and p by 0.1% are estimated to be 0.14% and 0.3% respectively. The effect of an increase of b by 0.01, when its negative effect on growth rate is ignored, drops to 0.5% of the initial level of consumption.

Substituting into equation (7) yields

(12) $\lambda_{(\sigma^*=0)} = [1+ V_{(\sigma)}\cdot(1/2)\cdot(\theta-1)^2\cdot\sigma^2]^{1/(1-\theta)}$

In a similar way, the welfare effects of eliminating all consumption risk from the disasters can be constructed by setting p or b to zero

(13) $\lambda_{(p^*,b^*=0)} = [1+ V_{(p,b)}\cdot p\cdot((1-b)^{1-\theta} - 1)]^{1/(1-\theta)}$

With the parameters assumed before, the proportional decrease in initial consumption required to compensate for elimination of σ turns out to be 2.1%. That is, the economy would be willing to give up about 2.1% of consumption each year to eliminate all of the normal economic fluctuations represented by σ. The compensation parameter for eliminating disaster shocks turns out to be 8.5%. When both normal and disaster shocks are eliminated, the compensating proportional decrease in initial consumption turns out to be 10.3%.

Lucas (1987, 2003) suggests a negligible welfare gain from eliminating normal consumption fluctuations by considering that the impact of a shock on output and consumption is purely transitory. In our framework, if all the shocks- both normal disturbances and disasters- are assumed to be transitory, the volatility shocks occurred at period t can have an effect on output and consumption at period t, but do not have any persistent effect to output and consumption path. The expected utility in equation (3) is changed

(14) $U_t = (C_t)^{1-\theta}/(1-\theta)\cdot e^{[(1/2)(\theta-1)^2\sigma^2+p[(1-b)^{1-\theta}-1]}\sum_{i=0}^{\infty} e^{(-\rho-(\theta-1)\gamma)i}$

The compensation parameter for eliminating consumption risk due to the random shock ε_t is $\lambda^*_{(\sigma^*=0)} \cong \frac{1}{2}(\theta-1)\sigma^2$. With the parameters assumed here, the compensation

parameter is 0.0025, implying that the proportional increase in initial consumption required to compensate for elimination of σ is 0.25% per year, while that for permanent disaster shocks is 2.1%. The compensation parameter for eliminating disaster shocks, v_t, is calculated by $\lambda^*_{(p^*=0)} \cong p[(1-b)^{1-\theta}-1]/(\theta-1)$. Thus, the proportional increase in initial consumption compensating for elimination of disaster shocks, if transitory, turns out to be 1.1%, while that for permanent disaster shocks is 8.5%.

2. The Effects of Currency Unions on Growth and Volatility

This section discusses how a currency union can affect the consumption growth rates and consumption volatility. This quantitative assessment calls unavoidably for a number of simplifying assumptions.

A currency union can generate welfare gains from the additional trade with countries belonging to the same currency union, which in turn stimulates an increase in consumption growth rates. The increase of trade (as ratio to GDP) by joining a currency union, ΔTR_i^j, can be measured by

$$(15)\quad \Delta TR_i^j = \frac{trade_{i,j}}{GDP_i}\alpha,$$

where $\frac{trade_{i,j}}{GDP_i}$ denotes the country i's ratio of total trade (exports plus imports) to GDP with a potential anchor country j, and α is the parameter capturing the marginal effect of joining a currency union on trade. Various studies report a wide range of estimates of α. The seminar paper of Rose (2000) reports the estimate of 2. Subsequently, there have been a vast number of studies made to check the robustness of his finding. Rose and

Stanley (2005) summarize thirty-four studies that yield 754 point estimates of common currency trade effects, ranging between -0.7 and 7.1 based on different samples and techniques. They use meta-regression analysis in order to combine these disparate estimates and conclude the true effects range between 30% and 90%.[22] They also control for publication selection bias, that is, favoring the reporting of significantly positive trade effects in the publications, and report the 'meta-estimate' for the currency union trade effect of 47%. For the benchmark calibration, we opt for an estimate of α=0.5. This estimate of α implies that joining a currency union increases bilateral trade volume between members by 50%, which makes the bilateral trade-to-GDP ratio increase by 50% with a given GDP. The trade-to-GDP ratio would not rise by as much as 50% if the subsequent increase in output due to trade expansion is considered. This repercussion effect, however, would be easily taken account of by reconstructing the estimate of α.

The increased trade then has a positive effect on grow rates of output and thereby consumption. Suppose that ψ is the parameter capturing the marginal effect of one-unit increase in trade-to-GDP ratio on growth rate, the total increase in growth rates is measured by

$$(16) \quad \Delta\gamma = \Delta TR_i^j \cdot \psi = \frac{trade_{i,j}}{GDP_i} \cdot \alpha \cdot \psi$$

Barro and Sala-i-Martin (2002) and Lee and De Gregorio (2004) show that, using a five-year panel data set for a broad number of countries, ψ is around 0.01. This magnitude of the estimate indicates that an increase in trade-to-GDP ratio by 1

[22]. Recent studies such as Tenreyro and Barro (2007) attempt to get around the endogeineity issue by developing a new instrumental-variable (IV) technique. The instrumental-variable approach reveals a significantly larger effect of a currency union on trade. Other approaches based on matching techniques show slightly smaller estimates than those from Rose-type regressions. See Baldwin (2006) for a survey of the literature on the trade effects of currency union.

percentage points (%p) leads to an increase in per capita GDP growth rate of 0.01%p. In a different framework, Frankel and Rose (2002) estimate that an increase in trade-to-GDP ratio of 1%p leads to an increase in the level of per capita GDP of 1/3%p over 20 years, which implies an increase of about 0.015%p per year. For the benchmark calibration, ψ=0.01 is assumed. Therefore, for instance, a currency union for 10 East Asian economies on average would increase the average trade-to-GDP ratio from 0.3 to 0.45, and then the average annual growth rate by 0.15%p (0.3*0.5*0.01).

In order to quantify the impact of joining a currency union on the welfare cost of business cycles, the exact role of independent monetary policy in stabilizing output and consumption fluctuations needs to be assessed. It is hard to gauge exactly how much the cyclical variability can be eliminated by monetary policy in East Asia. It may not be feasible for the monetary authority to remove the systematic cyclical variability originating from technological shocks. Lucas (2003) summarizes the previous researches and suggests that nominal shocks have accounted for something less than 30 percent of output variability in the postwar United States. We assume that monetary policy can stabilize a constant fraction, χ, of shocks to output and consumption. For the benchmark simulation, χ=0.3 is assumed, implying that independent monetary policy can stabilize 30 percent of normal disturbance volatility, $0.3 \cdot \sigma^2$.[23]

Under a currency union, country i can no longer use its own monetary policy for stabilization. When it adopts an anchor country j's currency, country i's monetary policy

[23] Alternatively, central bank may stabilize a part of transitory fluctuations that it considers as deviation of trend. We construct the transitory movement of consumption around its trend by using the widely used Hodrik-Prescott filtering. Then, monetary stabilization policy can be designed to mitigate the part of transitory fluctuations. We find this type of experiment can generate simulation results similar to those reported in the next sub-section. These results are available upon request from the authors.

is administrated by the monetary authority in the anchor country. It is assumed that the monetary authority of anchor country j uses its monetary policy to eliminate its own part of consumption fluctuation.

Since the anchor country reacts only to its own economic disturbances, country i's shocks cannot be stabilized by the extent as much as in the case of monetary policy independence under the floating exchange rate regime, but it is accommodated by the extent to which country i's shock is correlated with the systematic part of country j's consumption fluctuations. That is, when country i adopts country j's currency, the volatility of consumption of country i increases by $\chi \cdot Var(\varepsilon_t^i - \varepsilon_t^j)$.

If a group of countries create a new currency and a new joint central bank, the new monetary authority would adopt the monetary policy that stabilizes the fluctuation of the regional average output and thereby eliminate the systematic part of regional consumption volatility. Hence, when country i forms a currency union with the other countries in East Asia, the volatility of consumption of country i increases by $\chi \cdot Var(\varepsilon_t^i - \frac{1}{N}\sum_{j=1}^{N} \varepsilon_t^j)$.

Columns 3~6 of Table 8 report the estimates of the increased consumption volatility for individual East Asian economies that join a currency union. For an average East Asian economy, adopting US dollar as an anchor currency increases the standard deviation of consumption by 0.7%p from 0.041 to 0.048 while yen bloc increases it by 0.9%p. Joining a currency union involving 10 East-Asian economies is less destabilizing, as it increases the standard deviation of consumption by 0.55%p. The welfare benefit of this increased consumption volatility is estimated to yield a welfare cost of approximately 0.6 percent of consumption per year.

If the increased volatility due to the loss of an independent monetary policy is purely transitory, its welfare cost would be small. However, the increased volatility, regardless of the nature of shocks, may have permanent effects on welfare. As Ramey and Ramey (1995) and Barlevy (2004) show, business fluctuations may have long-term consequences by affecting growth. When people live in an economy that is subject to a larger volatility, they may be more willing to adopt risk-avoiding technology, accepting reduced average growth rates. Fluctuations may lower the level of investment in growth-enhancing activities. However, since lower investment is associated with increased resources for consumption, welfare benefits from eliminating fluctuations and thereby increasing investment rate would not be large. However, even without an effect on the average level of investment, increased volatility can have a significant effect on growth. For instance, with the assumption of diminishing returns to investment, lower volatility of investment implies higher average marginal rate of return to investment at the same level of investment. Hence, a higher variability can lead to lower productivity.

By assuming that all the shocks can have a permanent effect on consumer's welfare, this framework may give the upper bound estimate of the welfare cost from increasing volatility (due to random disturbances) caused by the loss of independent monetary policy. It is also assumed that other policy arrangements such as cooperative fiscal policy between member countries would not supplement the loss of monetary policy independence in order to lessen the welfare cost from the loss of independent national monetary policy. In addition, it is not considered that financial integration can provide risk sharing within member countries.

The loss of monetary policy independence may also have an impact on consumption fluctuations due to rare disasters. Monetary policy is often claimed to play a central role regarding major economic crises. For example, during the emerging market financial crises in the 1990s a major issue of discussion was the role of tightening monetary policy at the beginning of the crisis in order to avoid excessive currency depreciation and the role of monetary expansion to alleviate the output cost of a crisis (De Gregorio and Lee, 2004). A key, unresolved question is to what extent an independent monetary policy can exacerbate or mitigate crises by affecting the probability p or size b of major economic contractions, compared to the case of joining a currency union.

On the other hand, joining a currency union itself would help to lower the probabilities or sizes of disasters such as major wars and financial crises. One of the major benefits from joining a currency union is that it can remove the chance of financial crisis. A complete elimination of exchange rate movement is an ultimate solution for currency crises. However, the adoption of perfect floating exchange rate regime or credible pegs with sound macroeconomic policies, combined with a sufficient amount of international reserves, can also offer safeguards against speculative attacks. Therefore, the net welfare effect of a currency union must vary depending on the country characteristics that determine the probability of financial crises.

Currency unions (or more generally economic and political unions) can help to increase political as well as economic interdependence among member countries which in turn limit the incentive to use military force in interstate relations.[24] In this regard, an

[24] This "liberal" view in political science, which can be traced back to Montesquieu, Kant, and Angell, emphasizes the degree of mutual economic interdependence as a condition of peace. This view has been

increase in interstate economic dependence by sharing a common currency can help to lower the probability of bilateral military conflicts. In Europe, the impetus of forming the European Union and adopting the Euro was the desire of peace, in particular between France and Germany, after the Second World War.

While the impact of economic interdependence on interstate conflicts is unclear in theory and empirics, it is also an unresolved issue whether joining a currency union has a significant impact, independently from joining a trade organization or a military alliance, on the probability or size of interstate conflicts. A currency union is often considered as a final stage of economic cooperation. Other bilateral trade or political arrangements may have a more significant impact on the occurrence of major conflicts than an exchange rate arrangement such as a currency union. It is also important that while a currency union might help to lower the probability of war, it may deprive independent monetary policy of the role of mitigating the output loss during the disasters. It may also happen that conflicts over fiscal policy leads to greater probability of conflict. There may also be differences in desired monetary policy that provoke conflict.

3. Estimation of Welfare Effects of East Asian Currency Unions

For the benchmark calibration exercise, it is assumed the rate of time preference ρ is 0.03 per year, and the relative risk aversion coefficient θ is 4. The disaster probability p is 0.018 and disaster size b is 0.29. Other critical parameters are α, ψ and χ. It is assumed that the trade creation effect of a currency union, α, is 0.5 and the growth effect of an increase in trade-to-GDP ratio, ψ, is 0.01. The fraction of output volatility that monetary

influential. But, there are innumerable counter-arguments to the liberal view too. For instance, the neo-Marxist school argues that asymmetric trade links lead to more conflicts. Empirical studies have also provided ambiguous findings (see Glick and Taylor, 2005, and Martin et al. 2006).

policy stabilizes, χ, is assumed to be 0.3. Considering the ambiguous effects of a currency union or independent monetary policy on the probability and size of disasters, the benchmark exercise assumes that joining a currency union has no impact on the probabilities or sizes of disasters.

Table 11 presents the estimation results of the welfare effects of various currency unions for East Asian economies suggested by the benchmark simulation. The main results are as follows:

(1) The welfare gain from increasing growth rate due to trade creation is estimated to be substantial (Table 11.A). The gain is larger for more open economies such as Hong Kong, Malaysia, and Singapore. The Philippines also gets substantial welfare benefit from trade creation since the marginal welfare effect of an increased growth rate is larger for a lower-growth economy. The welfare gain is comparably smaller for the larger countries in East Asia— China, Indonesia, Japan and Korea, which are relatively less open. The broad membership a currency union has, it can be more beneficial to the members. Because of their substantial degree of intra-region trade, the East Asia countries would benefit most from forming a larger currency union involving all East Asian economies, compared to a dollar bloc, Euro bloc, Yen bloc or smaller unions for sub-groups of countries.[25] The net welfare benefit from increased growth rate due to a currency union involving all 10 East Asian economies

[25] The trade creation effect for an East Asian economy is evaluated for the case that an East Asian economy adopts the US dollar, Euro, or Yen as an anchor currency, independently from the other East Asian economies. If a dollar bloc, Euro bloc, or Yen bloc is formed by involving all East Asian economies, the trade creation effect would increase as the trade creation effect from adopting the US dollar is added to that from joining an East Asia-wide currency union. For example, for South Korea, the welfare gain from trade creation increases from 0.2% of initial consumption when it adopts US dollar as an anchor currency by itself to 0.6% when the other 9 East Asian economies also joins a U.S. dollar currency union.

is estimated to range from 0.1% (Japan) to 2.8% (Malaysia and the Philippines) in terms of their initial consumption per year.

(2) The potential welfare cost of increasing volatility due to the loss of an independent monetary policy is also substantial (Table 11.B). This relatively larger cost of increasing volatility is attributed to our assumption that consumption has a stochastic trend. The welfare cost from the loss of an independent monetary policy amounts to approximately 2.0% of initial consumption for China, Indonesia, and the Philippines when they adopt US dollar, Euro or yen. On the contrary, the welfare cost of increasing volatility is smaller than 0.5% of initial consumption for Japan, Singapore, and Taiwan. The potential welfare cost of increasing volatility becomes smaller when an economy joins a broad East Asian currency bloc, compared to a dollar, Euro or yen bloc. This is because regional monetary policy can play a role of accommodating a part of country-specific shocks. The welfare cost of increasing volatility from joining a currency union involving all 10 East Asian economies is estimated to range from 0.3% (Taiwan) to 1.9% (Indonesia) of initial consumption.

(3) A currency union like a dollar bloc, Euro bloc, or Yen bloc, would not be welfare-improving for most East Asian economies because the potential welfare loss from increasing volatility dominates the potential benefit of increasing growth rates, (Table 11.C). An exception is Singapore in which adopting an anchor currency- either US dollar, Euro or Yen- would incur net welfare gain. However, the majority of countries in East Asia would benefit most from forming a currency union

involving all East Asian economies. Hong Kong, Malaysia, the Philippines, and Singapore turn out to benefit most from joining an East Asia-wide currency union, with a net welfare gain of between 1.4% and 2.0% of initial consumption. On the contrary, China, Indonesia and Japan lose from joining the currency union involving 10 economies in East Asia. The net welfare benefit from joining an East Asia-wide currency union is estimated to be -0.6%, -1.1% and -0.3%, of initial consumption for China, Indonesia and Japan respectively. This is mainly because the welfare gain from increasing trade creation is smaller for these economies, which begin with smaller bilateral trade shares with other East Asian economies. The net welfare gain for Korea is also small, amounting to 0.05%, by joining the East Asia-wide currency union and it becomes negative by joining an East Asia currency union of 9 economies excluding Japan. Hence, the large countries in East Asia such as China, Indonesia, Japan and Korea would be less inclined to join a currency union than the other economies in East Asia.

4. Sensitivity of the Welfare Estimates

The simulation result hinges critically on the assumptions of parameter values. The lower the coefficient of relative risk aversion (θ), the larger the welfare gain from a higher growth rate and the smaller the welfare cost from higher volatility. Hence, the welfare gain from a currency union declines. Table 12, column 1 considers the total welfare effect in the case of $\theta=3$ for a US dollar currency union and a broad East Asian currency union of 10 economies. The general features of the welfare effects for individual East Asian economies are similar to Table 11.C. China, Indonesia, Japan still lose from

joining a currency union involving 10 economies in East Asia, while the others gain.[26] As the welfare cost of increasing volatility becomes smaller, Hong Kong gets net welfare gain from joining a US dollar currency union.

If monetary policy can stabilize a larger fraction of output volatility, the loss of independent monetary policy would be more costly. Column 2 considers the case that the fraction parameter χ is assumed to be 0.5. The general features of the welfare effects for individual East Asian economies are similar to Table 11.C. But, the net welfare gain from joining a US dollar currency union becomes negative for Taiwan. South Korea also gets net welfare loss from joining an East Asia-wide currency union.

The higher value of the parameter for trade creation effect ($\alpha \cdot \psi$) would make currency unions more favorable to East Asian economies. Table 12, column 3 shows to what extent this critical parameter values can change net welfare gain from adopting a US dollar as its currency or joining a broad currency union of 10 East Asian economies. When $\alpha \cdot \psi$ is assumed to increase from 0.005 to 0.009, Taiwan can get net welfare gain from adopting a US dollar as its currency. The net welfare gain from joining a broad currency union becomes positive for South Korea. All East Asian economies would get a larger net welfare gain from joining a US dollar currency union or an East Asia-wide currency union.

Columns 4 and 5 consider the additional welfare effect from lowering disaster probability (p) or size of disaster (b). The welfare consequences of a currency union likely involve its influence on the probability and size of disasters such as wars and financial crises in East Asia. Column 4 considers the case that the disaster probability

[26] In the case of θ=2, China and Indonesia can get net welfare gain by 0.5% and 0.3% of initial consumption respectively, but this low risk aversion coefficient fails in predictions on asset returns. See Barro (2006a).

decreases by 1% point. The lower probability of disaster shocks generates a substantially large welfare gain. It shows that with the baseline parameter values, all the East Asian economies would obtain net positive welfare gain when joining a US dollar currency union or an East Asia-wide currency union. The net welfare gain range from 3% to 15% of initial consumption.[27] Column 5 takes account of the change in the size of contractions (b) by 0.1, decreasing from 0.29 to 0.19. The net welfare effect is similar to that from the change in p: with the baseline parameter values, all the East Asian economies would obtain net positive welfare gain when joining either a US dollar currency union or an East Asia-wide currency union. Hence, whether a currency union can contribute to decrease the probability and size of disasters such as wars and financial crises in East Asia would be another critical factor for the net welfare effect of a currency union in East Asia.

V. Concluding Remarks

Judging from OCA criteria, it is not clear that East Asia is ready to form a currency union. While the degree of intra-region trade is high, the degree of output comovement is relative low. Overall, these forces make the net welfare gain from a currency union small. The low trade intensity and political proximity between Japan and other East Asian economies raise the leadership issue for an East Asian currency union. The calibration results shows that most countries in East Asia would obtain a net welfare gain from forming a currency union involving a broad group of East Asian economies.

[27] If disaster shocks are assumed to be transitory, its elimination would generate a smaller welfare gain. Nevertheless, as elimination of all transitory disaster shocks generates 1.1% of initial consumption (see section IV.1), all East Asian economies still get net positive welfare gain when joining an East-Asia wide currency union.

The gain will be larger if a currency union contributes to a lower probability and size of disasters such as wars and financial crises in East Asia.

The prospect for an East Asian currency union will hinge on future developments of economic and political conditions, rather than current environments. In East Asia, after the 1997 ~1998 financial crises there has been intensified interest in regional financial and monetary cooperation, and substantial progress has been made in several areas, such as information coordination and surveillance, reserve pooling, and regional bond market. The increasing economic cooperation will assist East Asian economies in eventually satisfying more OCA criteria. It would also enhance political cooperation among them if intensified economic interdependence in the region provokes political impetus to foster cooperation.

Despite potential gains, an East Asia-wide monetary union such as one involving ASEAN plus three countries is not likely to emerge in the immediate future. The creation of the monetary union is an outcome of a long-term process of financial cooperation and monetary integration. In Europe it took many decades before economic integration of the region starting from the European Coal and Steel Community in 1952 and then the Werner Plan in 1969 eventually evolved into the European Monetary Union. It was observed that the institutional inefficiencies and governance problems are more significant in East Asia than in Europe, because of the lack of institutional experience as well as leadership. Therefore, it can be much harder to build an efficient mechanism that can help to minimize inefficiencies from the political decision making process in the integration of East Asian economies. The discussion of a currency union in East Asia at the current stage is not considered premature. It may be the moment that East Asian

countries collaborate to build effective institutional frameworks that can foster regional economic integration.[28]

East Asian economies need to improve exchange rate coordination. Maintaining exchange rate stability of national currencies in the region is the most important step for an East Asian currency union. In recent years, there have been suggestions for various exchange rate regimes that East Asia can adopt to increase intra-region exchange rate stability. They include the adoption of the G-3 currency basket system based on the U.S. dollar, the euro, and the Japanese yen, the introduction of ACU (Asian Currency Unit), the use of a parallel currency based on ACU and national currencies, and adoption of an "Asian ERM." The assessments of the benefits and costs of these alternative regimes for East Asian economies during transition to an Asian Monetary Union is an important research topic.

[28] An important symbolic event in the region was the first East Asia Summit (EAS) held in December 2005 in Kuala Lumpur, Malaysia. The attendees included the sixteen countries that consist of the ten ASEAN members, the additional three from APT (ASEAN plus three)- China, Japan and Korea- plus Australia, New Zealand and India.

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Table 1. Bilateral Trade-to-GDP Ratio for East Asia and Europe, 1990-2003*

(percent)

	Trade Partners				
Country	**USA**	**Europe**	**Japan**	**East Asia** **	**World**
China	3.9	3.4	3.7	13.3	20.6
Hong Kong	12.8	14.0	10.6	63.6	119.8
Indonesia	3.3	4.1	6.1	14.7	24.7
Japan	2.1	1.4	.	3.2	8.3
Korea	5.5	3.6	4.6	11.5	27.7
Malaysia	15.3	11.7	13.9	50.8	82.6
Philippines	9.6	5.3	7.3	20.3	35.7
Singapore	22.3	18.8	16.6	72.0	141.0
Taiwan	11.2	6.3	9.2	25.4	51.1
Thailand	6.7	6.6	8.6	21.3	41.8
Average	*9.3*	*7.5*	*9.0*	*29.6*	*55.3*
Austria	1.2	21.1	0.6	1.6	30.5
Belgium	4.8	47.6	1.4	4.4	74.9
Denmark	1.3	18.8	0.8	2.1	26.7
Finland	1.7	16.5	0.8	2.7	26.5
France	1.4	12.7	0.5	1.5	20.2
Germany	1.8	13.6	0.8	2.2	23.1
Greece	0.7	10.0	0.5	1.3	16.1
Iceland	3.0	18.5	1.7	2.2	26.0
Ireland	7.8	36.3	2.3	5.4	55.5
Italy	1.2	10.9	0.4	1.4	18.6
Luxembourg	2.2	40.1	0.5	2.6	51.3
Netherlands	3.1	30.4	1.3	4.9	46.5
Norway	1.7	18.7	0.7	1.7	25.1
Portugal	1.0	21.3	0.5	1.0	26.7
Spain	0.9	12.7	0.4	1.2	18.3
Sweden	2.2	18.7	0.8	2.4	27.1
Switzerland	2.7	20.5	1.0	3.2	28.6
United Kingdom	2.6	11.4	0.8	2.4	20.6
Average	*2.3*	*21.1*	*0.9*	*2.5*	*31.2*
United States	.	1.9	1.1	3.0	9.0

* Trade is the average of exports and imports. The GDP value in the denominator of these ratios refers to the country paired with the potential anchor country or region.
** 10 economies including Japan.

Table 2. Mean and Standard Deviation of Annual Inflation Rates for East Asia and Europe*

(Percent)

Country	1975-89		1990-2003	
	mean	**s.d.**	**mean**	**s.d.**
China	3.8	3.9	5.3	6.7
Hong Kong, China	8.7	4.1	2.6	6.1
Indonesia	13.0	8.9	13.8	17.8
Japan	3.6	2.4	-0.2	1.6
Korea, Rep.	13.3	8.5	5.5	3.4
Malaysia	3.9	5.5	3.3	2.5
Philippines	13.3	11.7	8.2	3.3
Singapore	3.2	3.3	1.2	2.9
Taiwan	4.9	4.8	1.5	2.2
Thailand	5.6	3.2	3.5	3.1
Average	*7.3*	*5.6*	*4.5*	*5.0*
Austria	4.3	1.7	2.1	1.1
Belgium	5.3	2.6	2.0	0.9
Denmark	7.9	3.2	2.2	0.7
Finland	8.5	2.9	2.3	1.8
France	8.2	3.5	1.7	0.7
Germany	3.4	1.2	1.9	1.5
Greece	18.1	3.9	9.1	6.2
Iceland	38.0	15.7	4.7	4.3
Ireland	11.0	6.0	3.4	1.9
Italy	13.5	5.2	4.0	2.0
Luxembourg	4.7	3.9	2.7	1.3
Netherlands	3.9	3.2	2.5	1.1
Norway	7.0	3.4	2.9	4.3
Portugal	18.9	5.2	6.1	3.5
Spain	13.0	5.2	4.4	1.6
Sweden	8.9	2.6	2.8	2.7
Switzerland	3.4	1.8	1.5	1.8
United Kingdom	10.5	6.5	3.3	1.7
Average	*10.5*	*4.3*	*3.3*	*2.2*
United States	5.6	2.6	2.2	0.8

*Based on GDP deflators from WDI.

Table 3. Co-Movements of Prices for East Asia and Europe, 1975-1989 and 1990-2000*

	1975-1989				1990-2000			
Country	**US**	**Europe**	**Japan**	**East Asia****	**US**	**Europe**	**Japan**	**East Asia****
China	0.109	0.138	0.156	0.105	0.148	0.199	0.172	0.195
Hong Kong	0.064	0.097	0.130	0.082	0.032	0.108	0.105	0.138
Indonesia	0.115	0.179	0.189	0.132	0.298	0.308	0.257	0.238
Japan	0.133	0.105	.	0.139	0.099	0.149	.	0.133
Korea, Rep.	0.090	0.120	0.123	0.088	0.144	0.159	0.111	0.119
Malaysia	0.055	0.110	0.136	0.084	0.149	0.194	0.156	0.141
Philippines	0.073	0.127	0.153	0.083	0.120	0.126	0.123	0.126
Singapore	0.041	0.104	0.125	0.078	0.070	0.099	0.086	0.109
Taiwan	0.087	0.109	0.124	0.087	0.069	0.103	0.096	0.110
Thailand	0.051	0.098	0.119	0.072	0.086	0.110	0.088	0.110
Average	*0.082*	*0.119*	*0.139*	*0.095*	*0.121*	*0.155*	*0.133*	*0.142*
Austria	0.116	0.053	0.087	0.126	0.114	0.045	0.137	0.148
Belgium	0.108	0.055	0.101	0.128	0.119	0.043	0.140	0.154
Denmark	0.105	0.054	0.094	0.124	0.116	0.043	0.142	0.151
Finland	0.078	0.068	0.108	0.099	0.136	0.077	0.169	0.180
France	0.115	0.059	0.109	0.130	0.108	0.045	0.143	0.148
Germany	0.107	0.050	0.092	0.122	0.117	0.048	0.138	0.151
Greece	0.086	0.077	0.115	0.097	0.105	0.050	0.147	0.145
Iceland	0.101	0.089	0.100	0.106	0.095	0.060	0.137	0.152
Ireland	0.105	0.056	0.108	0.115	0.094	0.052	0.141	0.146
Italy	0.115	0.062	0.106	0.122	0.114	0.067	0.179	0.169
Luxembourg	0.115	0.060	0.102	0.131	0.132	0.050	0.156	0.165
Netherlands	0.121	0.056	0.103	0.133	0.110	0.045	0.133	0.147
Norway	0.079	0.058	0.098	0.101	0.098	0.048	0.138	0.140
Portugal	0.098	0.071	0.115	0.119	0.126	0.054	0.155	0.163
Spain	0.116	0.074	0.124	0.126	0.124	0.065	0.166	0.167
Sweden	0.085	0.061	0.108	0.107	0.132	0.075	0.182	0.173
Switzerland	0.131	0.079	0.093	0.139	0.115	0.054	0.132	0.147
U. K.	0.103	0.075	0.129	0.112	0.085	0.078	0.139	0.153
Average	*0.105*	*0.064*	*0.105*	*0.119*	*0.113*	*0.055*	*0.148*	*0.155*
United States	.	0.105	0.133	0.082	.	0.113	0.099	0.122

* The co-movement measure is the standard error of the residual for the AR-2 regression for the log of the real exchange rate using the sample of 1960-2000. The bilateral real exchange rate is constructed from the Penn World Tables v.6.1. A higher number implies less co-movement of prices.
** 10 economies including Japan.

Table 4. Co-Movements of Outputs for East Asia and Europe, 1975-1989 and 1990-2003

	1975-1989				1990-2003			
Country	**US**	**Europe**	**Japan**	**East Asia****	**US**	**Europe**	**Japan**	**East Asia****
China	0.062	0.061	0.058	0.065	0.040	0.043	0.040	0.050
Hong Kong	0.040	0.049	0.050	0.049	0.042	0.048	0.035	0.039
Indonesia	0.032	0.040	0.031	0.041	0.052	0.056	0.043	0.039
Japan	0.030	0.025	.	0.038	0.025	0.027	.	0.038
Korea, Rep.	0.034	0.044	0.038	0.047	0.057	0.057	0.049	0.046
Malaysia	0.034	0.036	0.038	0.042	0.029	0.035	0.028	0.034
Philippines	0.050	0.042	0.035	0.046	0.033	0.037	0.031	0.039
Singapore	0.041	0.041	0.034	0.042	0.043	0.052	0.043	0.052
Taiwan	0.025	0.037	0.036	0.040	0.024	0.032	0.029	0.041
Thailand	0.028	0.033	0.019	0.037	0.053	0.057	0.045	0.040
Average	*0.038*	*0.041*	*0.038*	*0.045*	*0.040*	*0.044*	*0.038*	*0.042*
Austria	0.033	0.028	0.022	0.039	0.019	0.020	0.019	0.040
Belgium	0.027	0.026	0.021	0.038	0.017	0.020	0.021	0.039
Denmark	0.029	0.032	0.029	0.043	0.017	0.020	0.024	0.041
Finland	0.039	0.032	0.018	0.040	0.021	0.032	0.036	0.053
France	0.027	0.026	0.016	0.034	0.020	0.020	0.023	0.044
Germany	0.018	0.025	0.019	0.033	0.026	0.022	0.020	0.040
Greece	0.039	0.040	0.031	0.049	0.026	0.027	0.027	0.045
Iceland	0.040	0.041	0.038	0.046	0.027	0.032	0.026	0.049
Ireland	0.039	0.040	0.030	0.046	0.034	0.036	0.037	0.049
Italy	0.027	0.027	0.017	0.037	0.022	0.021	0.020	0.041
Luxembourg	0.043	0.045	0.047	0.052	0.031	0.038	0.046	0.046
Netherlands	0.020	0.025	0.019	0.036	0.018	0.019	0.022	0.040
Norway	0.031	0.032	0.024	0.041	0.022	0.024	0.019	0.038
Portugal	0.042	0.037	0.033	0.046	0.028	0.027	0.027	0.045
Spain	0.031	0.030	0.022	0.038	0.037	0.037	0.044	0.058
Sweden	0.033	0.030	0.018	0.039	0.020	0.023	0.028	0.046
Switzerland	0.034	0.035	0.028	0.044	0.019	0.022	0.024	0.044
U.K.	0.025	0.029	0.019	0.035	0.011	0.022	0.022	0.041
Average	*0.032*	*0.032*	*0.025*	*0.041*	*0.023*	*0.026*	*0.027*	*0.044*
United States	.	0.032	0.030	0.038	.	0.023	0.025	0.040

* The co-movement measure is the standard error of the residual for the AR-2 regression for the log of the ratio of real per capita GDPs using the sample of 1960-2003. The real GDP data, adjusted by PPP is constructed from the Penn World Tables v.6.1. A higher number implies less co-movement of outputs.
** 10 economies including Japan.

Table 5. International Portfolio Asset Holdings by East Asia and Europe in 2003*

(percent in GDP)

	Destination Country/Region				
Source Country	**USA**	**Europe**	**Japan**	**East Asia** **	**World**
China	---	---	---	---	---
Hong Kong	29.8	57.6	6.7	34.9	213.8
Indonesia	0.2	0.1	0.0	0.1	0.9
Japan	14.4	14.1	0.0	0.5	40.0
Korea	1.3	0.5	0.0	0.2	2.9
Malaysia	0.3	0.4	0.0	0.7	1.6
Philippines	3.1	0.9	0.0	0.3	4.6
Singapore	24.7	61.3	3.8	31.9	157.5
Taiwan	---	---	---	---	---
Thailand	1.2	0.4	0.0	0.1	1.9
Average	*9.4*	*16.9*	*1.3*	*8.6*	*52.9*
Austria	8.1	57.6	0.8	1.0	81.7
Belgium	10.7	94.5	0.7	1.1	138.4
Denmark	13.7	33.9	1.4	2.6	59.9
Finland	5.4	54.6	0.6	1.0	66.4
France	8.7	56.6	1.7	2.2	77.8
Germany	5.5	31.8	1.1	1.3	50.1
Greece	2.8	9.3	0.0	0.0	19.7
Iceland	8.4	12.9	0.7	1.6	35.1
Ireland	144.8	297.0	11.5	17.2	528.0
Italy	6.7	26.0	0.8	1.1	53.9
Luxembourg	---	---	---	---	---
Netherlands	42.5	90.0	3.6	5.8	153.0
Norway	19.1	50.1	5.5	6.4	83.5
Portugal	3.9	43.7	0.1	0.1	65.8
Spain	4.4	35.6	0.2	0.3	51.6
Sweden	21.8	32.6	2.8	3.6	70.9
Switzerland	29.9	88.8	3.8	5.0	204.4
United Kingdom	24.1	40.2	6.6	10.5	96.4
Average	*21.2*	*62.1*	*2.5*	*3.6*	*108.0*
United States	.	15.1	2.7	4.1	28.6

--- data unavailable

*The amount of cross-border portfolio assets invested by each East Asian and European economy, as a ratio to the source economy's GDP.

** 9 economies including Japan and China but excluding Taiwan

Source: International Monetary Fund. (http://www.imf.org/external/np/sta/pi/cpis.htm)

Table 6. International Portfolio Assets Invested in East Asia and Europe in 2003*

(percent in GDP)

	Source Country/Region				
Destination	**USA**	**Europe**	**Japan**	**East Asia** **	**World**
China	1.0	0.7	0.2	1.8	3.8
Hong Kong	24.0	24.2	4.6	7.7	65.0
Indonesia	2.4	1.5	0.1	1.4	8.5
Japan	6.8	6.2	0.0	0.3	14.9
Korea	8.8	5.9	0.9	3.5	20.5
Malaysia	7.7	7.8	1.6	13.0	31.4
Philippines	6.3	6.0	1.6	4.2	18.4
Singapore	27.4	16.5	3.0	10.1	61
Taiwan	---	---	---	---	---
Thailand	5.1	5.1	0.7	5.1	17.8
Average	*9.8*	*8.1*	*1.4*	*5.0*	*26.4*
Austria	4.1	57.9	4.4	5.1	75.3
Belgium	5.6	51	5.1	5.8	76.8
Denmark	10.4	33	3.4	4.7	55.9
Finland	25.4	63.7	4.2	4.7	102.4
France	10.4	38.2	5.1	6.0	62.0
Germany	7.8	39.9	6.4	7.2	64.2
Greece	3.4	68.8	2.6	2.8	81.4
Iceland	1.4	82.2	3.0	4.4	101.8
Ireland	21.8	142.3	21.9	26.3	210.3
Italy	4.6	47.2	4.0	4.2	63.2
Luxembourg	---	---	---	---	---
Netherlands	35.6	139.8	12	14.6	209.3
Norway	9.6	17.5	4.9	6.2	37.3
Portugal	3.6	60.0	1.0	1.4	70.4
Spain	6.1	41.2	2.6	2.8	54.9
Sweden	15.0	41.2	7.2	8.1	76.6
Switzerland	37.4	42.7	2.9	3.5	94.6
United Kingdom	36.9	36.3	5.5	9.8	93.0
Average	*14.1*	*59.0*	*5.7*	*6.9*	*90.0*
United States	.	14.6	5.7	6.4	25.8

--- data unavailable *The amount of cross-border portfolio assets invested by source country or region, as a ratio to the GDP of each host economy in East Asia or Europe,

** 8 economies including Japan but excluding China and Taiwan

Source: International Monetary Fund. (http://www.imf.org/external/np/sta/pi/cpis.htm)

Table 7. Political Proximity for East Asia and Europe, Average over 1985-1990 and 2000-2005*

	1985-1990				2000-2005			
Country	**US**	**Europe**	**Japan**	**East Asia****	**US**	**Europe**	**Japan**	**East Asia**.**
China	0.150	0.487	0.489	0.791	0.106	0.532	0.591	0.787
Hong Kong	---	---	---	---	---	---	---	---
Indonesia	0.125	0.473	0.455	0.823	0.120	0.567	0.601	0.821
Japan	0.317	0.757	.	0.491	0.292	0.836	.	0.653
Korea, Rep.	---	---	---	---	0.278	0.805	0.853	0.633
Malaysia	0.143	0.495	0.496	0.849	0.121	0.571	0.610	0.827
Philippines	0.142	0.513	0.488	0.835	0.142	0.587	0.626	0.828
Singapore	0.154	0.524	0.529	0.828	0.137	0.593	0.632	0.818
Taiwan	---	---	---	---	---	---	---	---
Thailand	0.132	0.497	0.490	0.836	0.132	0.615	0.656	0.832
Average	*0.166*	*0.535*	*0.491*	*0.779*	*0.166*	*0.638*	*0.653*	*0.775*
Austria	0.223	0.737	0.713	0.634	0.346	0.928	0.856	0.665
Belgium	0.409	0.796	0.793	0.473	0.362	0.939	0.840	0.636
Denmark	0.300	0.806	0.800	0.564	0.369	0.944	0.861	0.649
Finland	0.225	0.738	0.718	0.623	0.353	0.935	0.862	0.653
France	0.466	0.713	0.685	0.414	0.413	0.858	0.742	0.560
Germany	0.429	0.764	0.756	0.439	0.369	0.933	0.832	0.630
Greece	0.220	0.698	0.723	0.664	0.357	0.937	0.842	0.655
Iceland	0.292	0.792	0.793	0.552	0.365	0.942	0.856	0.641
Ireland	0.249	0.773	0.753	0.613	0.323	0.900	0.844	0.675
Italy	0.395	0.798	0.800	0.496	0.368	0.933	0.837	0.647
Luxembourg	0.390	0.789	0.783	0.476	0.365	0.942	0.847	0.643
Netherlands	0.404	0.796	0.792	0.481	0.365	0.942	0.850	0.643
Norway	0.300	0.802	0.792	0.565	0.367	0.936	0.854	0.645
Portugal	0.388	0.793	0.816	0.505	0.364	0.924	0.841	0.654
Spain	0.275	0.742	0.787	0.591	0.36	0.921	0.838	0.647
Sweden	0.237	0.748	0.726	0.633	0.337	0.907	0.864	0.659
Switzerland	---	---	---	---	0.331	0.930	0.841	0.653
U. K.	0.562	0.674	0.642	0.377	0.464	0.849	0.749	0.548
Average	*0.339*	*0.762*	*0.757*	*0.535*	*0.365*	*0.922*	*0.836*	*0.639*
United States	.	0.339	0.317	0.166	.	0.367	0.292	0.166

--- data unavailable *Political proximity is the fraction of times out of all votes that countries voted alongside in the U.N. General Assembly along with each other.

** 7 economies except Hong Kong, Korea and Taiwan for 1985-90, and 8 economies including Korea for 2000-2005.

Table 8. Mean and Standard Deviation of Annual Per Capita Real Consumption Growth over the Period of 1960-1997

Country	Mean growth rate	S. D. of growth rate shocks	S.D. of growth rate shocks after a currency union			
			US dollar	Euro	Yen	East Asia10
China	0.0367	0.0532	0.0614	0.0617	0.0634	0.0603
Hong Kong	0.0569	0.0462	0.0525	0.0523	0.0540	0.0527
Indonesia	0.0359	0.0593	0.0687	0.0698	0.0737	0.0680
Japan	0.0458	0.0322	0.0378	0.0365	0.0322	0.0372
Korea	0.0495	0.0367	0.0433	0.0424	0.0464	0.0410
Malaysia	0.0326	0.0441	0.0532	0.0503	0.0519	0.0497
Philippines	0.0139	0.0338	0.0405	0.0385	0.0410	0.0379
Singapore	0.0480	0.0381	0.0432	0.0424	0.0446	0.0428
Taiwan	0.0628	0.0319	0.0371	0.0362	0.0404	0.0365
Thailand	0.0411	0.0360	0.0420	0.0412	0.0450	0.0406
Average	0.0423	0.0410	0.0478	0.0470	0.0500	0.0465

Note: The consumption fluctuation of country i, after adopting a currency of anchor country j or joining a currency union involving a group of 10 East Asian countries including country i, is assumed to increases by $\chi \cdot Var(\varepsilon_t^i - \varepsilon_t^j)$ or $\chi \cdot Var(\varepsilon_t^i - \frac{1}{10}\sum_{j=1}^{10} \varepsilon_t^j)$. The parameter χ measures a constant fraction of shocks to output and consumption that can be stabilized by the monetary policy and is assumed to be 0.3. Data for Singapore is from 1966 to 1997.

Table 9. Declines of 10% or More in Real Per Capita GDP in East Asia[1]

Event	Country	Years	% fall in real per capita GDP
Great Depression	China	1932-34	10
	Indonesia	1929-35	14
	Malaysia	1929-32	17
	Taiwan	1928-31	12
World War II	China[2]	1936-50	18
	Indonesia[3]	1941-49	36
	Japan	1943-45	52
	Korea	1937-45	58
	Malaysia[4]	1942-47	36
	Philippines[5]	1939-46	60
	Taiwan	1942-45	51
Financial Crises	Indonesia	1997-99	12
	Philippines	1982-86	17
	Thailand	1997-98	12
Mean for 14 contractions			29

[1] Data are compiled from Maddison (2003) for 7 East Asia countries for 1915-1955, and the Penn-World Tables v.5.1 for 10 East Asian economies for 1955-2000. Satisfactory data for Hong Kong, Singapore, and Thailand are unavailable until after World War II.
[2] No data available for 1939-49.
[3] No data available for 1942-48.
[4] No data available for 1941-45.
[5] No data available for 1943-46.

Table 10. Compensating parameter
Proportionate change in initial consumption

A. Marginal Effect

(1)	(2)	(3)
Marginal change in:	Welfare effect	Numerical value
normal s.d. (σ)	$V\cdot(\theta-1)\cdot\sigma$	1.1
disaster probability (p)	$V\cdot[(1-b)^{1-\theta}-1]/(\theta-1)$	5.1
disaster size (b)	$V\cdot p\cdot(1-b)^{-\theta}$	0.6
growth rate (γ)	-V	-8.6

B. Total Effect

(1)	(2)	(3)
Change in:	Welfare effect	Numerical value
normal s.d. (σ=0)	$[1+ V\cdot(1/2)\cdot(\theta-1)^2\cdot\sigma^2]^{1/(1-\theta)}$	2.1
disaster probability (p=0)	$[1+ V\cdot p\cdot((1-b)^{1-\theta}-1)]^{1/(1-\theta)}$	8.5
Normal s.d. and disaster probability (σ=b=0)	$[1+ V\cdot(1/2)\cdot(\theta-1)^2\cdot\sigma^2 + V\cdot p\cdot((1-b)^{1-\theta}-1)]^{1/(1-\theta)}$	10.3

Note: Numerical values for the welfare effect in column 3 are based on the parameters in the baseline simulation. These values are p, disaster probability, of 0.018 per year; b, disaster size, of 0.29; ρ, rate of time preference, of 0.03 per year; θ, coefficient of relative risk aversion, of 4; γ, growth-rate parameter, of 0.039 per year; and σ, standard deviation of normal fluctuations of real GDP and consumption, of 0.049 per year. V corresponds to $[\rho + (\theta-1)\cdot\gamma - (1/2)\cdot(\theta-1)^2\cdot\sigma^2 - p\cdot((1-b)^{1-\theta}-1)]^{-1}$. See equations in the text.

Table 11. Welfare Effects of Currency Unions in East Asia: Baseline Simulation

A. Welfare Effect from Trade Creation

Country	US dollar	Euro	Yen	East Asia C.U. 9	East Asia C.U. 10
China	0.20	0.18	0.19	0.50	0.69
Hong Kong	0.40	0.44	0.33	1.62	1.93
Indonesia	0.18	0.23	0.34	0.48	0.81
Japan	0.08	0.05	0.00	0.00	0.12
Korea	0.20	0.13	0.16	0.24	0.41
Malaysia	0.87	0.67	0.79	2.04	2.77
Philippines	1.36	0.76	1.04	1.83	2.80
Singapore	0.81	0.69	0.61	1.97	2.53
Taiwan	0.31	0.17	0.25	0.44	0.69
Thailand	0.29	0.28	0.37	0.55	0.91

B. Welfare Effect of increasing Volatility

Country	US dollar	Euro	Yen	East Asia C.U. 9	East Asia C.U. 10
China	-1.54	-1.60	-1.94	-1.30	-1.30
Hong Kong	-0.60	-0.58	-0.75	-0.64	-0.61
Indonesia	-2.11	-2.37	-3.44	-1.84	-1.92
Japan	-0.46	-0.34	0.00	0.00	-0.40
Korea	-0.58	-0.49	-0.88	-0.35	-0.36
Malaysia	-1.58	-1.04	-1.32	-0.95	-0.92
Philippines	-2.29	-1.52	-2.48	-1.41	-1.34
Singapore	-0.47	-0.39	-0.61	-0.45	-0.42
Taiwan	-0.30	-0.24	-0.51	-0.27	-0.26
Thailand	-0.61	-0.53	-0.96	-0.46	-0.46

Table 11, Continued.

C. Total Welfare Effect (A+B)

Country	US dollar	Euro	Yen	East Asia C.U. 9	East Asia C.U. 10
China	-1.32	-1.41	-1.73	-0.78	-0.58
Hong Kong	-0.19	-0.13	-0.41	1.01	1.36
Indonesia	-1.91	-2.12	-3.05	-1.33	-1.05
Japan	-0.38	-0.29	0.00	0.00	-0.28
Korea	-0.38	-0.36	-0.71	-0.10	0.05
Malaysia	-0.66	-0.35	-0.49	1.16	1.94
Philippines	-0.80	-0.71	-1.33	0.52	1.61
Singapore	0.36	0.31	0.01	1.56	2.15
Taiwan	0.01	-0.07	-0.25	0.18	0.44
Thailand	-0.32	-0.24	-0.58	0.09	0.46

Note: The welfare effect corresponds to a proportional change in initial consumption per year caused by joining a currency union in East Asia. The welfare effect for US dollar, Euro, and Japanese Yen is derived by assuming that each East Asian economy adopts the corresponding anchor currency as a national currency independently. East Asia Currency Union 10 or 9 indicates a regional common currency bloc for East Asia that encompasses all 10 economies or excludes Japan. The simulation is based on the parameter values in the note to Table 10. It is also assumed that trade creation effect of a currency union (α) is 0.5, and growth effect of an increase in trade-to-GDP ratio (ψ) is 0.01. The fraction of output volatility that monetary policy can stabilize (χ) is assumed to be 0.3.

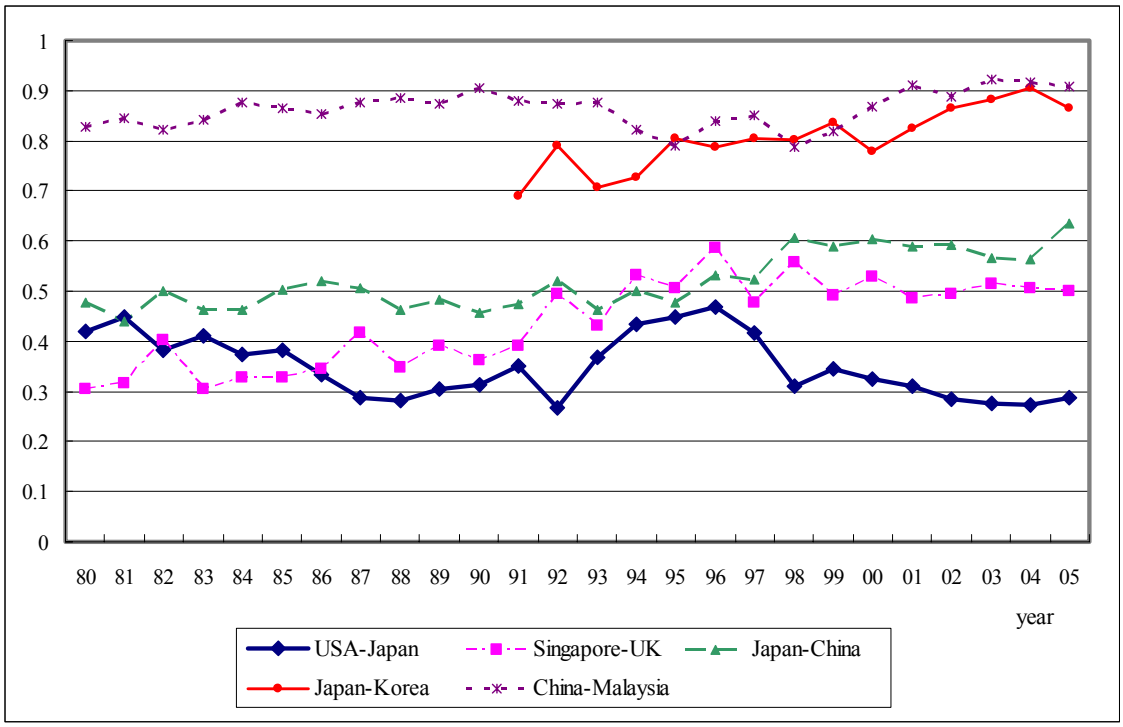
Table 12. Sensitivity Analysis of Total Welfare Effects

	(1) $\theta = 3$	(2) $\chi = 0.5$	(3) $\alpha\psi$=0.009	(4) p=0.008	(5) b=0.19
A. US Dollar Currency Union					
China	-0.95	-2.39	-1.15	4.59	4.14
Hong Kong	0.01	-0.59	0.13	3.63	3.36
Indonesia	-1.38	-3.41	-1.75	4.38	3.90
Japan	-0.29	-0.69	-0.31	3.91	3.58
Korea	-0.24	-0.76	-0.22	3.73	3.42
Malaysia	-0.16	-1.73	0.06	6.12	5.67
Philippines	-0.05	-2.35	0.33	13.31	12.45
Singapore	0.66	0.05	1.00	5.01	4.70
Taiwan	0.15	-0.19	0.26	3.34	3.10
Thailand	-0.14	-0.73	-0.08	4.63	4.27
B. Currency Union of 10 East Asian Economies					
China	-0.18	-1.46	-0.01	5.59	5.16
Hong Kong	2.02	0.97	2.83	6.23	5.98
Indonesia	-0.48	-2.37	-0.38	5.58	5.12
Japan	-0.18	-0.54	-0.18	4.04	3.71
Korea	0.22	-0.19	0.38	4.29	3.99
Malaysia	2.63	1.38	4.02	9.57	9.18
Philippines	1.84	0.78	3.73	15.51	14.74
Singapore	2.92	1.89	4.03	7.86	7.59
Taiwan	0.70	0.27	0.98	4.06	3.82
Thailand	0.77	0.16	1.18	5.79	5.44

Note: The figures correspond to the total welfare effect of Table 11.C when the parameter value is changed as indicated.

Figure 1. Political Proximity for Selected Country-Pairs, 1980-2005

A.



B.