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Abstract

After the political unification of Hong Kong with China, Hong Kong is supposed to function as a separate economic entity under the framework of "one country, two systems". However, the increasingly close ties between the two economies have raised the possibility of full economic integration, and even of monetary union as the Chinese currency progresses towards full convertibility. This paper employs the theory of optimum currency area (OCA) and adopts recently developed techniques to test whether China and Hong Kong constitute an OCA. The empirical findings based on disaggregated historical data are overwhelmingly negative. Other considerations also point to a sceptical answer even for the post-1997 era.

JEL Codes: F15, F33, F36.

Do China and Hong Kong Constitute An Optimum Currency Area?

Yue Ma and Shu-ki Tsang

The foreign exchange system in China has been changing at a remarkable pace in the reform period, particularly since 1994. Current account convertibility for the Chinese currency, the Renminbi (RMB), was formally achieved on 1 December 1996, when the country's central bank, the People's Bank of China, accepted Article VIII of the Articles of Agreement of the International Monetary Fund (Tsang, 1997). Economists are now arguing about the possibility and desirability of full convertibility within the next decade. According to the experiences in other countries and the reality of the mainland economy, it is most unlikely for RMB to be fully convertible within 10 years (see Liu, Zhao, Ma, Yiu, Kueh, and Tsang, 2002).

However, as the Renminbi (RMB) moves towards the state of full convertibility, an issue worthy of serious attention is the fate of the currency of Hong Kong---the Hong Kong dollar (HK$). After a decade and a half of British colonial rule, Hong Kong became a special administrative region (SAR) under Chinese sovereignty on 1 July 1997 within a constitutional framework of "one country, two systems", which guarantees a high degree of autonomy for the SAR. Hong Kong is now supposed to enjoy fiscal independence, continue to issue its own currency (the HK$), and be responsible for all matters except (1) national defense, and (2) diplomacy, which are under the jurisdiction of mainland China. These arrangements are sanctified by the Joint Declaration between China and the UK in 1984 and the Basic Law promulgated by China in 1990.

In any case, since China launched her economic reform and open policy in the late 1970s, the economic linkages with mainland China and Hong Kong have been rapidly strengthening through apparently phenomenal trade and capital flows. Hong Kong as an international port now handles half of China's external trade. It has provided over 60% of "foreign capital" which has been crucial for the Chinese economic take-off. On the other hand, Chinese economic influence in Hong Kong is also increasing rapidly (Tsang, 1996a). To many, the political unification in 1997 will only further cement the economic ties. The big question is therefore: Are two separate currencies (the RMB and the HK$) really necessary, particularly when the RMB becomes fully convertible, some time in the future?

This paper investigates the issue by looking at whether the widely acclaimed economic integration between mainland China and Hong Kong has progressed to a stage that monetary unification is justified. This would involve mainly empirical analysis of the situation so far. In a forward looking sense, the discussion will also engage some theorizing about a "future" monetary union when the RMB becomes fully convertible.

I. The Theory of Optimum Currency Area

In the analysis of the justification or otherwise for the system of "one country, two currencies" for Hong Kong and China, it is natural for us to go into the theory of optimum currency area (OCA) as pioneered by Mundell (1961) and extended by McKinnon (1963) and others, which is the dominant framework for the economics of monetary union. The push towards a common currency for Europe has prompted a new generation of models and analyses (e.g. Tavlas, 1993). Traditional optimal currency literature identified factor mobility (Mundell, 1961), trade integration (McKinnon, 1963), and regional production diversification (Kenen, 1969) as the major criteria to determine the desirability of a common currency area. Recent literature points to the variance of the real exchange rates (Vaubel, 1976), monetary integration (von Hagen and Neumann, 1994) and fiscal integration (Kenen, 1969; Eichengreen, 1992) as crucial factors that characterize an optimal currency area. For recent theoretical and empirical contributions, see Mélitz (1995, 1996) and Artis, Kohler and Mélitz (1998).

Since China launched its reform in 1978, the economy has undergone a rapid process of monetization (Yi, 1996). However, there are still doubts as to whether the country has fully emerged from the constraints of planning and bureaucratic intervention, which would be serious obstacles to a full-scale financial liberalization and the possibility of a freely convertible Renminbi.[1] Monetary union with Hong Kong, which is regularly elected as one of the "free-est" economies in the world, would then not be plausible. In the light of these considerations, the key questions that we attempt to answer in this paper are: (a) Is China itself an OCA? (b) Do China and Hong Kong constitute an OCA? (c) Do eastern China, the most open of the Chinese regions, together with Hong Kong form an OCA? (d) What are the implications for macroeconomic policies and exchange rate arrangements between China and Hong Kong?

Artis, Kohler and Mélitz (1998) investigated the issue of OCAs in the worldwide context. China and Hong Kong were included as two of the regions in their sample. Based on the trade criterion, they concluded that China and Hong Kong are an OCA or part of the Asian and Oceanian OCA. Nervertheless, our paper looks at the issue of OCA from rather different criteria and can therefore be compared with the study by Artis, Kohler and Mélitz (1998). It is interesting to check if their results are robust to criteria other than trade.

II. Econometric Methodology

In the existing literature, three major empirical techniques have been developed to test whether different economies or economic regions constitute an OCA.

II.A. Variance approach

[1] For a review of the recent literature on the relationship between exchange rates and the economic fundamentals, see Ma and Kanas (2000).

The traditional approach looks at the variance of some key variables (Mundell, 1961; Vaubel, 1976)). In the recent context, Eichengreen (1992) looks at the minimum, maximum and standard deviations of the real exchange rates of European Community members against Germany. De Grauwe and Vanhaverbeke (1993) focus on the standard deviations of regional growth and unemployment rates. Whilst most variables such as GDP and investment growth rates can be applied by conventional variance analysis, the case of the real exchange rates among regions in China and Hong Kong requires special treatment. This treatment has been formalized by von Hagen and Neumann (1994), which is summarized as follows.

Define the real exchange rate (RER) between a mainland Chinese region i and Hong Kong as

<1> $$Q_{it} = P_t + s_t - p_{it}$$

where P_t is the logarithm of Hong Kong's CPI, s_t is the logarithmic nominal exchange rate of RMB/HK$, p_{it} is the logarithm of Chinese region i's CPI. The real exchange rate between two mainland Chinese regions i and j as

<2> $$q_{jit} = p_{jt} - p_{it}$$

as the nominal exchange rate between the latter two is one.

To derive the unexpected component of variables Q_{it} and q_{jit}, we do the following regressions:

<3> $$Q_{it} = \alpha_0 + \Sigma_k \alpha_k Q_{i,t-k} + U_{it}$$

<4> $$q_{jit} = \alpha_0 + \Sigma_k \alpha_k q_{ji,t-k} + u_{jit}$$

Call these residuals, U_{it} and u_{jit}, RER shocks. Then compute the conditional standard deviations (STD) of these chocks and average over the Chinese regions to yield the measures of conditional RER variance.

<5> $$V = \Sigma^{M}_{i=1} STD(U_{it})/M$$

<6> $$v_j = \Sigma^{M}_{i=1} STD(u_{jit})/M$$

where M is the number of Chinese regions covered in the regressions.

Then compare v_j (j=1,..M) to see if China is an OCA. However, in the case of China and Hong Kong, we need to construct an aggregate measure for China and then compare it with the measure of Hong Kong. One way is to construct an average RER variance of China:

<7> $$v = (1/N)\Sigma_i \Sigma_j STD(u_{jit})$$

where N=1+2+3+..+M=Z, which is the total number of u_{jit} of mainland Chinese regions. Then compare V and v to see if China and Hong Kong together constitute an OCA.

To construct indicators for eastern China, the most open of the country, and compare with Hong Kong:

<8> $$V_S = (1/S)\Sigma^{S}_{i=1} STD(U_{it})$$

<9> $$v_S = [1/(1+...+S)]\Sigma_j \Sigma_i STD(u_{jit})$$

here S is the number of eastern regions in mainland China. Then compare V_S and v_S to see if they form an OCA.

II.B. Common shock decomposition approach

This approach applies principal component analysis to decompose the common shocks to an economic variable in different regions into symmetric and asymmetric shocks. This is complementary to the von Hagen and Neumann's (1994) individual shock approach. One example of this approach can be found in Caporale (1993).

To generate estimates of the shocks or innovations to a set of economies, one can use the following vector auto-regression (VAR):

<10> $$y_t = \gamma + \beta . y_{t-1} + u_t$$

where y_t is a vector of values for an important economic variable, say GDP or CPI, over M different economies or regions, γ represents a vector of constants, β is coefficient matrices, and u_t is vector of disturbance terms. The estimated u_t can then be subjected to principal components analysis after they are normalized so that their expected value equal to 0 and their variance equals 1. Let us call the normalized value e_t. Suppose there are M principal components denoted as $p_1, \ldots, p_M$. Each principal component is a time series of the sample period under investigation. The normalised eigenvectors, $f_1, \ldots, f_M$, of the correlation matrix of the e_t is called the loading factors. The squares of the factor loadings show the weight applied to each component in expressing each series as a function of the components. Hence the square of f_{ij}, which is the i-th element of f_j, represents the percentages of the variance of region i's variable explained by j-th principal component included in the model. They show the percentages of the fluctuation of the economic variable that can be explained by "common shocks", i.e. the "principal components", or shocks that have economy-wide effects. That is,

<10a> $$e_{it} = f_{i1}\, p_{1t} + f_{i2}\, p_{2t} + \ldots\ldots + f_{iM}\, p_{Mt}$$

We can improve upon the above principal components approach of Caporale (1993) by decomposing the total variance of common shocks into positive (symmetric) and negative (asymmetric) contributions. If the symmetric contribution outweighs the asymmetric contribution for a particular economy or region, it would constitute as evidence that the economy would derive net benefit by being a member of the wider community, say an OCA. As the eigenvectors, or the loading factors, are normalised so that $\Sigma^{M}_{j=1} f_{ij}^{2} = 1$ for any given region i, the calculated symmetric and asymmetric shocks for each region are also normalised. The decomposition into symmetric shocks for region i is given as follows:

<11> $$\sum_{j\in\{j|f_{ij}\geq 0\}} f_{ij}^{\,2}$$

whilst the asymmetric shocks is given as:

$$< 12 > \qquad \sum_{j \in \{j | f_{ij} < 0\}} f_{ij}^{\,2}$$

As the total shocks are normalised to one, it implies that although we cannot compare the shocks *across* regions, we can compare them *within* each region and assess each particular region if it is beneficial to stay with a common currency area.

III. Empirical evidence for Chinese regions and Hong Kong

III.A. Our hypothesis

The economic linkages between the Mainland and Hong Kong have no doubt been strengthening rapidly, but their true scale and significance should be viewed in the proper perspective. After all, trade and capital flows started to expand from very small bases in the 1980s. As we have analyzed elsewhere, the huge volume of trade between Hong Kong and China has been dominated by trade in intermediate goods arising from Hong Kong's utilization of mainland China as an outward processing zone. Netting out intermediate trade, Hong Kong's dependence on the United States as a market for *final goods* has fallen by only 3-4% in the 1980s (Tsang, 1996a). The share still stood at 32.6% in 1995, while China took only 10.5% of Hong Kong's final products in that year.

Even as Hong Kong accounts for over 60% of foreign direct investments in China, China's cumulative stock of direct investments in Hong Kong by 1994 made up only 18% of total foreign direct investments and ranked third, after the UK and Japan. In the year of 1994, China's direct investments in Hong Kong were estimated to constitute a merger 4.5% of Hong Kong's capital formation (Ma, Tsang and Tang, 1998). In any case, even Hong Kong capital's contribution to China should not be exaggerated. Hong Kong dominates in direct investment but not in non-equity finance, which it has made up for about only 10% since 1979. Overall, Hong Kong's share in China's absorption of foreign capital (foreign direct investment plus non-equity financing) was 29.93% in the years of 1979-1995. Tsang and Ma (1997) estimate that on average Hong Kong's capital contributed to only 0.29% in China's annual real growth rate up to the early 1990s.

Overall, the economic "integration" between Hong Kong and Mainland China has not been that advanced, before the political unification in 1997. It has in our view not developed to a stage that the two economies constitute an "optimum currency area".

III.B. Empirical tests

In the literature, a number of criteria has been used in testing the existence or viability of an OCA. The most common ones are growth and inflation rates (Boltho, 1989; Caporale, 1993; de Grauwe and Vanhaverbeke, 1993) and movements in real exchange rates (RER) (Eichengreen, 1992; von Hagen and Neumann, 1994). On top of these, other criteria that test factor mobility have been adopted, e.g. capital mobility (Mundell, 1961; Eichengreen, 1992). Regional stock price differentials in real terms, similar to the RER variable, are a good proxy. Another important variable is of course labour mobility (Eichengreen, 1992; de Grauwe and Vanhaverbeke, 1993).

In our case of investigating the monetary affinity between Hong Kong and China, we are constrained in our choice of variables for empirical tests by data availability as well as the institutional peculiarities of the Chinese and Hong Kong economies. For example, Hong Kong has adopted a fixed exchange system since late 1983 (the "link" which pegs the Hong Kong dollar to the US dollar at the rate of 7.80), but her prospect as a door step to a rising China has led to domestic inflation (Tsang, 1996c). China, on the other hand, has gone through various stages in exchange rate manipulation and liberalization (Tsang, 1994; and Tsang, 1997) during the reform process, as price reforms have proceeded at an uneven pace.

Data on other forms of financial integration are also a serious problem. The stock markets in China, in Shanghai and Shenzhen are still at their formation stages. Given the lack of investment outlets in a transition economy like China, where residents are not experienced about stock market investment, stock prices in the two exchanges have exhibited wide fluctuations. More seriously, the markets in the two cities have been segregated into two submarkets, A shares and B shares, and foreign investors have been confined to the B submarket, which has unfortunately shown little dynamism. In terms of monetary flows, the World Bank has suggested that "China's official interest rates have loosely followed interest rates in Hong Kong, with the China's interest rates higher by several percentage points in recent years..." (World Bank, 1996, p.30). This may point to some fund movements that seek interest gains, despite the rather strict control on the capital account on the Chinese side. Alternatively, it could simply means that the Chinese government wants to stabilize its currency against the US dollar, to which the HK$ is pegged. As Hong Kong's interest rates broadly follow those of the US, China has actually been following the HK interest rates.

In any case, we have to strike a proper balance between theoretical interest and data handling. In our empirical analysis, we have tried our best to probe into several basic variables: (1) growth rates of real national income and GDP; (2) real investments growth; and (3) real exchange rates (RER). For each variable we implement two complementary analyses: the variance approach (modification of von Hagen and Neumann, 1994) which examines the individual, region-*specific* shocks; and the principal component approach (improvement of Caporale, 1993) which decomposes the *common* shocks into symmetric and asymmetric contributions.

III.C. Results using national income and GDP data

The Chinese national income data are based on 'material production system' (MPS) but Hong Kong's data are based on SNA (system of national accounting) (see the Data appendix of this paper and Tsang and Ma (1997) for details of the differences of the two statistical systems). As a result, the national income data of China and Hong Kong are non-comparable. The GDP time series, which are based on SNA but only available after 1978 for China, are too short to apply the principal component analysis for China and Hong Kong as a whole. Subject to the data availability, we decide to investigate the question if China is an OCA herself first by using national income data. Then we will look at the issue that if eastern (costal) regions of China and Hong Kong are an optimal currency area (OCA) by using GDP data.

In Table 1, we report the results of the variance test on the real national income growth rates of 28 regions in China over the period of 1954 to 1994. It can be seen that while the standard deviation (STD) of China as a whole for the period of 1962-1994 turns out to be 0.120, most of the 28 regions show a STD that is quite close to it. Jianxi has the lowest STD at 0.075, which is 37% below the national average, while Beijing has the highest at 0.175, which is 46% above the average. This gives some evidence to support the view that China is an OCA.

This conclusion is confirmed by the results of principal component analysis. Among the common shocks, 26 regions of China have symmetric shocks outweighing the asymmetric ones. The only suspect cases are Jiangsu and Henan. But neither of them failed both tests of variance and principal component analyses.

Table 2 looks at the eastern costal Chinese regions. The results confirm that they are also an OCA with two exceptions of Jiangsu and Guangdong. However the two outlier regions did not fail both tests.

To conclude, there are evidence that China as a whole is an OCA based on the real national income growth from 1954 to 1994.

Next, we ask the question if Hong Kong and China constitute an OCA. Using real GDP growth to compute STDs for mainland China and Hong Kong, we found some evidence against this hypothesis: Hong Kong exhibits substantial STD differences to other Chinese regions whether compared with the whole of China (Table 3) or just those regions on the eastern coast (Table 4). A decomposition of the common shocks among the eastern regions indicates that about 70% of them are asymmetric and 30% are symmetric in Hong Kong (Table 4). To conclude, we do not find empirical evidence to support the hypothesis that Hong Kong and China constitute an optimal currency area.

III.D. Results on investment data

The exercises are repeated using data of real investment growth. Table 5 shows that the standard deviation of Hong Kong has the fourth largest divergence from the national average. The asymmetric shocks on Hong Kong have a share of about 64%. If Hong Kong joined a common currency with mainland China, it would suffer a great deal of inflexibility due to asymmetric shocks. However, while it is not optimal for Hong Kong's investors to join the whole of mainland China as a single currency area, would it optimal for Hong Kong to ally with the eastern coastal regions, which are the most developed in the country, in a monetary union?

Table 6 shows the negative findings to this question. In terms of STD, Hong Kong shows the second largest divergence with 91% less than the average of coastal regions of China. As to principal components analysis, most of the eastern Chinese regions have symmetric shocks outweighing the asymmetric ones, whereas the reverse is true for Hong Kong (and Fujian). Hence both tests point to the conclusion that Hong Kong is not part of the OCA.

IV.E. Results of real exchange rate shocks

Finally, we investigate the real exchange rate shocks on China and Hong Kong. Table 7 gives the most striking results so far. Both the variance and the principal components analyses strongly confirm that China was an OCA but Hong Kong did not belong to it in the period of 1962-1994.

As can be observed from Table 7, the real exchange rate shocks on Hong Kong exhibit a standard deviation of 0.18 which is as large as 447% of China's national average (0.033). Among the common shocks, 99.9% are in fact asymmetric shocks in Hong Kong whilst more than 90% shocks appeared to be symmetric ones in all other mainland regions. Hong Kong is clearly an outlier by whatever criteria.

Table 8 looks at the coastal regions of China as a regional bloc plus Hong Kong. Both exercises confirm again overwhelmingly that eastern China was an OCA, but Hong Kong was not part of it.

IV.F. Results based on recent data from the 1980s/90s

All our tests of OCA so far are based on long time series analyses from the 1950s or 1960s to 1990s, except Tables 3 and 4 of GDP growth. That is important for the investigation of the long run relationship among Chinese regions and Hong Kong. We found that there is overwhelming evidence that Hong Kong and mainland Chinese regions are not an OCA. However, since Chinese economic reform in the late 1970s, there have been widely observed and well documented fundamental structural changes in both China and Hong Kong (see, for example, Ma, Tsang and Tang 1998; Tsang and Ma, 1997). A rapid economic integration process has occurred between China and Hong Kong. The question is whether the two economies have since been formed an OCA. We test this hypothesis by using the economic data after 1978. There are two problems associated with the principal component analysis (PCA). One is that the number of annual observations is too small to implement PCA to *all* Chinese regions plus Hong Kong. As the Chinese regional data have only annual observations, we can only implement the PCA to the eastern coastal regions of China plus Hong Kong. The results are reported in Table 4. However, we can find some consistent monthly price data for the 35 major cities located across 28 regions of China over January 1989 to November 1993. We therefore use this data set to approxy the regional urban economies of China and to test their integration with Hong Kong which virtually has no agricultural sector. The results are reported in Tables 9 and 10.

It can be shown from Table 9 that the standard deviation (STD) of Hong Kong's monthly real exchange rate has the second largest divergence, about 48%, above the average of Chinese cities, whilst the STDs of all mainland cities are about 10% to 20% around the average, except Guangzhou which is located in Guangdong province.

The principal component analysis strengthens our argument that Hong Kong and China has not formed an OCA up to the end of 1993: the asymmetric shocks in HK account for 80% of the common shocks. By looking at the results of Table 10, we are convinced that Hong Kong and eastern China are also not an OCA, although both the divergence of HK's STD from Chinese average and asymmetric shocks in HK are relatively smaller than that in Table 9.

Having established the argument that Hong Kong and China are not an OCA, we may look closely into the results of Chinese regions to ask the question if China herself is an OCA again. Most of the results based on long time series from the 1950s or 1960s to 1990s seem to support the view that China is an OCA. However, Tables 9 and 10 which are based on more recent and higher frequency data cast some doubt on this conclusion.

In Table 9, ten out of 35 major cities in China have experienced more than 50% of asymmetric shocks over 1989 to 1993. While even within the bloc of eastern cities, as Table 10 shows, five out of 17 cities suffered more asymmetric shocks than symmetric shocks over the same period. This indicates that economic liberalization has generated significant disparities among the Chinese regions, both nationwide and within the developed eastern regions.

IV. Future Prospects and Conclusion

Extending the OCA criteria beyond trade flows, we have reached a different conclusion from that of Artis, Kohler and Mélitz (1998). The results presented in this paper clearly point to the finding that China and Hong Kong have not constituted an OCA up to the very recent past. However, one interesting question is the future likelihood of such a prospect. As far as the continued existence of the RMB and the HK$ is concerned, the official position is clear. There will *not* be any monetary union which unifies the two currencies. As stipulated in the Basic Law, the mini-constitution promulgated by China on post-1997 Hong Kong, the Hong Kong SAR will continue to issue its own currency and decide its own monetary policies. Monetary relations between the Mainland and the SAR have been characterized by Joseph Yam, Chief Executive of the Hong Kong Monetary Authority (the territory's central bank), as "one country, two currencies, two monetary systems and two monetary authorities which are mutually independent." (Yam, 1996) Chen Yuan, a Deputy Governor of PBOC, has openly endorsed such a view. Chen emphasizes that "(t)he Hong Kong dollar and the Renminbi will circulate as legal tender in Hong Kong and the mainland respectively. The HK$ will be treated as a foreign currency in the mainland. Likewise, the Renminbi will be treated as a foreign currency in Hong Kong." (Chen, 1996)

Is this official line of monetary separation credible? Our empirical analyses presented above, involving both the variance and principal component approaches, show little evidence that China and Hong Kong have constituted an OCA. Looking ahead, it is likely that similar exercises will show a *less* extent of divergence between China and Hong Kong, as trade, investment and monetary flows between the two sides further strengthen. However, we are sceptical whether such ties will grow to the extent that a monetary union is justified. The economic rationale for the coexistence of the HK$ and the RMB in the post-1997 era has been analyzed in detail by Barandiaran and Tsang (1997). As the other side of the same coin, such an analysis amounts to addressing critically the rationale of monetary unification.

The benefits of a unification of currencies are basically related to (a) the transaction costs of the currencies and (b) the risk posed by exchange rate variations. In the case of China and Hong Kong, unification would reduce the transaction costs and the risk of exchange rate variations only between the HK$ and the RMB *but not* between the RMB (or for argument's sake a new unifying currency) and other currencies.

From the perspective of optimality, the unification of two currencies of different qualities will produce a net social benefit only if the "inferior currency" is eliminated. This is why, in a multi-currency environment such as the European Union, the "best currency" (the German mark) is always seen as the model for the unified currency (the Euro). In the case of China and Hong Kong, it is politically impossible that the RMB would be regarded as an "inferior" currency to be replaced by the HK$. Reality would dictate the demise of the HK$ in a one-currency system. This will hardly be beneficial to Hong Kong, and its benefit to China is also in serious doubt.

Moreover, the net benefit of any monetary union is unlikely to become significant over time, particularly if the RMB, in its further progress towards full convertibility, is increasingly seen as a stable currency by international traders and investors. As is well known, the benefit of unifying two stable currencies is very low. Of course, if, in some distant future, the economic reform in China has "completed" and the Chinese economy has developed to a stage that the RMB is considered to be the "superior" currency, whilst the Hong Kong dollar for various reasons turns "inferior", the question of a monetary union may become a real issue. But that seems to be a very far-fetched issue now.

In any case, regarding the economic relations between Hong Kong and China, we have argued that the Hong Kong economy should maintain a degree of "coherence" after 1997. Because of the constraints of the "one country, two systems" framework, Hong Kong should not be "Manhattanized" or "totally de-industrialized", to become just another, albeit very important, city economy in China (Tsang, 1994). The linked exchange rate system for the Hong Kong dollar has been relatively robust since its inception in October 1983. Problems persist, but can be solved with various moves that fall short of any fundamental overhaul.[2] There is little reason to seek protection through unification with the Renminbi in the foreseeable future (Tsang, 1996b).

Nor should the formation of Hong Kong and China as an OCA be targeted in the post-1997 era. Among the criteria for monetary union, fiscal integration and a high degree of factor mobility are often regarded as the most important. According to the framework of "one country, two systems", however, fiscal integration between Hong Kong and China is not supposed to take place as there will be no fiscal transfers to smooth out asymmetrical shocks to the two economies. Moreover, labour mobility across the border is to be strictly controlled. Hong Kong cannot export its unemployment to the Mainland, nor vice versa. All in all, the arrangement of "one country, two currencies" is consistent with the framework of "one country,

[2] For research on the Hong Kong's linked exchange rate system, see Ma, Meredith and Yiu (2002) and Tsang and Ma (2002).

two systems". There is no good economic argument for unifying the HK$ and the RMB in the foreseeable future.

Data Appendix

This appendix summarizes how the data for the variance and principal components analyses are compiled.

Up to 1996, China had 27 provinces and three municipalities under central control (Beijing, Tianjin and Shanghai). But data for two of the provinces (Hainan and Tibet) are too short or sporadic to be of any use. Hence, we look at only 28 "regions".

The 28 regions are separated into three big blocs: east, central and west, in accordance with China's own planning classification: (1) Eastern (coastal) China: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi; (2) Central China: Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan; (3) West China: Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang. The eastern bloc is a more developed region than other blocs.

National income and GDP data. National income data for Chinese regions are defined under the traditional socialist "material production system" (MPS) which excludes "non-material" and "non-productive" activities from output accounting. There is therefore a serious downward bias (Tsang and Ma, 1997). Figures are obtained from State Statistical Bureau (1990) and various recent issues of the statistical yearbooks of China. Regional GDP data for China, along the international convention of SNA (system of national accounting) are only available since 1978 in State Statistical Bureau (1990) and various recent issues of regional statistical yearbooks of China. As to Hong Kong, the earliest GDP statistics date back to 1966, and can be found in Census and Statistics Department, *Annual Digest of Statistics*, various issues.

Investment data. For Hong Kong, the investment data from GDP accounting are used. As to China, they are obtained from State Statistical Bureau (1990) and various recent issues of regional statistical yearbooks of China.

Price data. Regional price data in China date back much earlier, in fact from 1952 onwards for annual statistics of the retailed price index (RPI). They are published in State Statistical Bureau (1990) and various recent issues of regional statistical yearbooks of China. For monthly price figures, unfortunately, the earliest year is 1989. They are available in *China's Latest Economic Statistics*, published by CERD Consultants Hong Kong on behalf of the State Statistical Bureau of China. Three different sets of price indexes, which are not entirely consistent, have so far been published: (1) January 1989 - December 1993: indices of cost of living of staff and workers in 35 major cities; (2) January 1994 - June 1996: residents' consumption prices sub-indices in 35 major cities; and (3) December 1995 - present: classified consumer price sub-indexes by regions. For the consideration of the degree of freedom, we have chosen (1) as the price index to compare. On the other hand, Hong Kong compiles only consumer price indexes (CPI), rather than RPI. We use the CPI(A) index, which represents 50% of the households. Annual and monthly figures are readily available from Census and Statistics Department, *Annual Digest of Statistics* and *Monthly Digest of Statistics*, various issues. The Hong Kong CPI is broadly consistent with the Chinese cost of living index in the monthly case. However, it differs from the Chinese RPI in that it covers services while the RPI does not.

Table 1

Annual real national income growth of 28 regions of mainland China over 1954 to 1994

		standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	(e)	0.175	(+46.2)	100.0	0.0	100.0
Tianjin	(e)	0.127	(+6.2)	97.7	2.3	100.0
Hebei	(e)	0.109	(-9.3)	93.2	6.8	100.0
Shanxi		0.143	(+19.5)	58.0	42.0	100.0
Inner Mongolia		0.158	(+32.3)	97.9	2.1	100.0
Liaoning	(e)	0.153	(+28.1)	99.6	0.4	100.0
Jilin		0.114	(-4.8)	63.7	36.3	100.0
Heilongjiang		0.125	(+4.3)	77.2	22.8	100.0
Shanghai	(e)	0.132	(+10.6)	90.8	9.2	100.0
Jiangsu	(e)	0.094	(-21.8)	44.4	55.6	100.0
Zhejiang	(e)	0.096	(-19.7)	50.7	49.3	100.0
Anhui		0.113	(-5.4)	67.3	32.7	100.0
Fujian	(e)	0.122	(+1.5)	77.0	23.0	100.0
Jianxi		0.075	(-37.4)	64.8	35.2	100.0
Shandong	(e)	0.109	(-8.7)	50.0	50.0	100.0
Henan		0.125	(+4.5)	38.9	61.1	100.0
Hubei		0.117	(-2.0)	81.7	18.3	100.0
Hunan		0.102	(-15.1)	81.5	18.5	100.0
Guangdong	(e)	0.107	(-10.4)	73.5	26.5	100.0
Guangxi	(e)	0.084	(-29.8)	72.4	27.6	100.0
Sichuan		0.127	(+5.7)	59.6	40.4	100.0
Guizhou		0.142	(+18.2)	70.5	29.5	100.0
Yunnan		0.101	(-16.0)	63.3	36.7	100.0
Shaanxi		0.147	(+22.9)	86.6	13.4	100.0
Gansu		0.123	(+2.3)	95.5	4.5	100.0
Qinghai		0.114	(-5.0)	94.9	5.1	100.0
Ningxia		0.120	(+0.6)	74.0	26.0	100.0
Xinjiang		0.099	(-17.5)	56.4	43.6	100.0
Average of mainaland China		0.120				

Notes: '(e)' denotes eastern (coastal) regions. Other regions are non-coastal regions; The figure in parentheses represents the percentage divergence of the standard deviation from the average of 28 regions of mainland China. Due to data unavailability, Hainan and Tibet are not included in this table. See the Data Appendix.

Table 2

Annual real national income growth of 11 coastal regions of mainland China over 1954 to 1994

	standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	0.175	(+47.2)	100.0	0.0	100.0
Tianjin	0.127	(+6.9)	88.4	11.6	100.0
Hebei	0.109	(-8.7)	85.8	14.2	100.0
Liaoning	0.153	(+28.9)	94.2	5.8	100.0
Shanghai	0.132	(+11.3)	85.6	14.4	100.0
Jiangsu	0.094	(-21.3)	31.0	69.0	100.0
Zhejiang	0.096	(-19.1)	71.7	28.3	100.0
Fujian	0.122	(+2.1)	82.6	17.4	100.0
Shandong	0.109	(-8.2)	63.3	36.7	100.0
Guangdong	0.107	(-9.8)	47.6	52.4	100.0
Guangxi	0.084	(-29.3)	85.7	14.3	100.0
Average of coastal regions of China	0.119				

Notes: The figure in parentheses represents the percentage divergence of the standard deviation from the average of 11 eastern (coastal) regions of mainland China. Due to data unavailability, Hainan is not included in this table. See the Data Appendix.

Table 3

Annual real GDP growth of 28 regions of mainland China and Hong Kong over 1978 to 1995

	Standard deviation	%
Beijing	0.049719	(+5.5)
Tianjin	0.064501	(+36.9)
Hebei	0.039888	(-15.4)
Shanxi	0.051596	(+9.5)
Inner Mongolia	0.045992	(-2.4)
Liaoning	0.040040	(-15.0)
Jilin	0.052028	(+10.4)
Heilongjiang	0.046250	(-1.9)
Shanghai	0.036820	(-21.9)
Jiangsu	0.049079	(+4.1)
Zhejiang	0.048911	(+3.8)
Anhui	0.056235	(+19.3)
Fujian	0.052644	(+11.7)
Jiangxi	0.041745	(-11.4)
Shandong	0.039777	(-15.6)
Henan	0.049455	(+4.9)
Hubei	0.043099	(- 8.6)
Hunan	0.036184	(-23.2)
Guangdong	0.046012	(-2.4)
Guangxi	0.051775	(+9.9)
Sichuan	0.040462	(-14.1)
Guizhou	0.045991	(-2.4)
Yunnan	0.043089	(-8.6)
Shaanxi	0.045444	(-3.6)
Gansu	0.053316	(+13.1)
Qinghai	0.059695	(+26.7)
Ningxia	0.046769	(-0.8)
Xinjiang	0.043000	(-8.8)
Hong Kong	0.057156	(+21.3)
Mainland CHINA (excluding HK)	0.047126	

Notes: The period under investigation is 1978-1995. The figure in brackets represents the percentage divergence of the standard deviation from China's national average (excluding HK). Due to the lack of observations, the principal components analysis cannot be conducted in this table. Due to data unavailability, Hainan and Tibet are not included in this table. See the data appendix.

Table 4

Annual real GDP growth rates of 11 coastal regions of mainland China and Hong Kong over 1978 to 1995

	Standard deviation		% Common shocks decomposition: symmetric	asymmetric	total
Beijing	0.055146	(+23.1)	100.00	0.000	100.000
Tianjin	0.063835	(+42.5)	74.47	25.52	100.000
Hebei	0.041415	(-7.6)	100.00	0.000	100.000
Liaoning	0.042949	(-4.2)	95.30	4.697	100.000
Shanghai	0.035176	(-21.5)	0.00	0.000	100.000
Jiangsu	0.046599	(+4.0)	0.00	0.000	100.000
Zhejiang	0.042396	(-5.4)	80.20	19.79	100.000
Fujian	0.043754	(-2.4)	81.30	18.69	100.000
Shandong	0.035165	(-21.5)	56.60	43.39	100.000
Guangdong	0.040867	(-8.8)	65.55	34.44	100.000
Guangxi	0.045643	(+1.9)	67.60	32.39	100.000
Hong Kong	0.058990	(+31.6)	29.862	70.13	100.000
coastal regions of China (excluding HK)	0.044813				

Notes: The figure in brackets represents the percentage divergence of the standard deviation from China's national average. Due to data unavailability, Hainan is not included in this table.

Table 5

Annual real investment growth of 23 regions of mainland China and Hong Kong over 1962 to 1994

		standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	(e)	0.940	(-9.2)	100.0	0.0	100.0
Tianjin	(e)	0.679	(-34.4)	94.9	5.1	100.0
Hebei	(e)	0.567	(-45.2)	61.8	38.2	100.0
Shanxi		0.476	(-54.0)	93.8	6.2	100.0
Inner Mongolia		0.258	(-75.1)	91.3	8.7	100.0
Liaoning	(e)	0.937	(-9.5)	23.2	76.8	100.0
Jilin		0.282	(-72.8)	32.3	67.7	100.0
Heilongjiang		3.841	(+271.1)	76.8	23.2	100.0
Shanghai	(e)	1.156	(+11.7)	10.0	90.0	100.0
Jiangsu	(e)	0.350	(-66.2)	99.7	0.3	100.0
Anhui		1.257	(+21.4)	64.1	35.9	100.0
Fujian	(e)	5.446	(+426.1)	65.5	34.5	100.0
Jianxi		0.229	(-77.9)	93.1	6.9	100.0
Shandong	(e)	0.261	(-74.8)	69.4	30.6	100.0
Henan		0.626	(-39.5)	75.3	24.7	100.0
Hunan		1.197	(+15.7)	83.4	16.6	100.0
Guangdong	(e)	0.351	(-66.1)	97.6	2.4	100.0
Sichuan		1.581	(+52.7)	51.2	48.8	100.0
Guizhou		2.070	(+99.9)	78.8	21.2	100.0
Yunnan		0.306	(-70.5)	99.7	0.3	100.0
Shaanxi		0.471	(-54.5)	95.1	4.9	100.0
Gansu		0.268	(-74.2)	62.5	37.5	100.0
Ningxia		0.261	(-74.8)	98.5	1.5	100.0
Hong Kong		0.105	(-89.9)	36.4	63.6	100.0
mainland China (excluding HK)		1.035				

Notes: '(e)' denotes eastern regions. Other regions are central and western regions. The figure in parentheses represents the percentage divergence of the standard deviation from the average of 23 regions of mainland China. Due to data unavailability, Zhejiang, Hubei, Qinhai, Xinjiang, Hainan Tibet and Guangxi are not included in this table.

Table 6

Annual real investment growth of nine coastal regions of mainland China and Hong Kong over 1962 to 1994

	standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	0.940	(-20.8)	100.0	0.0	100.0
Tianjin	0.679	(-42.8)	63.1	36.9	100.0
Hebei	0.567	(-52.2)	84.8	15.2	100.0
Liaoning	0.937	(-21.1)	80.6	19.4	100.0
Shanghai	1.156	(-2.6)	64.3	35.7	100.0
Jiangsu	0.350	(-70.5)	79.4	20.6	100.0
Fujian	5.446	(+358.7)	9.7	90.3	100.0
Shandong	0.261	(-78.0)	54.0	46.0	100.0
Guangdong	0.351	(-70.5)	86.4	13.6	100.0
Hong Kong	0.105	(-91.2)	33.8	66.2	100.0
coastal regions of China (excluding HK)	1.187				

Notes: The figure in parentheses represents the percentage divergence of the standard deviation from the average of 9 eastern regions of mainland China (excluding HK). Due to data unavailability, Zhejiang, Hainan and Guangxi are not included in this table.

Table 7

Real exchange rates among 28 regions of mainland China and HK over 1962 to 1994

		standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	(e)	0.041	(+24.1)	100.0	0.0	100.0
Tianjin	(e)	0.031	(-6.3)	98.0	2.0	100.0
Hebei	(e)	0.031	(-5.7)	99.9	0.1	100.0
Shanxi		0.028	(-14.0)	98.7	1.3	100.0
Inner Mongolia		0.035	(+5.5)	99.8	0.2	100.0
Liaoning	(e)	0.029	(-11.7)	97.4	2.6	100.0
Jilin		0.029	(-11.0)	100.0	0.0	100.0
Heilongjiang		0.029	(-11.6)	100.0	0.0	100.0
Shanghai	(e)	0.036	(+9.4)	99.6	0.4	100.0
Jiangsu	(e)	0.030	(-9.4)	96.5	3.5	100.0
Zhejiang	(e)	0.034	(+3.5)	99.4	0.6	100.0
Anhui		0.032	(-2.0)	98.7	1.3	100.0
Fujian	(e)	0.031	(-4.7)	98.6	1.4	100.0
Jianxi		0.030	(-8.1)	98.7	1.3	100.0
Shandong	(e)	0.039	(+18.1)	89.4	10.6	100.0
Henan		0.035	(+7.4)	98.2	1.8	100.0
Hubei		0.027	(-16.4)	99.8	0.2	100.0
Hunan		0.048	(+45.5)	100.0	0.0	100.0
Guangdong	(e)	0.041	(+25.4)	96.5	3.5	100.0
Guangxi	(e)	0.032	(-2.0)	99.3	0.7	100.0
Sichuan		0.030	(-9.9)	99.5	0.5	100.0
Guizhou		0.029	(-12.5)	100.0	0.0	100.0
Yunnan		0.030	(-7.7)	100.0	0.0	100.0
Shaanxi		0.032	(-3.6)	98.0	2.0	100.0
Gansu		0.030	(-9.9)	98.4	1.6	100.0
Qinghai		0.037	(+11.1)	99.1	0.9	100.0
Ningxia		0.032	(-1.5)	94.9	5.1	100.0
Xinjiang		0.032	(-1.9)	99.6	0.4	100.0
Hong Kong		0.180	(+447.1)	0.1	99.9	100.0
mainland China (excluding HK)		0.033				

Notes: '(e)' denotes eastern regions. Other regions are central and western regions. The figure in parentheses represents the percentage divergence of the standard deviation from the average of 28 regions of mainland China. Due to data unavailability, Hainan and Tibet are not included in this table.

Table 8

Real exchange rates among 11 coastal regions of mainland China and HK over 1962 to 1994

	standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	0.041	(+6.3)	100.0	0.0	100.0
Tianjin	0.036	(-7.8)	99.3	0.7	100.0
Hebei	0.037	(-4.5)	95.1	4.9	100.0
Liaoning	0.038	(-2.8)	98.5	1.5	100.0
Shanghai	0.038	(-2.0)	98.8	1.2	100.0
Jiangsu	0.035	(-10.7)	95.8	4.2	100.0
Zhejiang	0.041	(+4.7)	99.1	0.9	100.0
Fujian	0.038	(-1.2)	98.4	1.6	100.0
Shandong	0.043	(+10.0)	81.7	18.3	100.0
Guangdong	0.043	(+10.5)	95.9	4.1	100.0
Guangxi	0.038	(-2.4)	98.3	1.7	100.0
Hong Kong	0.165	(+323.1)	0.5	99.5	100.0
coastal regions of China (excluding HK)	0.039				

Notes: The figure in parentheses represents the percentage divergence of the standard deviation from the average of 11 eastern regions of mainland China. Due to data unavailability, Hainan is not included in this table.

Table 9

Monthly real exchange rates among 35 major Chinese cities and Hong Kong over January 1989 to November 1993

		standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	(e)	0.019	(-11.6)	100.0	0.0	100.0
Tianjin	(e)	0.019	(-8.7)	62.1	37.9	100.0
Shijiazhuang	(e)	0.019	(-8.7)	77.3	22.7	100.0
Taiyuan		0.018	(-13.0)	51.3	48.7	100.0
Huhhot		0.019	(-9.8)	80.8	19.2	100.0
Shenyang	(e)	0.017	(-17.0)	69.8	30.2	100.0
Dalian	(e)	0.023	(+8.5)	86.0	14.0	100.0
Changchun		0.021	(-2.5)	61.8	38.2	100.0
Harbin		0.019	(-10.9)	38.2	61.8	100.0
Shanghai	(e)	0.025	(+19.7)	74.7	25.3	100.0
Nanjing	(e)	0.019	(-9.5)	73.9	26.1	100.0
Hangzhou	(e)	0.017	(-17.4)	63.8	36.2	100.0
Ningbo	(e)	0.021	(-2.0)	68.7	31.3	100.0
Hefei		0.021	(-1.2)	58.0	42.0	100.0
Fuzhou	(e)	0.019	(-7.8)	77.3	22.7	100.0
Xiamen	(e)	0.022	(+3.0)	79.5	20.5	100.0
Nanchang		0.021	(+0.6)	41.1	58.9	100.0
Jinan	(e)	0.020	(-5.6)	32.6	67.4	100.0
Qingdao	(e)	0.021	(-2.4)	28.7	71.3	100.0
Zhengzhou		0.020	(-5.6)	8.5	91.5	100.0
Wuhan		0.018	(-12.9)	72.3	27.7	100.0
Changsha		0.018	(-13.7)	63.9	36.1	100.0
Guangzhou	(e)	0.052	(+145.4)	70.6	29.4	100.0
Shenzhen	(e)	0.020	(-5.1)	60.8	39.2	100.0
Nanning	(e)	0.022	(+3.6)	21.7	78.3	100.0
Haikou	(e)	0.027	(27.2)	19.7	80.3	100.0
Chongqing		0.021	(+0.1)	63.5	36.5	100.0
Chengdu		0.019	(-7.9)	54.1	45.9	100.0
Guiyang		0.023	(+9.7)	50.1	49.9	100.0
Kuming		0.018	(-13.1)	18.7	81.3	100.0
Xi'an		0.019	(-9.7)	89.1	10.9	100.0
Lanzhou		0.019	(-10.6)	65.7	34.3	100.0
Xining		0.019	(-8.0)	82.8	17.2	100.0
Yinchuan		0.020	(-3.2)	11.4	88.6	100.0
Urumqi		0.021	(+0.2)	57.9	42.1	100.0
Hong Kong		0.031	(+48.2)	11.3	88.7	100.0
35 major cities of China (excluding HK)		0.021				

Notes: '(e)' denotes that the city belongs to an eastern (coastal) region. Other cities belong to non-coastal regions; The figure in parentheses represents the percentage divergence of the standard deviation from the average of 35 major cities of mainland China.

Table 10

Monthly real exchange rates among 17 major Chinese eastern cities and Hong Kong over January 1989 to November 1993

	standard deviation (STD)	%	Common shocks decomposition: symmetric	asymmetric	total
Beijing	0.020	(-14.2)	100.0	0.0	100.0
Tianjin	0.021	(-8.8)	78.7	21.3	100.0
Shijiazhuang	0.021	(-11.1)	83.6	16.4	100.0
Shenyang	0.019	(-18.1)	67.3	32.7	100.0
Dalian	0.023	(-1.3)	25.5	74.5	100.0
Shanghai	0.025	(+9.7)	24.3	75.7	100.0
Nanjing	0.020	(-14.0)	66.7	33.3	100.0
Hangzhou	0.019	(-18.7)	70.6	29.4	100.0
Ningbo	0.021	(-8.5)	86.3	13.7	100.0
Fuzhou	0.020	(-12.7)	54.5	45.5	100.0
Xiamen	0.022	(-3.7)	55.0	45.0	100.0
Jinan	0.021	(-7.4)	71.2	28.8	100.0
Qingdao	0.022	(-6.7)	43.7	56.3	100.0
Guangzhou	0.049	(+113.9)	11.1	88.9	100.0
Shenzhen	0.020	(-12.7)	23.0	77.0	100.0
Nanning	0.022	(-3.7)	73.1	26.9	100.0
Haikou	0.027	(+18.0)	67.1	32.9	100.0
Hong Kong	0.032	(+39.7)	39.1	60.9	100.0
17 Eastern cities of China (excluding HK)	0.023				

Notes: The figure in parentheses represents the percentage divergence of the standard deviation from the average of 17 major eastern cities of mainland China.

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