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AGGREGATE SHOCKS DECOMPOSITION FOR EIGHT EAST ASIAN COUNTRIES

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ABSTRACT

Every economy experiences peaks and troughs in its business cycle. It has always been the researchers' interests to identify the underlying causes of shocks. In the business cycle literature, there exists a new strand of methodology that allows the analysis at a disaggregated level using the dynamic factor model. This model allows the decomposition of aggregate shocks into country-specific, regional and world common business cycles for eight East Asian economies of China, Japan, Korea, Indonesia, Malaysia, the Philippines, Singapore and Thailand. It therefore allows the identification of causes for major events experienced by these countries. Empirical evidences show that country factors are the most important causes of major events for all these countries examined here, implying the needs to rely more heavily on its own independent counter-cyclical policies. The region factor is largest for the most developed economies in the region such as Japan, Korean and Singapore, indicating that a regional coordinated policy is more effective for these economies to respond to the disturbances. The world factor explains only 8% of the output variation in East Asia for the median country. In addition, the examination of the contribution of world, region and country-specific factors to the major economic fluctuations of each East Asian country in the past decades shows that the role of world factor is insignificant (with the exception of the first oil shock in 1974). This might explain why the world economy was stabilised through periods of US slowdown by the East Asian economies.

Keywords: Business Cycle; East Asia; Aggregate Shocks Decomposition; Dynamic Factor Model; Bayesian

JEL codes: E3

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1. Introduction

The emergence of East Asia as the most dynamic regions of the world is hailed as one of the most important developments of the past decade. It has assumed a more prominent global role and has become more integrated with the world economy. A debate on the adoption of a single currency is slowly emerging in East Asia especially in the aftermath of Asian financial crisis, and after the introduction of Euro. Robert Mundell's theory of Optimum Currency Area (OCA) has been widely used in literature to assess the suitability of a common currency. The examination of business cycle synchronization (a crucial OCA criterion) in East Asia is particularly relevant in the context of the possibility of a monetary union with a common currency in the region. While the results from this study can shed some light on the suitability for a monetary union in East Asia based on the OCA theory (by examining the business cycle synchronization in the region), the main intention here is to identify the causes of major shocks to the East Asian economies (China, Japan, Korea, Indonesia, Malaysia, the Philippines, Singapore and Thailand) over the past few decades.

The main contribution of this paper to the existing literature is the use of a dynamic common factor model to examine the features business cycles and to identify the underlying causes of shocks during major events. Many of the related studies for East Asian business cycles have been limited primarily on the examination of simple correlation between countries.² Some important studies have gone beyond the typical cross-country examination of observed responses by using the structural VAR approach proposed by Bayoumi and Eichengreen (1994). However, the VAR empirical studies come with drawbacks. Many researchers see little justification that only supply shocks matter.³ Section 2 provides a literature review on the existing studies in measuring the business cycle.

The dynamic common factor model employed in this paper is essentially a multilateral approach which allows the decomposition of shocks among the world common, the region common and the country-specific shocks for each economy. The importance of studying all three in one model is that studying a subset of countries can lead one to believe that observed co-movement is particular to that subset of countries when it in fact is common to a much larger group of countries. Understanding the sources of international economic fluctuations is important for making policy decisions. For example, if a country exhibits a large value of the share accounted by the region common factor, then its business cycle movement is largely synchronized to the region, indicating that a regional coordinated policy is more effective to respond to the disturbances. However, if a country possesses a smaller value of the share accounted for by the region common factor and a larger value of that accounted for by the country-specific factor, it needs to rely more heavily on its own independent counter-cyclical policies.

Section 2 provides a literature review on the empirical methodologies in measuring the business cycle. Section 3 discusses the dynamic unobserved factor methodology used in this paper and section 4 discusses the empirical results. Section 5 provides a brief analysis of major economic events that happened during the sample period for all the eight East Asian countries in the model. Section 6 concludes the paper.

² See Lee *et al.* (2004) for a discussion of disadvantages of bilateral measures.

³ Among others, see Lee *et al.* (2004).

2. Literature Review

The constitution of the European Monetary Union (EMU) has resulted in extensive study of the European business cycles. Most of the important works in the literature of business cycle have been centred on the European and US data. In this section, our intention is to provide a literature review on the empirical methodologies in measuring the business cycle. The results of the studies are not provided as they are mixed and inconclusive. In addition, the results are not directly comparable to our study which intends to examine the East Asian business cycles.

The pioneer in the study of linkages in business cycles is Mitchell (1927), who found positive correlation of business cycles across countries as a result of greater financial and trade integration. One of the first prominent seminal contributions to the measurement of business cycle was by Burns and Mitchell (1946). In their paper, they provided a comprehensive catalogue of the empirical features of the business cycles. In addition, they developed the general methods for measuring business cycles.

There are many strands of methodology in measuring the business cycle. One strand of the literature has focused on the identification of asymmetric shocks within the member countries of the union.⁴ A celebrated technique is Bayoumi (1992)'s SVAR. The procedure used is a modification from Blanchard and Quah (1989) in order to assess the relative importance of supply and demand shocks for the European countries. The first stage of this technique consists of running VAR of changes of output and prices. To identify the coefficients of the structural form, Bayoumi assumes the orthogonality of supply and demand shocks and that supply shocks are permanent and demand shocks are temporary. The response of a variable to structural shocks can be traced by the moving average representation of the SVAR. In addition, the proportion of the variance of certain variables explained by different innovations at different time horizons can be obtained by the variance-decomposition analysis. Bayoumi and Eichengreen (1993) concluded that disturbances within the EU as less correlated than those within the US, suggesting a potential cost associated with a monetary union. Many other authors have employed the SVAR methodology with alternative identification strategies (i.e. by using different restrictions or by using different variables), their results are contradicting. For instance, Artis and Ehrmann (2000) and Funke (2000) explored the responsiveness of the sterling exchange rate to asymmetric supply shocks.

The second strand of related literature has attempted to shed light on common fluctuations by looking at bivariate correlations of business cycle indicators and examining changes in these correlations over different time periods. In a famous essay, Lucas (1976) shed light on a key business cycle fact that outputs of broadly-defined sectors move together. The analysis of comovement in dynamic settings typically makes use of two nonparametric tools, the autocorrelation function and the spectral density function.⁵ A good example of the business cycle analysis in the time domain which examines multivariate dynamics via the autocorrelation function is Backus and Kehoe (1992), who characterize the dynamics of output, consumption, investment, government purchases, net exports, money, and prices across ten countries and a hundred years. If one examines dynamics in the frequency domain

⁴ See Cochrane (1997) for a critical review of SVAR methodology.

⁵ See Diebold and Rudebusch (1996) for a more detailed discussion.

via the spectral density function, the spectral density matrix decomposes variation and covariation among variables by frequency, permitting one to concentrate on the dynamics of interest. A good example of such application is Sargent (1987), who examined the spectral density matrix of seven US data series: real GNP, the unemployment rate, the interest rate, the change in real money stock, inflation, productivity, and real wages.

The third strand of literature has moved to a more disaggregated level of analysis. They have tried to assess the relative importance of the common factor, country-specific factors and the industry-specific factors in explaining the variance of output. For instance, Stockman (1988) and Bayoumi and Prasad (1997) used an error components methodology. The analysis is extended to a dynamic setup using the dynamic factor models. Dynamic factor models have a long history in cross-sectional settings and their generalisation to dynamic environments is due to Sargent and Sims (1977), Geweke (1977) and Watson and Engle (1983). Co-movements among economic variables are assumed to be driven by some underlying unobservable common shocks. This view is shared by many new open-economy macroeconomic models, where underlying shocks are unobservable and the State-Space representation is usually solved by Gaussian Maximum Likelihood Estimation. Norrbin and Schlagenhauf (1996), Gregory *et al.* (1997) and Gregory and Head (1999) used this technique to conduct multi-country studies focusing only on industrialised countries. Gregory *et al.* (1997) using Kalman filtering and dynamic factor analysis. Gregory *et al.* (1997) followed Stock and Watson (1989, 1992 and 1993), using classical statistical techniques employing the Kalman filter for estimation of the model parameters, and the Kalman smoother to decompose aggregate outputs, consumptions and investments for G7 countries into common factors, country specific factors and idiosyncratic factors. Norrbin and Schlagenhauf (1996)⁶ employed the dynamic factor model to examine the role of world, national specific, and industry specific factors in explaining common movement across G7 and countries, Belgium, and Netherlands. Other important contributions include, Stock and Watson (1989, 1991, 1993), Altonji and Ham (1990), Quah and Sargent (1993), and Forni and Reichlin (1996) among others. They treat a related model as an observer system. Lumsdaine and Prasad (1997) incorporated a time-varying weighting procedure for constructing the common component, implicitly assigning a lower weight to a country when it is subject to a large country-specific shock but leaving the weights unchanged if a common shock occurs.

It has been long recognised that the parameters may not be constant through time but rather that structural shifts may occur. The fourth strand of literature involves dividing the period into distinct regimes with different parameter values (i.e., regime switching). In the regression model context, Quandt (1972) studied the case of independent switches in regime, then Goldfeld and Quandt (1973) extended the analysis to regime-dependent-switching probabilities according to a Markov chain. The Markov switching between regimes has become increasingly popular since Hamilton's (1989) application of this technique to deal with the endogenous structural breaks. His model can be viewed as an extension of Goldfeld and Quandt's (1973) model to the important case of structural changes in the parameters of an autoregressive process. There has been a number of subsequent extension and refinements.⁷

⁶ Norrbin and Schlaenhaus (1996) use the Kalman filter for parameter estimation. However, they do not implement the smoother to extract the common component. Such common component would be a close idea to the coincident indicator of Stock and Watson (1991) for the US.

⁷ Chapter 4 in Kim and Nelson (1999) provided a good discussion on the Markov-Switching Models. Diebold and Rudebusch (1996) provided an excellent literature review on this matter.

The fifth strand of literature involves the dynamic factor model with Markov switching. In their pioneering study, Burns and Mitchell (1946) established two defining characteristics of the business cycle: comovement among economic variables through the cycle and nonlinearity in the evolution of the business cycle, that is, regime switching at the turning points of the business cycle. As noted by Diebold and Rudebusch (1996), these two aspects of the business cycle have been considered in isolation from one another in the literature. Two of the most recent and influential examples include Stock and Watson's (1989, 1991, 1993) linear dynamic factor model mentioned earlier and Hamilton's (1989) regime-switching model. In Stock and Watson's dynamic factor model, comovement among economic variables is captured by a composite index, and Hamilton's regime-switching model features nonlinearity in an individual economic variable. After an extensive survey of related theoretical and empirical literature, Diebold and Rudebusch (1996) proposed a multivariate dynamic factor model with regime switching that encompasses the two key features of the business cycle. This obvious extension in the literature that incorporates both state variables and regime switching seems straightforward conceptually but has been computationally infeasible thus far. However, with the algorithm for approximate maximum likelihood estimation developed by Kim (1993a, 1993b, 1994), a broad class of models that could not be handled before has become operational.

In the classical framework, an index of coincident indicators for the economy is obtained in two steps: (i) the parameters of the State-Space model are estimated via approximate maximum likelihood; then (ii) conditional on those estimates, we run the Kalman filter to extract the estimate of the index from the observed indicators. Similarly, inferences about which regime, recession or expansion, the economy is in at each point in time condition on the maximum likelihood estimates of the parameters. As noted in Kim and Nelson (1999), the necessity of approximation for obtaining a computationally feasible algorithm for estimation and the treatment of parameter estimates as fixed when estimating state variables in the classical framework lead the researchers to consider the Bayesian approach as an alternative. This gives rise to another strand of literature that uses Bayesian methods in the context of State-Space models/Markov switching. Bayesian econometrics has a long history. Gibbs-sampling methods, which is the key to feasible estimation of the State-Space model was originally introduced by Geman and Geman (1984). Albert and Chib (1993) introduced Gibbs-sampling in the context of Markov switching, Carlin *et al.* (1992), Carter and Kohn (1994) and DeJong and Shephard (1995) introduced Gibbs-sampling in the context of State-Space models. Kim and Nelson (1998) operationalised Gibbs-sampling for the State-Space model with Markov switching and construct an experimental index of coincident indicators that encompasses both comovement among economic variables and nonlinearity in the evolution of the business cycle. Otrok and Whiteman (1998) used an alternative single factor model based on a recent development in the Bayesian literature on missing data problems called "data augmentation" (Tanner and Wong, 1987). Kose *et al.* (2003) extended Otrok and Whiteman's (1998) model by considering a dynamic factor model.

3. Methodology

The econometric model employed here follows the dynamic unobserved factor model in Kose *et al.* (2003), which is an extension of the single dynamic unobserved factor model in Otrok and Whiteman (1998). The world economy consists of many different regions and each region consists of many different countries. The movement of an aggregate output in each country i is decomposed into three different components: (i) the world common component, (ii) the region common component and (iii) the country-specific component. Every country in the world is influenced by the world common, while the region common component influences only the countries belonging to the same region. The influence of country-specific component is restricted to the specific country. For example, the output of Japan fluctuates due to shocks to the world economy, shocks to the East Asian region or Japan-specific shocks.

Let $Y_{i,t}$ denote a measure of observable aggregate output at time t for country i , N denote the number of countries, M the number of time series per country, and T the length of the time series. The output series for each country is decomposed into three separate components:

$$Y_{i,t} = a_i + b_{wi} Y_t^W + b_{ri} Y_t^R + b_{ni} Y_t^N + \varepsilon_{i,t}$$

Let Y_t^W (world common factor) be an unobservable component of world economic activity common to all the countries; Y_t^R (region common factor) be an unobservable component common to each country belonging to the same region R and Y_t^N be an unobservable component of country specific factors. This paper then measures the relative contributions of the world, region and country factors to variations in aggregate output in these East Asian countries.

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$$E \varepsilon_{i,t} \varepsilon_{j,t-s} = 0 \text{ for } i \neq j$$

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The coefficients, b_{wi} , b_{ri} and b_{ni} are the impact coefficients on factors Y_t^W , Y_t^R and Y_t^N , reflecting the degree to which variation in y_i can be explained by each factor. The impact coefficients are allowed to differ across countries since the world common and the region common factors have different influences on each country. There are $M \times N$ time series to be “explained” by the (many fewer) $N+R+1$ factors. The “unexplained” idiosyncratic errors $\varepsilon_{i,t}$ are assumed to be normally distributed, but may be serially correlated and are modelled as p_i -order autoregressions:

$$\phi_i(L) \varepsilon_{i,t} = u_{i,t}$$

$$\text{Or } \phi_i(L) = 1 - \phi_{i,1}L - \phi_{i,2}L^2 - \dots - \phi_{i,p_i}L^{p_i}$$

is a polynomial in the lag operator L ; $E u_{i,t} u_{j,t-s} = \sigma_i^2$ for $i = j$ and $s = 0$, 0 otherwise.

The evolution of the unobserved factors is likewise governed by an autoregression of q_i - order with normal errors:

$$f_{k,t} = \varepsilon_{f_k,t}$$

$$\varepsilon_{f_k,t} = \phi_{f_k,1} \varepsilon_{f_k,t-1} + \phi_{f_k,2} \varepsilon_{f_k,t-2} + \dots + \phi_{f_k,q_k} \varepsilon_{f_k,t-q_k} + u_{f_k,t}$$

$$E u_{f_k,t} u_{f_k,t-s} = \sigma_{f_k}^2 \text{ for } s = 0; 0 \text{ otherwise}$$

$$E u_{f_k,t} u_{i,t-s} = 0 \text{ for all } k, i \text{ and } s.$$

As in Otrok and Whiteman (1998), all the innovations, $u_{i,t}$, $i = 0, \dots, M \times N$ and $u_{fk,t}$, $k = 1, \dots, K$ are assumed to be zero mean, contemporaneously uncorrelated normal random variables; that is $u_{i,t} \sim N(0, \sigma_i^2)$ and $u_{fk,t} \sim N(0, \sigma_{f_k}^2)$. Thus all comovement is mediated by the factors, which in turn all have autoregressive representations (of possibly different orders).

There are two related identification problems arise for the model⁸ above: the signs and the scales of the dynamic factors (Y_t^W , Y_t^R and Y_t^N) and the impact coefficients (b_{wi} , b_{ri} and b_{ni}) cannot be separately identified. Following Otrok and Whiteman (1998), signs are identified by requiring one of the impact coefficients to be positive for each of the factors. In particular, b_{wi} (impact coefficient for the world factor) for the US output; country factors are identified by positive impact coefficients for output for each country, and the regional factors are identified by positive coefficients for the output of US for the North America region; Germany for the Europe region; and Singapore for the East Asian region.⁹ Scales are identified following Sargent and Sims (1977) and Stock and Watson (1989, 1992, and 1993) by assuming that each $\sigma_{f_k}^2$ is equal to a constant.

Under a conjugate prior, the model would be a simple set of regressions with Gaussian autoregressive errors if the factors were observable. This structure can be used to determine the conditional (normal) distribution of the factors given the data and the parameters of the model. It is then straightforward to generate random samples from this conditional distribution. These samples will then be used as stand-ins for the unobserved factors. The essential idea is to determine posterior distributions of all unknown parameters conditional on the latent factor, and then if the conditional distribution of the latent factor given the observables and the other parameters is available, the joint posterior distribution of the unknown parameters and the unobserved factor can be sampled using a Markov Chain Monte Carlo procedure on the full set of conditional distributions.

We start sampling by taking starting values of the parameters and factors as given and follow the following steps:

⁸ These problems are also recognised by Otrok and Whiteman (1998) and Kose *et al.* (2003).

⁹ In Kose *et al.* (2003), regional factors are identified by positive coefficients for the output of US for the North America region; Cameroon for the Africa region; Costa Rica for the South America region; France for the Europe region, Bangladesh for the Asia (poor) region; Hong Kong for the Asia (rich) region and Australia for the Oceania region.

- (i) Sample from the posterior distribution of the parameters conditional on the factors;
- (ii) Sample from the distribution of the world factor conditional on the parameters and the country and regional factors;
- (iii) Sample each regional factor conditional on the world factor and the country factors in that region;
- (iv) One step of the Markov Chain is completed by sampling each country factor conditioning on the world factor and the appropriate regional factor.¹⁰

This sequential sampling of the full set of conditional distributions is known as “Gibbs sampling” (See Chib and Greenberg, 1996; Geweke, 1997). Technically, our procedure is “Metropolis within Gibbs” (Kose *et al.*, 2003), as one of the conditional distributions – for the autoregressive parameters given everything else – cannot be sampled from directly. As in Otrok and Whiteman (1998) and Kose *et al.* (2003), we follow Chib and Greenberg (1996) in employing a “Metropolis-Hastings” procedure for that block. Given the bounded likelihood and proper priors that are used in the model, the joint posterior is well behaved, and thus the regularity conditions of Geweke (1997), Tierney (1994), and Chib and Greenberg (1996) apply, and the procedure produces a realisation of a Markov chain whose invariant distribution is the joint posterior of interest.

Let ϕ denote the set of parameters $(a_i, b_{wi}, b_{ri}, b_{ni}, \sigma_i^2, \theta_{ij})$ $i = 1, \dots, n$. We then proceed in the following two steps:

- (i) describe analysis of the posterior of ϕ conditional on the dynamic factors by applying Chib and Greenberg’s (1994) procedure in estimating regression models with AR errors. D
- (ii) determination and analysis of the conditional distribution of the factors given ϕ using Otrok and Whiteman’s (1998) procedure. D

Following Kose *et al.* (2003), we measure the relative contributions of the world, region, and country factors to variations in aggregate output in each country by estimating the share of the variance of the output aggregate due to each factor. Since the world common, the region common, and the country-specific factors are orthogonal, the variance of aggregate output for country i can be decomposed into:

$$Var(Y_{i,t}) = (b_{wi})^2 Var(Y_t^W) + (b_{ri})^2 Var(Y_t^R) + (b_{ni})^2 Var(Y_t^N) + Var(\varepsilon_{i,t})$$

Let S_i^f denote the share of the variance of aggregate output for country i accounted for by variation in the factor $f = W, R, N$.

$$S_i^f = \frac{(b_{fi})^2 Var(Y_t^f)}{Var(Y_{i,t})}$$

These measures can be calculated at each pass of the Markov chain. The estimates of the shares accounted for by the world common, the region common and the country-specific factors can then be obtained.

¹⁰ Note that the sampling order within each step is irrelevant. Kose *et al.* (2003) experimented with changing the order, and the results obtained were indifferent.

4. Results and Estimation

This study examines eight East Asian countries, namely ASEAN 5 – Indonesia, Malaysia, the Philippines, Singapore and Thailand – and China, Japan and Korea.¹¹ The data used in this paper are drawn from the Penn World Table, the sample period is from 1970 to 2000. Output is measured by the log of real GDP growth. Gauss program is used in the estimation. It can be shown that the accuracy of the model estimation gets better and better as the number of replications is increased. In order to get highly accurate estimates, the number of draws is set at 100,000 and discard an initial 10,000 burn-in replications.

Table 1 reports the variance shares (medians, 33% and 67% quantiles of posterior) attributable to the world, regional and country factors for each individual East Asian country in the next section. Table 1 presents the variance decompositions for the East Asian countries. The country-specific factors capture the greatest share of output fluctuations in the region, explaining about 65% of output volatility. However, the country-specific factors share of output volatility ranges widely across the East Asian region, from a low of 43.62% in Japan to a high of 81.61% and 81.66% in Korea and Thailand respectively using the median quantile.

The world and region factors, on the other hand, play a relatively modest role in accounting for the economic activities in these countries. For the median country, only 8% of the output variation is due to the world factor and only about 3% of the output variation is due to the East Asian regional factor. The region factor is largest for the most developed economies in the region, namely, Japan, Korea and Singapore. The region factor accounts for about 7% of output variation in these countries. In fact, the world factor share of output volatility also ranges widely across the region from a low of less than 1% in Indonesia to a high of more than 36% in Japan. This result is consistent with that of Kose *et al.* (2003) who found Japan's world factor to be important.

¹¹ The new ASEAN members include Cambodia, Laos, Myanmar and Vietnam are excluded in the study as the stages of development in these countries are very much different from the rest of the East Asian countries. Williamson (1999), for example, omits the new members of ASEAN, limiting the heterogeneity of the countries adopting a common basket peg. We lack data on Brunei.

Table 1 Variance Decomposition

Country	Factor	1/3	Median	2/3
China	World	11.11	12.47	13.87
	Country	59.73	63.58	67.21
	Region	1.01	2.20	4.01
Japan	World	33.11	35.99	38.85
	Country	38.79	43.62	48.09
	Region	4.08	7.05	10.69
Korea	World	1.97	2.65	3.44
	Country	75.30	81.61	85.54
	Region	2.99	6.98	13.45
Indonesia	World	8.78	10.19	11.70
	Country	53.55	58.04	62.35
	Region	0.43	1.05	2.16
Malaysia	World	8.78	10.19	11.70
	Country	53.55	58.04	62.35
	Region	0.43	1.05	2.16
Philippines	World	8.78	10.19	11.70
	Country	53.55	58.04	62.35
	Region	0.43	1.05	2.16
Singapore	World	4.94	5.95	7.08
	Country	51.06	58.02	64.50
	Region	3.51	6.69	10.81
Thailand	World	2.21	3.00	3.90
	Country	77.86	81.66	84.47
	Region	1.44	3.49	7.09

Notes: Figures are expressed in percentage terms.

5. Analysis of Individual East Asian Countries

This section provides a brief analysis of major economic events that happened during the sample period for all the East Asian countries in the model. Our intention is to identify the causes (world, regional or country factors) for the peaks and troughs experienced by the countries.

In Figure 1 to Figure 8, the median of the growth rate of output is plotted, together with the world factor, the East Asian regional factor and the country-specific factor for each country. The world, region and country factors are multiplied by their median factor loading coefficients. The graphs presented in this section give us the insights into the contribution of world, region and country-specific factors to the major economic fluctuations of each East Asian country in the past decades. The presence of world, regional and country-specific factors during major events in these countries is summarized in Table 2.

Figure 1: The Median of Output Growth, World, Regional and Country-Specific Factor for China (1970-2000)

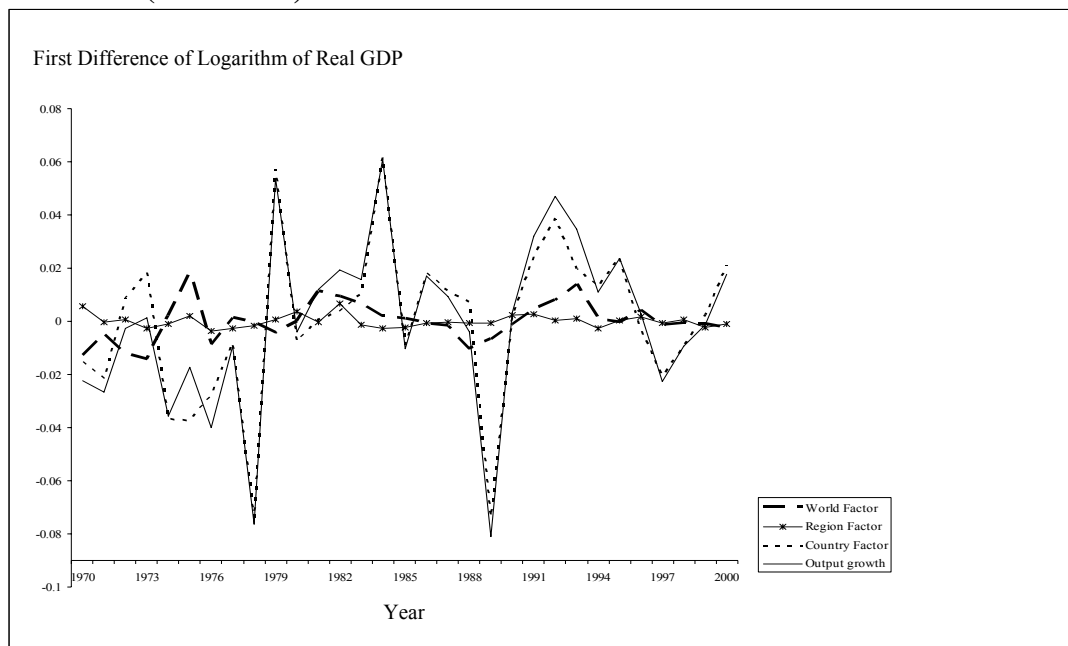


Figure 2: The Median of Output Growth, World, Regional and Country-Specific Factor for Indonesia (1970-2000)

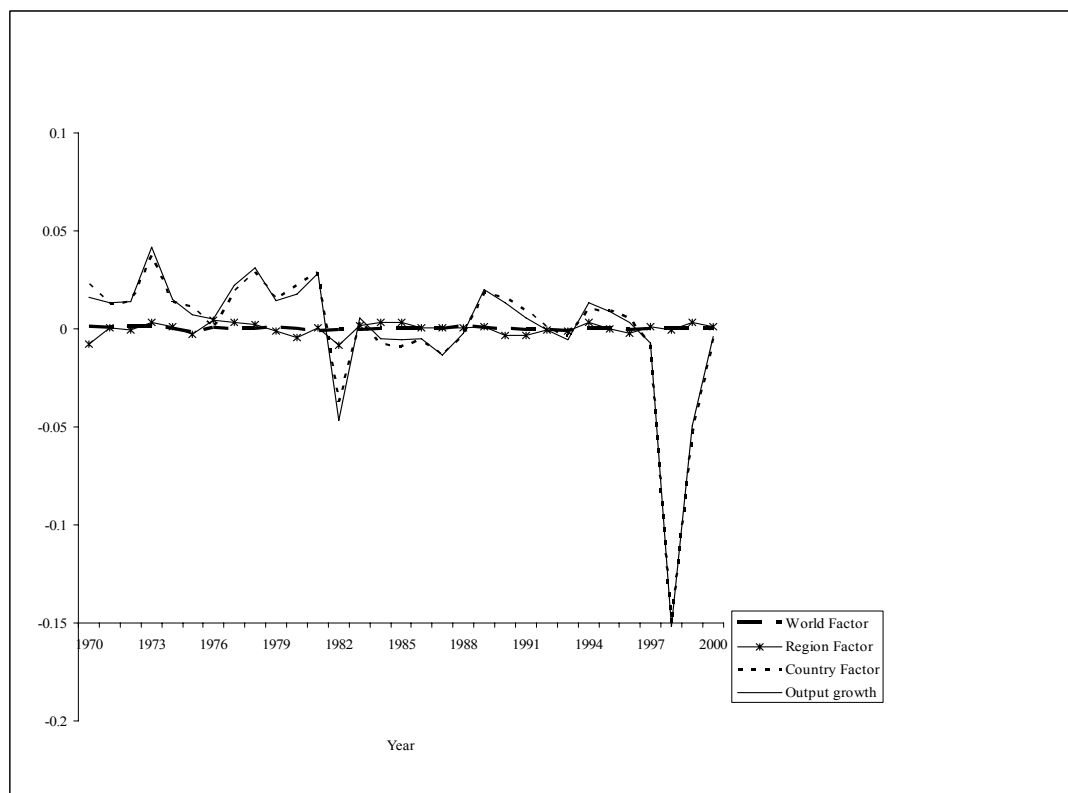


Figure 3: The Median of Output Growth, World, Regional and Country-Specific Factor for Japan (1970-2000)

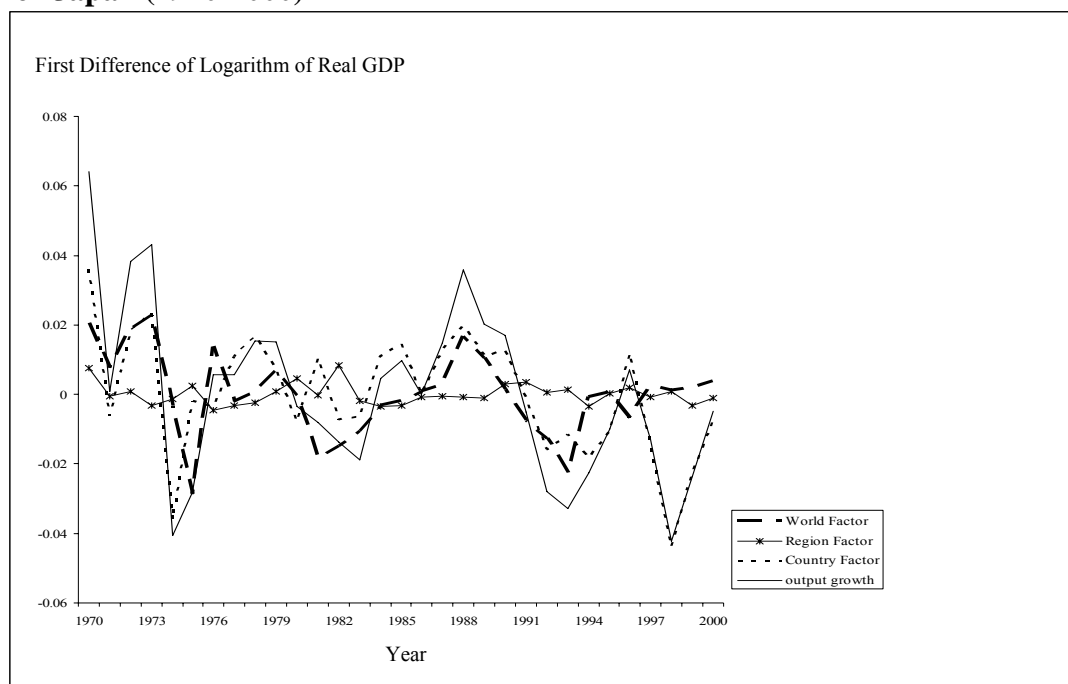


Figure 4: The Median of Output Growth, World, Regional and Country-Specific Factor for South Korea (1970-2000)

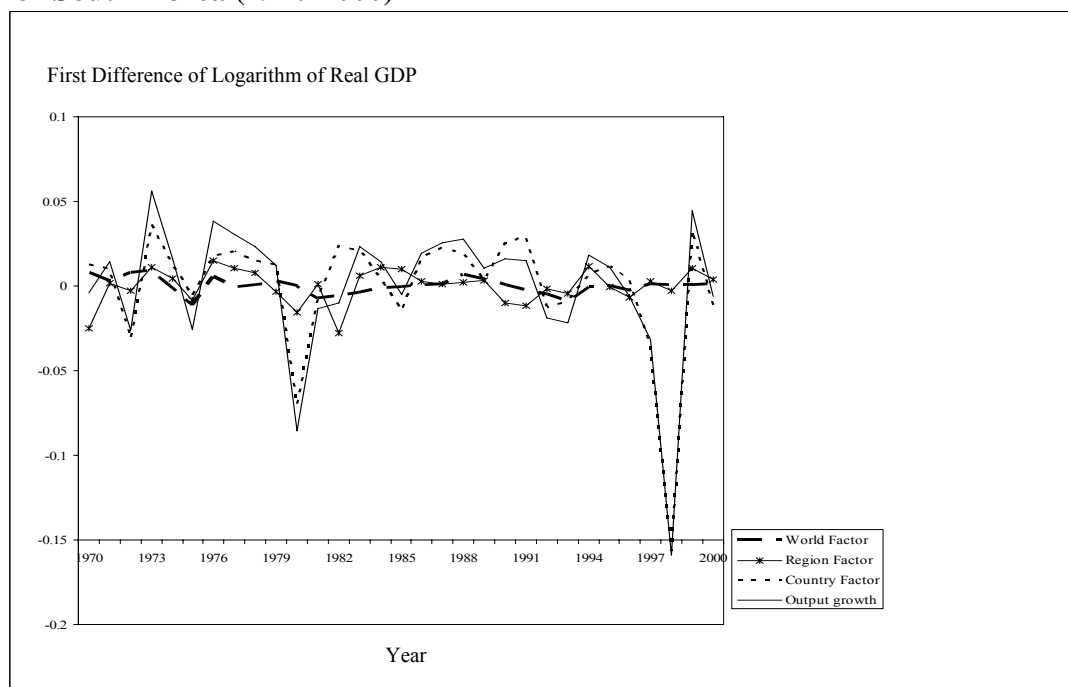


Figure 5: The Median of Output Growth, World, Regional and Country-Specific Factor for Malaysia (1970-2000)

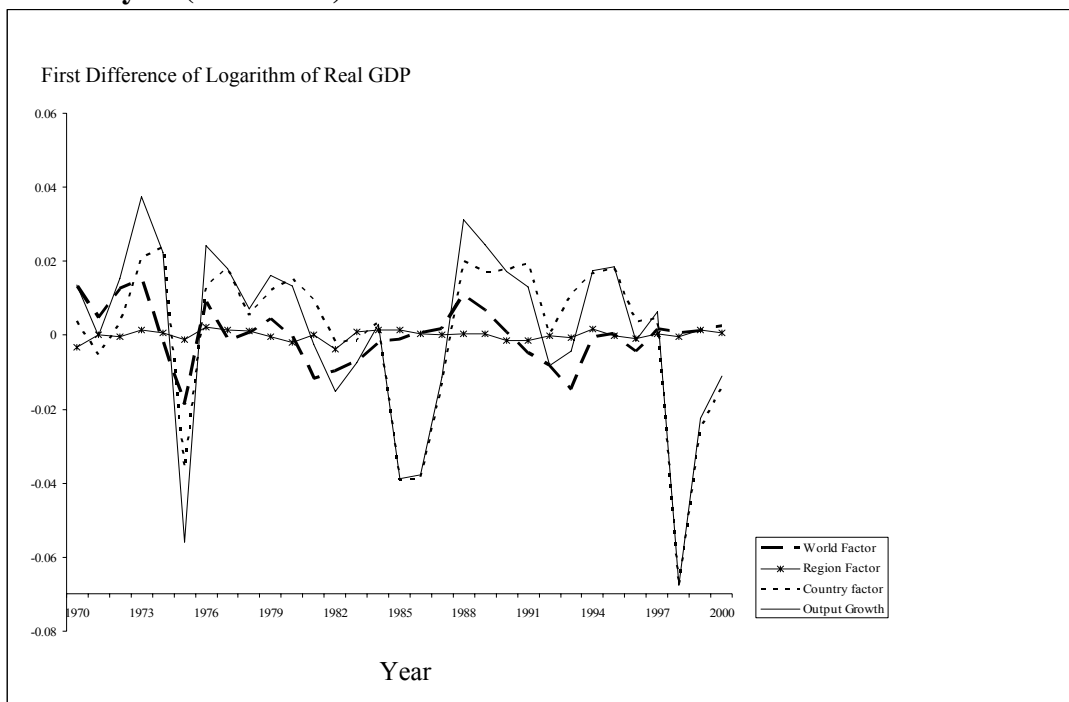


Figure 6: The Median of Output Growth, World, Regional and Country-Specific Factor for The Philippines (1970-2000)

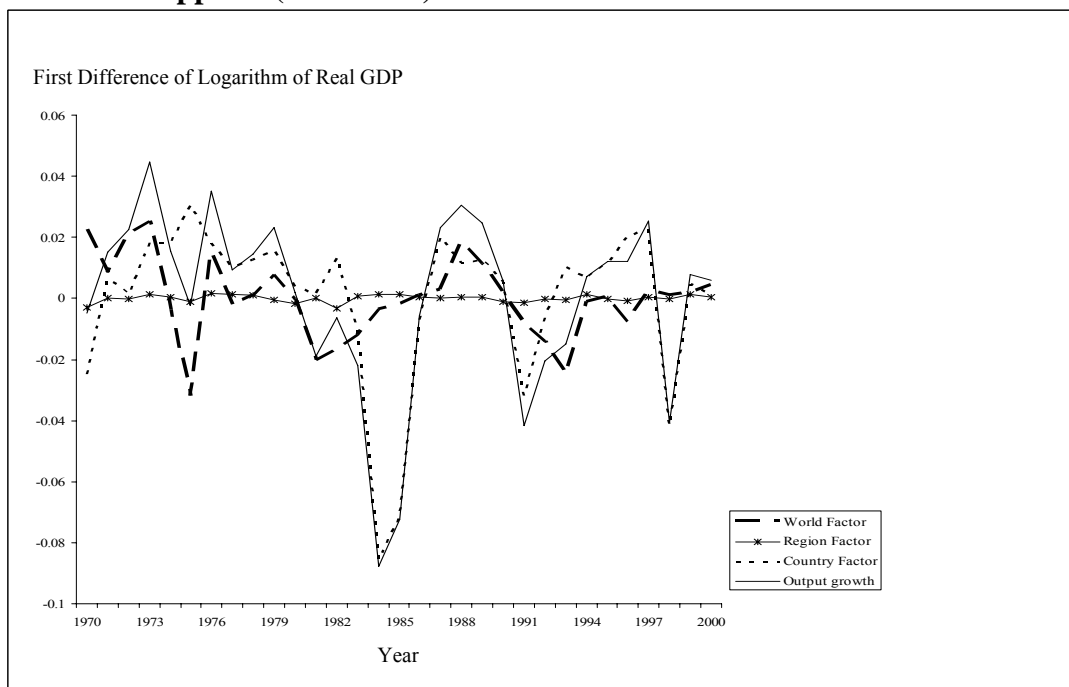


Figure 7: The Median of Output Growth, World, Regional and Country-Specific Factor for Singapore (1970-2000)

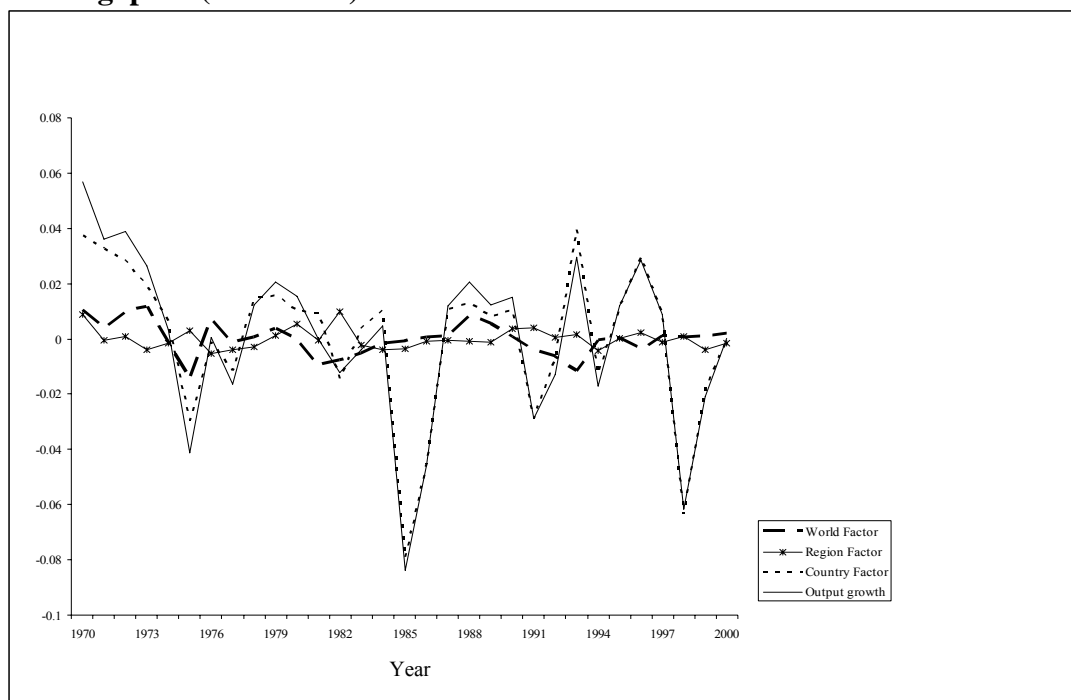
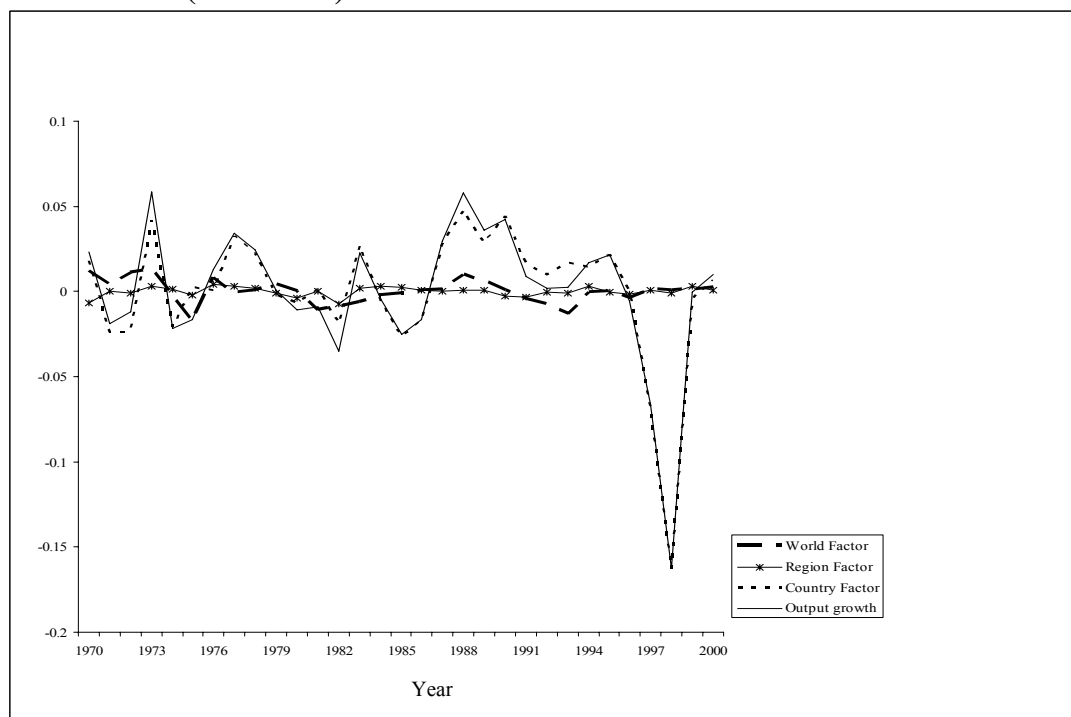


Figure 8: The Median of Output Growth, World, Regional and Country-Specific Factor for Thailand (1970-2000)



5.1 *China*

This section is interested in analysing the economic fluctuations in the Chinese economy after 1978, when the government reformed its economy from a centrally planned economy system to a more market-oriented economic system. However, this so-called “Socialism with Chinese characteristics” was still within very rigid political framework imposed by the ruling Communist Party of China. These reforms were aimed at increasing productivity, living standards, and technological quality. During the 1980s, these reforms led to average annual rates of growth of 10% in agricultural and industrial output. Our results indicate that the economic growth during the early 1980s was led mainly by the country factor, although the presence of world and regional factors is also detected.

By the late 1980s, however, the economy had become overheated with increasing rates of inflation. At the end of 1988, in reaction to a surge of inflation caused by accelerated price reforms, the leadership introduced an austerity program. Our variance decomposition results show that the slowdown was caused by both world and country factors.

China recovered from the slowdown quickly in the early 1990s. The government renewed push for market reforms to create a “socialist market economy”. The government’s reform efforts were shown by the presence of country factor in the growth. Influx of foreign direct investment and foreign capital following the introduction of more than 2,000 Special Economic Zones (SEZs) had also fuelled the economic expansion. The economy slowed in the late 1990s (Asian Financial Crisis), influenced by all three (world, region and country) factors.

The results seem to indicate the most of the major economic events were influenced by the country-specific factor, and to a smaller extent, the world factor. Regional factor however, plays a minor role in explaining the major economic fluctuations in China. The variance decomposition results in Table 1 shows that country-specific factor accounts for 63.6% of output fluctuation. While the world factor accounts for a sizeable 12.5%, the region factor accounts for only 2.2% of the output fluctuation in China.

5.2 *Japan*

Japan is an industrialised, free-market economy which achieved one of the highest economic growth rates in the world from the 1960s through the 1980s. Japan was hard hit by the oil crisis in 1973. Our results show that both the world and country factors caused the trough in 1974. The presence of the country specific factor was found because the crisis coincided with internal economic problems and with the end of stability between the world’s major currencies (Smith, 1995). These factors have caused the crisis to hit Japan harder than other industrialised nations.

The structure and nature of the Japanese economy changed after the crisis of 1973-4.¹² Before the early 1970s Japanese economic growth was driven mainly by the domestic market.

¹² These changes were not induced solely by the oil shock, many of the symptoms of transition were present before 1973 (Smith, 1995). See Smith, 1995 for a discussion of the Japanese economy after the first oil shock.

After 1973 exports became more important in sustaining growth in the Japanese economy. In 1979-80, Japan was hit by the second oil shock which was caused mainly by the world factor as shown in our results. The second oil shock was not as severe as the 1973 oil crisis and the recovery was fairly rapid. Our results show that both country and world factors contributed to the recovery, with the country factor played a more vital role in the recovery process.

Japan enjoyed a respectable rate of economic growth in the 1980s, with an annual growth rate of about 4%. Our results show that the economic growth in the 1980s was contributed by the country and the world factors. During the second half of the 1980s the Japanese domestic economy was awash with high level of liquidity. Banks loaned huge sums to finance the purchase of land and shares and company investment which sustained economic growth. The rapid growth of the late 1980s in Japan developed into an economic bubble. The speculative boom finally came to an end when the so-called “bubble economy” collapsed in 1989 and ushered in a severe and prolonged recession. Though the collapse of the speculative bubble economy was the domestic experience, the fall in demand in the domestic market was also accompanied by a decrease in demand for Japanese goods abroad due largely to the rise in the value of the yen. It is therefore not surprising for the empirical results to show that both country and world factors contributed to the economic crisis in the early 1990s. In the late 1990s, the Japanese economy went into another crisis as the Asian financial crisis unfolded. Both region and country factors contributed to this recession.

5.3 South Korea

As one of the East Asian Tigers, South Korea has the tenth largest economy in the world, and the third largest in Asia, behind only Japan and China. At the end of World War II, Korea was one of the poorest countries in Asia and it became heavily dependent on US aid. It inherited a colonial economic system designed for Japan’s expansion policy. The country then embarked on a series of ambitious five-year plans for economic development led by general Park Chung-hee in 1962. With foreign trade focused policy and the normalisation of relations with Japan in 1965 had led to expansion in trade and investment. It achieved rapid economic growth in 1960s and 1970s through exports of manufactured goods. During this period,” the South Korea economy grew at an average annual rate of about 9%. Our results show that all the world, region and country factors contributed to this phenomenal growth.

Up to the early 1970s, the industrial structure had been based on low value-added and labour-intensive products, which faced increasing competition and protectionism from the other developing countries. The government responded to this problem in the mid-1970s by emphasising the development of heavy and chemical industries and by promoting investment in high value-added, capital-intensive industries. However, the structural transition was difficult. In addition, it occurred at the end of the 1970s when the industrial world was experiencing a prolonged recession following the second oil price shock of the decade and protectionism was resulting in a reduction of South Korean exports. In 1980, the economy had a negative GDP growth for the first time since 1962. Inflation soared and the balance-of-payments position deteriorated significantly. In the early 1980s, the government instituted wide-ranging structural reform to control inflation and to liberalise trade and foreign investment to promote competition. These measures, coupled with significant improvements in the world economy had helped the South Korean economy regain its lost momentum in the late 1980s. The country achieved an average of 12.5% real GDP growth between 1986 and

1988. Our results indicated that all world, region and country factors had contributed to this double digit growth rate.

However, the high growth rates of the late 1980s slowed down during the early 1990s. One reason for this slow down was the economic restructuring that began in the late 1980s, including the slower growth of major export industries that were no longer competitive on the world market (footwear for instance) and the expansion of those competitive industries such as electronics. The growth continued after the early 1990s as South Korea transformed itself from an exporter of mostly textiles and shoes into a major global producer of automobiles, electronics, shipbuilding, and steel and later, high-technology fields such as digital monitors, mobile phones, and semiconductors. In the 1990s, the rapid accumulation of short-term external debts coupled with a highly leveraged corporate sector and the banking sector has provided the background to the contagion of Asian financial crisis in 1997. South Korea was one of the countries which is most adversely hit by the Asian financial crisis. Our results indicate that both region and country-specific factors had contributed to this recession.

5.4 *Indonesia*

The government plays a significant role in the Indonesian economy. It owns more than 164 state-owned enterprises and administers prices on several basic goods. Indonesia's economy grew from a per capita GDP of \$70 to more than \$1,000 by 1996 under the 30-year Suharto's "New Order" government. The inflation rates and exchange rates were stable and predictable. Concessional foreign aid financed much of the development budget.

Indonesia started its Five Year Development Plan in 1969 when Indonesia was one of the poorest countries in the world. Due to the oil boom in 1973, Indonesia enjoyed the highest GDP growth of 11.3%, but it then suffered from a series of oil shocks and economic crises from 1982-1987 when the average GDP growth dropped to less than 5%. Our results have shown that while the oil boom in 1973 was affected by region and country-specific factors, the economic crises from 1982-1987 were mainly country-specific phenomenon.

In response to the shocks, the Indonesian government began to implement a broad range of adjustment policies and structural reforms starting in 1983. These measures resulted in financial stability and economic growth. The economic activities grew at an average of nearly 7% per year from 1987-1997. It is evident from the figure above that the Indonesian business cycles were influenced by the region and its country-specific factor; the world factor hardly played any roles in explaining the fluctuations during the period 1987-1997. Indonesia was one of the countries which is most adversely hit by the Asian financial crisis in 1997. Our results indicate that both region and country-specific factors had contributed to this recession.

5.5 *Malaysia*

As Table 1 indicates, the country-specific factors capture the greatest share of output fluctuations in the country, explaining about 58 percent of output volatility. The world and region factors, on the other hand, play a relatively modest role in accounting for the economic activities in Malaysia. About 10 percent of the output variation is due to the world factor and only about 1 percent of the output variation is due to the East Asian regional factor.

Since independence in 1957, the Malaysian economy has shown sustained growth and has diversified away from tin and rubber. The government policy during the first decade of independence was generally designed to suppress growing inter-communal rivalries (Athukorala and Menon, 1996). Like many other developing countries, Malaysia's industrialisation began in the late 1950s with import substitution. The first stage of Import Substitution Industrialisation (ISI) consisted of high tariffs to motivate domestic investment, the under pricing of fuel and utilities to keep production costs down and tax and interest rate breaks to pioneer industries. However, our findings indicate that the output fluctuations after 1963 till the late 1960s were explained mainly by the East Asian regional factor.

It became obvious that by the late 1960s that the domestic market was too small for the import substitution industrialisation. The growth rate started declining after 1965. The government decided to give more emphasis to those industrial and investment incentives which encouraged the growth of export-oriented activities (Lim, 1992). The Industrial Incentive Act was enacted in 1968 to offer such incentives for export-oriented ventures as exemption from company tax and duty on imported inputs, relief from payroll tax, investment tax credits and accelerated depreciation allowances on investment (Athukorala and Menon, 1996). The boom in 1973 was explained by all world, region and country factors. Our findings demonstrate that the first oil crisis in 1973-1974 was evidently a worldwide event. In fact, all world, region and country-specific factors contributed to the reduction in growth rate during that period.

In 1985-86, the collapse of commodity prices led to Malaysia's worst recession since independence, with real GDP growth at -1% and Nominal GNP falling 11% . This crisis, however, was more distinctly Malaysian phenomena (although the regional factor did loosely reflect the reduction in output growth). This crisis was attributed to the poor performance of many state-owned enterprises, heavy external debts, overvalued Ringgit and depressed commodity markets. The Malaysian economy, however, rebounded remarkably, responding positively to the various macroeconomic policies and market based reforms introduced by the government. These reforms included privatisation and restructuring of many public enterprises, debureaucratisation, deregulation, decontrol and the devaluation of the Ringgit (Ariff, 1998). As such, the Malaysian economy has picked up again and has been growing at over 8.5% per annum since 1987. Our results have shown that the recovery after the 1985-86 crisis was led mainly by the country-specific factor.

The recent 1997-98 financial crisis was caused mainly by the country-specific factor, although the regional factor did play a role. The regional factor was not expected to play an important role in this instance as the financial crisis only affected 4 (Indonesia, Malaysia, Singapore and Thailand) out of the 8 countries in the East Asian region that are considered in the model. Similarly, our results show that the financial crisis affecting Indonesia, Singapore and Thailand was due mainly to the country-specific factors.

After the late 1960s, the Malaysian country factor captures most of the peaks and troughs of the business cycles. The world factor, on the other hand, only loosely reflects the Malaysian output. Although the regional factor reflected only 1% of the overall output fluctuation from 1970-2000 for the median country, it did reflect the peaks and troughs of the Malaysian business cycle (though playing a much lesser important role than the country-specific factor).

5.6 *The Philippines*

Since the end of the World War II, the Philippines economy has been characterised by complex social, economic and political problems. There was rapid economic growth right after the war, but it slowed down over time. The country's political life has been volatile, marked by a long period of dictatorship under Ferdinand Marcos in the 1970s and 1980s. The first severe post-war recession in 1984-85 caused a 10% reduction in economic output, and the perceptions of political instability during the Aquino administration further exacerbated the problems. Our results indicate that the 1984-85 was mainly a country-specific phenomenon.

After the severe recession in 1984-95, the government introduced a broad range of economic reforms and initiatives aimed at expanding business growth and foreign investment. The peak in 1989 was explained by all world, regional and country-specific factors. The Philippines enjoyed a period of rapid sustained growth until the Asian financial crisis in 1997. As in the case for other crisis-hit countries in the region, the Asian financial crisis was caused mainly by the country-specific factor, although the world and regional factor did play a role.

5.7 *Singapore*

Singapore is a remarkably open and highly developed economy with corruption-free business environment. The main source of revenue for the economy comes from the exports in electronics and chemicals and services. Singapore purchases raw goods and refines them for re-export, such as in the wafer fabrication industry and oil refining. Singapore's strategic port coupled with its infrastructure and skilled workforce is fundamental in providing easier access to markets for both importing and exporting and refining imports into exports. Over the past three decades, Singapore's success in transforming from a third world to a newly industrialised economy was the result of several paradigm shifts. The first shift was to industrialise the economy. The entrepot trade had reached its limits, and the only way to create ore jobs was to embark on an import-substitution strategy. Since the separation from Malaysia in 1965, the import substitution strategy had become unworkable. Singapore then made another paradigm shift, to re-orientate their industries towards serving world markets. Trade barriers were removed and industries were forced to face global competition. Singapore was hit by the first oil crisis in 1973-74. Our findings show that such crisis was evidently a worldwide event. In fact, all world, region and country-specific factors contributed to the reduction in growth rate during that period.

In order to create jobs and to penetrate overseas markets and bring in Western and Japanese technologies, they have also opened the door fully to Multi-National Corporation (MNC) investments. These strategies have succeeded in bringing full employment and higher income. Over time, the country has moved into higher value-added activities. However, in the early 1980s, rapid wage increases outpaced productivity gains, and when the regional economy turned down in 1985, Singapore fell into a deep recession. Our results indicate the crisis in 1985 was caused by both country and region factors.

The country had reassessed the economic policies after the 1985 recession to focus on improving competitiveness and flexibility. In the overall development strategy, Singapore put

more emphasis on the services sector as a major growth engine. The assimilation and adoption of new technology from the advanced economies has increased the country's incomes and capabilities. These policies had contributed to the economic boom after 1985 until the Asian financial crisis in 1997. In addition to the domestic policy changes in the country, East Asia was undergoing an economic boom, the global electronics industry was expanding rapidly, and the US economy was also experiencing recovery. Therefore, it is not surprising for our empirical results to show that such economic boom was caused by country specific, world and regional factors. Singapore enjoyed a period of rapid sustained growth until the Asian financial crisis in 1997. As in the case for other crisis-hit countries in the region, the Asian financial crisis was caused mainly by the country-specific factor, although the world and regional factor did play a role.

5.8 Thailand

Thailand was one of the most diverse economies in South-east Asia in the past 25 years to 1998 (*The Economists*, 14th April 2004). The economy was based traditionally on agricultural exports, however, Thailand's active promotion of foreign investment before 1970s created an industrial sector based on import substitution. In the 1980s an export-oriented manufacturing sector, based on labour-intensive output such as textiles and garments, began to develop (*The Economists*, 14th April 2004). After 1990 the fastest growth was in higher-technology goods such as computer accessories and motor vehicle parts. Our results indicate that all world, region and country factors contributed to the rapid economic growth of Thailand in the late 1980s. However, the growth in the early 1990s was driven by country-specific factors.

Following several years of unprecedented economic growth, Thailand's economy collapsed under the weight of foreign debt and its dependence on short-term capital to finance it in 1997. In addition, the pegging of Thai baht to a strengthening US dollar in the 1990s eroded the competitiveness of low-cost goods, and import-dependent high-technology products were unable to fill the gap. The Thai economy's downfall set off a chain of reaction in the region, sparking the Asian Financial Crisis. The figure above shows that both region and country factors contributed to this economic crisis.

Table 2: Presence of World, Regional and Country-Specific Factors during Major Events in East Asia (1970-2000)

Country/Major Events	Presence of World Factor	Presence of Regional Factor	Presence of Country Factor
China			
1980s - Expansion (Reforms)	Yes	Yes	Yes
End of 1988	Yes	No/insignificant	Yes
Early 1990s	Yes	No/insignificant	Yes
1997 - Asian Financial Crisis	Yes	Yes	Yes
Japan			
1973-4 – First Oil Crisis	Yes	No/insignificant	Yes
1979-80 – Second Oil Shock	Yes	No/insignificant	No/insignificant
1980s - Speculative Boom	Yes	No/insignificant	Yes
Early 1990s – Recession	Yes	No/insignificant	Yes
Late 1990s – Recession	No/insignificant	Yes	Yes
Korea			
1970s - Expansion	Yes	Yes	Yes
1980 - Recession	Yes	Yes	Yes
Late 1980s - Expansion	Yes	Yes	Yes
Early 1990s - Slowdown	Yes	Yes	Yes
1997 - Asian Financial Crisis	No/insignificant	Yes	Yes
Indonesia			
1973 - oil boom	No/insignificant	No/insignificant	Yes
1982-1987 - Slowdown	No/insignificant	Yes	Yes
1987-1997 - Expansion	No/insignificant	Yes	Yes
1997 - Asian Financial Crisis	No/insignificant	Yes	Yes
Malaysia			
Early 1970s - Peak	Yes	Yes	Yes
1973-74 - First oil crisis	Yes	Yes	Yes
1985-86 - Commodity Crisis	No/insignificant	Yes	Yes
Late 1980s - Peak	Yes	No/insignificant	Yes
1997 - Asian Financial Crisis	Yes	Yes	Yes
Philippines			
1984-85 - Recession	No/insignificant	No/insignificant	Yes
Late 1980s - Peak	Yes	Yes	Yes
1997 - Asian Financial Crisis	Yes	Yes	Yes
Singapore			
1973-74 - First oil crisis	Yes	Yes	Yes
1985 - Recession	No/insignificant	Yes	Yes
Late 1980s - Peak	Yes	Yes	Yes
1997 - Asian Financial Crisis	Yes	Yes	Yes
Thailand			
Late 1980s - Expansion	Yes	Yes	Yes
Early 1990s - Expansion	No/insignificant	No/insignificant	Yes
1997 - Asian Financial Crisis	No/insignificant	Yes	Yes

6. Conclusion

This study enables the identification of the sources of the economic fluctuations for an economy. Understanding the sources of economic fluctuations is important for making policy decisions. As a result, composition of the shocks in these East Asian economies will be identified and appropriate policy actions can be undertaken accordingly.

A few summaries and conclusions can be drawn from the empirical findings. First, the country-specific factors capture the greatest share of output fluctuations in East Asia, explaining about 65% of output volatility. The country-specific factors share of output volatility ranges widely across the East Asia region, from a low of 44% in Japan to a high of about 80% in Indonesia and Thailand. This difference can be explained by the difference in the degree of development in these countries. Kose *et al.* (2003) suggest that country specific factors tend to be more important for developing and poorer countries compared with the developed countries. The results also indicate that country-specific factors play the most important role in accounting for most the peaks and troughs in the region.

Second, the region factors, on the other hand, play a relatively modest role in accounting for the economic activities in these countries. For the median country, only 3% of the output variation is due to the East Asian regional factor. The region factor is largest for the most developed economies in the region, namely, Japan, Korea and Singapore. The region factor accounts for about 7% of output variation in these countries, indicating that a coordinated policy should be considered for these economies to respond to the disturbances. The presence of regional factor is detected (though to a lesser degree compared to the country-specific factor) in most of the major events for these countries. In the context of OCA, the cost of a regional monetary union would be large due to the insignificant share of regional common factor.

Finally, the world factor explains only 8% of the output variation in East Asia for the median country. The world factor share of output volatility also ranges widely across the region from a low of less than 1% in Indonesia to a high of more than 36% in Japan. This result is consistent with that of Kose *et al.* (2003) who found that the world factor to be more important in explaining output fluctuations in developed countries while country specific factors are more important in developing countries. In addition, the world factor contributed only mildly (with the exception of the first oil shock in 1974) to the peaks and troughs in East Asia (except for Japan). This might explain why the world economy was stabilised through periods of US slowdown by the East Asian economies. For instance, when the US experienced negative economic growth in 1991, East Asia grew at 7% on average with China leading the growth at 12%. Again, in 2001, when US growth fell, these East Asian economies grew many times more than the US.

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