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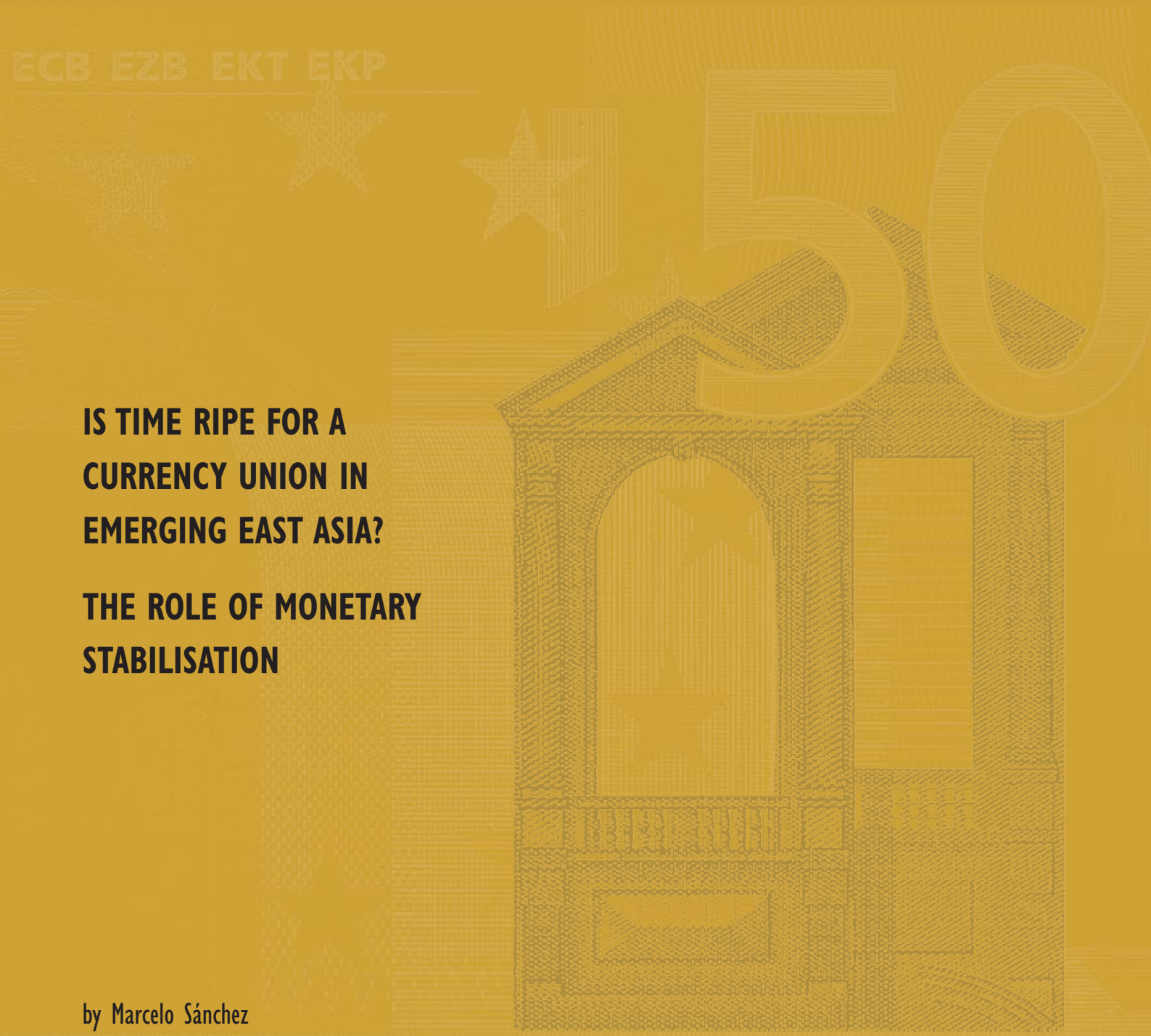

IS TIME RIPE FOR A CURRENCY UNION IN EMERGING EAST ASIA?

THE ROLE OF MONETARY STABILISATION

by Marcelo Sánchez

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In 2005 all ECB publications will feature a motif taken from the €50 banknote.

1 Comments received from Daniel Heymann are gratefully acknowledged. The views expressed in this study are those of the author and do not necessarily reflect those of the European Central Bank. All errors are the author's responsibility.
2 European Central Bank, Kaiserstrasse 29, D-60311 Frankfurt am Main, Germany; Fax: +49 69 1344 6353, Phone: +49 69 1344 6531, e-mail: marcelo.sanchez@ecb.int

Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Internet
http://www.ecb.int

Fax
+49 69 1344 6000

Telex
411 144 ecb d

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CONTENTS

Abstract

This paper assesses the prospects for monetary integration between Emerging East Asian (EEA) economies. Our empirical analysis is based on a simple analytical framework for currency unions of small open economies, with a focus on the conduct of monetary policy in the presence of different types of shocks. Our empirical analysis looks at a number of supply-side characteristics of EEA countries, distinguishing between aggregate and tradable sector structural features. Moreover, we discuss the evidence on the cross-country variation of disturbances hitting the region. Our study indicates that, at present, EEA economies exhibit a high degree of cross-country supply diversity, while there is no compelling evidence that shocks are highly correlated across the region.

Keywords: East Asia; emerging economies; currency union; stabilisation

JEL: E52; E58: F33: F40

Non-technical summary

Emerging East Asian (EEA) economies have exhibited the world's fastest growth rates of real output and exports over the last fifteen years. During this period, their intra-regional trade has also expanded very rapidly, while regional financial cooperation has been enhanced following the Asian crisis of 1997-1998. One useful test of how far Asian trade integration and regionalism have proceeded consists of assessing whether these economies would benefit from taking a further step into monetary integration. Such an evaluation naturally involves careful consideration of structural aspects of the region, including the degree of trade interdependence within and even outside the region.

Against this background, the present paper assesses the prospects for monetary integration between EEA economies. Our empirical analysis is based on a simple analytical framework for currency unions of small open economies, with a focus on the conduct of monetary policy in the presence of different types of shocks. This model extends the previous literature by allowing for a richer setup with a broad set of shocks, the role of inflation targets and the choice of interest rates as the instrument of union-wide monetary policy. Our empirical analysis looks at a number of supply-side characteristics of EEA countries, distinguishing between aggregate and more specifically tradable sector structural features. Moreover, we discuss the evidence on the cross-country variation of disturbances hitting the region, as well as recent data on inflation targets. Our study indicates that, at present, EEA countries' supply characteristics remain rather diverse and that there is not very compelling evidence that shocks are highly correlated across the region. The present paper does not assess other important aspects that have attracted interest in the literature on monetary integration in Asia, such as the current state of institutional development concerning economic and in particular financial regional integration, the incomplete financial market integration between EEA countries and

the degree of strength of regional institutions aimed at pushing the integration efforts forward.

The previous analysis may help explain why the major issue for monetary integration in EEA at present is not a formation of a currency union, but rather monetary coordination under a variety of forms. However, it is important to bear in mind that integration via trade, financial and financial flows go hand in hand with each other. For this reason, increasing trade, financial and investment interdependence could reinforce each other over time, leading to more mature conditions for deeper economic integration and in particular a monetary union. Understanding the implications of increasing spillovers would also necessitate the use of approaches that deviate from our small open economy assumption, incorporating the flavour of either two-country or core-periphery models, depending on the specific configuration taking place. In addition, further progress in real and monetary integration may prove instrumental in shaping ongoing developments in the sphere of domestic policies (including monetary and exchange rate policies) and regional financial cooperation efforts.

1 Introduction

There is a wide-ranging and increasing literature on the experience and prospects of monetary integration around the globe. One of the areas in the world that has attracted considerable attention in recent years is East Asia, with many studies having investigated whether the region could be suitable for embarking in further monetary cooperation and eventually forming a currency union. Among the reasons for this interest, we can mention the following three. First, East Asian economies exhibit high shares of intra-regional trade. Second, there is evidence of increasing financial market interdependence over recent years.[1] Third, there has been a number of initiatives regarding financial cooperation following the Asian crisis of 1997-1998. Such cooperation most notably includes the Chiang Mai initiative of May 2000, a network of bilateral swap arrangements established among ASEAN+3 countries for the case of speculative attacks against their currencies. Enhanced interaction via trade and financial flows has proved instrumental in leading to monetary unions in previous historical experiences.[2]

Most of the literature on the monetary integration of small open economies is of an empirical nature, and while it is often rooted on some general theoretical underpinnings concerning so-called optimal currency area criteria it is rarely explicit about the exact structure of the member economies and the way monetary stabilisation concretely works. Partly explaining the latter, the conduct of a monetary stabilisation policy in a currency union between small open economies has received very little research attention. This is surprising, given that monetary policy considerations are key to comparing a currency

[1] For instance, Cheung, Chinn and Fujii (2005) find that deviations from international parity conditions have recently shrunk for money markets within the Greater China region. Such deviations can be attributed to the presence of capital controls and exchange rate variability. The authors, however, note that the Chinese banking sector remains rather insulated from regional developments.

[2] With regard to the role of financial integration, Kawai and Takagi (2005) review the European Payments Union, the CFA Franc Zone and the Monetary Arab Fund to draw lessons for East Asian countries.

union to alternative exchange rate arrangements. Moreover, the relevance of such comparisons is not called into question by the recent debate about the optimality of exchange rate regimes. One strand of this literature has interpreted the instability of fixed exchange rate systems to imply that the only viable long-term options for a country are a floating exchange rate or participation in a currency union. This view, commonly known as the "hollowing-out hypothesis" was originally proposed by Fischer (2001). Alternatively, some authors have stressed that many officially pure floating regimes are in practice managed floats, thereby defying the notion that intermediate regimes are extinct. To the extent that the implied desire for relative exchange rate stability may be driven by regional competition considerations, this raises the question whether such stability could be best achieved by regional monetary cooperation and in particular the extreme case of a currency union. The latter arrangement could, if economically justified and properly designed, help maintain exchange rate stability while mitigating credibility problems sometimes arising in intermediate regimes.[3]

In terms of stabilisation policy, the existing literature identifies as a key characteristic of a currency union that the authorities aim at union-wide objectives, while not accommodating for the specific needs of each and every country within the union. The most important cost implied by full monetary integration consists of renouncing to an independent monetary policy for inflation and output stability. For this reason, many studies have discussed from different perspectives how currency union's stabilisation properties and individual countries' macroeconomic performance are affected by heterogeneity in key structural parameters and the nature of disturbances. With regard to the latter, analysts have focused on the consequences of union members exhibiting positively correlated or common, as opposed to asymmetric, shocks. In the case of countries in the emerging East Asia (EEA) region, the discussion of

[3] The idea of joining a currency union as a commitment strategy has been developed in Alesina and Barro (2002).

the nature of shocks has appeared in many different contexts. Asymmetric shocks have arguably been the impulse behind the collapse of fixed exchange rate systems in the region and beyond. In this regard, some authors have analysed the role of swings in the yen-dollar rate in the outbreak of the Asian crisis of 1997-1998 in countries that were in practice pegging to the dollar, or attaching high weights to the dollar in the conduct of their exchange rate policy. Moreover, the assessment of the suitability of various regions for currency unions have focused on the prevalence of asymmetric shocks as a key indicator of whether a region qualifies as an optimal currency area (see Eichengreen and Bayoumi, 1999, for a discussion focusing on East Asian countries).

In addition to analyses of currency unions based on their implications for stabilisation policy, there are other factors - which are rather exogenous to monetary policy *per se* - that have played a major role in the discussion about monetary union. For example, there is evidence that the formation of a currency union induces favourable credibility and trade-enhancing effects. The latter, in particular, has been emphasised in the influential empirical analysis of Rose (2001, 2002). He finds strong evidence of a positive impact of currency unions on trade.[4] The positive impact on potential output via trade and financial integration, as well as the experience with currency unions, has led some analysts to assess more positively the possibility of a country joining a currency union even before full economic integration is achieved. It has however to be mentioned that not all of the considerations about currency unions that are unrelated to the conduct of monetary policy lead to a support of a common currency.

[4] Other studies finding similar results are Engel and Rose (2002) and Glick and Rose (2002). Bagella, Becchetti and Hasan (2004) investigate the direct output impact of EMU, reporting that more stable macroeconomic policies have had a significant impact on the level and growth rates of per capita GDP in euro area countries. For a meta-analysis of the size of the currency union effect on international trade, see Rose (2004).

Another potential channel for welfare improvement from having a common currency is that of fostering financial deepening across the union. In a similar vein, Plummer and Click (2005) advocate the establishment of a common ASEAN basket of currencies as a way to facilitating cross-issuance of bonds.

The object of this paper is twofold. We start by taking a step in the direction of developing theoretical results on currency unions between small open economies. The focus on small open economies implies that we neglect the possibility of spillovers across countries of the type analysed by Lane's (2000) two-country model, and Buiter, Corsetti and Pesenti (1998a and 1998b) core-periphery approach. We also abstract from defining the exact unit of account to be used within the union.[5] We then use our model to assess the prospects of monetary union between the EEA economies.[6] By concentrating on this group of countries, we follow most of the studies assessing prospective monetary integration in Asia. The assumption that these economies are small can be reconciled with the existence of cross-country correlations as a result of common factors hitting the region from the outside. This is consistent with the lack of compelling evidence of intra-regional correlations between domestic shocks, which is one of the conclusions of this paper.

Our extension of the theory of currency unions draws from work that has recently been integrated into the standard time inconsistency literature. Previous studies in this area include those by Lane (2000), who studies a two-country model, and Ca' Zorzi, De Santis and Zampolli (2005), who analyse a currency union between a large and a small country.[7] The model used in the present paper is closest to Ca' Zorzi and De Santis' (2004) multi-country approach, which is motivated by the experience of the accession of new member states to the European Union. We extend the theoretical literature on

[5] The literature about monetary integration in EEA has formulated different possible optimal anchors. The latter include individual currencies such as the yen (Kwan, 2001), the US dollar (Mundell, 2002) or the renminbi (Hefeker and Nabor, 2005). Moreover, some studies propose a common basket of major currencies (Williamson, 1999, 2002, and Mussa, Masson, Swoboda, Jadresic, Mauro and Berg, 2000). Ito (2002) argues that the latter proposal can potentially be in conflict with inflation objectives. Alesina, Barro and Tenreyro (2002) find no compelling case for a yen block by looking at output correlations around the globe.

[6] More precisely, this paper defines emerging East Asia as comprising the economies of China, Hong Kong, India, South Korea (henceforth Korea), Taiwan and ASEAN-5. The latter grouping is composed of Indonesia, Malaysia, Philippines, Singapore and Thailand.

[7] Another theoretical contribution to the literature relevant for the present paper is Alesina and Barro (2002).

currency unions in the following five ways. First, we characterise stabilisation policy in terms on decisions about the interest rate, which is, realistically, the union-wide monetary policy instrument. Formerly, the focus has been on the equilibrium outcome in terms of optimal inflation (Ca' Zorzi and De Santis, 2004, and Ca' Zorzi, De Santis and Zampolli, 2005), or in addition on money supply as the authorities' policy instrument (Lane, 2000). Second, we fully endogeneise macroeconomic developments in output, inflation, interest rates and exchange rates. In doing so, in particular, we deviate from Ca' Zorzi and De Santis' (2004) and Ca' Zorzi, De Santis and Zampolli's (2005) focus on Balassa-Samuelson-type exogenous productivity factors driving inflation. Third, we study a rather general set of shocks as given by supply, demand and risk premium disturbances while also allowing inflation targets to play a role, in line with the recent literature on small open economies spawned by Ball (1999, 2002) and Svensson (2000). As in Lane (2000), we permit shocks to adopt three different features, namely, to be common, idiosyncratic or asymmetric. Fourth, the present paper explicitly models the role of imported inflation. As a result, members of a currency union are allowed to face different imported inflation as stemming from a different commodity composition of their international trade and different effective exchange rates as resulting from different geographical composition of trade.[8] Fifth, we allow supply schedules to differ across countries.

The structure of the rest of the paper is as follows. In section 2, the model is laid out. In section 3, monetary policy in a currency union is studied. In section 4 we apply the lessons from the model to EEA economies by looking at the latter's specific structural characteristics in order to assess the prospects of monetary integration in the region. Section 5 concludes.

[8] A role for geographical composition of trade also features in Ogawa and Ito (2000). They show that an EEA economy's choice of the exchange rate (or weights in a basket comprising the US, Japan and an emerging regional partner) is dependent on the neighbouring EEA country's.

2 The model

In order to investigate monetary stabilisation matters in a monetary union, let us consider a simple small open economy model. Four equations describe the behaviour of the private sector in each of the union's members $i = 1, 2, ..., N$:

$$y_i = \alpha_i (\pi_i - \pi_i^e) + \varepsilon_i \quad (1)$$

$$y_i = -\beta_i r_i - \delta_i e_i + \varsigma_i \quad (2)$$

$$r_i = \theta_i e_i + \varepsilon_i^f \quad (3)$$

$$r_i = R - \pi_{i,+1}^e \quad (4)$$

where all variables are expressed as deviations from steady state values and, with the exception of the nominal and real interest rate, are in logarithms. Constants have been normalised to zero. All parameters are assumed to be positive. All shocks are of the zero-mean, constant variance, type, and serially correlated. They are also assumed to be uncorrelated with each other for each economy i, but allowed to be correlated across countries, as is made clear below.

Equation (1) is a simple aggregate supply schedule which states that output (y_i) responds positively to surprises from the last period's expectations of the inflation level ($\pi_i - \pi_i^e$) .[9] Expression (2) states that aggregate demand is decreasing in the (short-term) real interest rate (r_i). Output also depends negatively on the real exchange rate (e_i). Note that an increase in e_i denotes an appreciation of the real exchange rate. Equation (3) posits a positive relation between interest rates and exchange rates that can be interpreted to mean

[9] For simplicity, we do not include an exchange rate pass-through term in equation (1). The latter is customarily shown to affect monetary policy in a rather simple way by modifying inflation targets with an extra term that corrects for temporary deviations from long run real exchange rate. See Ball (2002) and Sánchez (2005).

For the case of EEA countries, the degree of pass-through is considered in any case to be rather small (see Ca' Zorzi, Hahn and Sánchez, 2004).

that higher interest rates encourage capital inflows, which leads to an appreciation. Other determinants of exchange rates, such as investor confidence and expectations, are captured by the error ε_i^f.[10] Finally, (4) is the Fisher equation defining the real interest rate as a difference between nominal short-term interest rate R (decided by the currency union's monetary authority) and the current period's expectation of future inflation, $\pi_{i,+1}^e$. Positive values for ε_i and ς_i represent favourable supply and demand shocks, respectively, while a positive value for ε_i^f is interpreted to reflect an adverse risk premium shock.

Ca' Zorzi and De Santis (2004) close their model by relating inflation differentials between the union's members to an aggregate measure of real exchange rate developments, which they decompose into an expected part and a shock. They also interpret such real exchange rate developments in terms of productivity differentials between tradable and non-tradable sectors. By closing the model by deriving the monetary policy reaction function, the present model endogenously determines macroeconomic developments. Moreover, it allows us to undertake a deeper analysis of the shocks affecting the non-tradable and imported components of inflation as shown in the Appendix. In particular, we decompose supply shock ε_i into three exogenous factors affecting supply. These are shocks to non-tradable inflation and two tradable sector disturbances, namely, one affecting tradable prices in foreign currency and aggregated by using country-specific weights (due to different commodity compositions of international trade) and shocks to nominal effective exchange rates which are also idiosyncratic due to specific shares of different trading partners. The implications of this decomposition will be discussed in more detail when applying the present theory to emerging East Asian countries.

[10] It has been argued that EEA countries' exchange rates are dependent on each other. For instance, policymakers in these economies may have in mind exchange rates vis-à-vis each other as affecting competitiveness in both intra-regional and extra-regional markets. Moreover, contagion could lead to spillovers across EEA currencies. The present model is able to address these sources of exchange rate interaction as follows. Cross-country competitiveness concerns can be handled by allowing for correlation between demand shocks between any given pair of countries, while contagion can be represented in terms of correlation between risk premium disturbances.

3 Monetary policy in a currency union

By definition, there is but a single monetary policy for a currency union. We assume that the monetary authority of the currency union cares equally about each member country.[11] The monetary authority recognises that it can only affect aggregate union-wide output and inflation, and not their distribution between the different member countries. Even if monetary policy (and hence aggregate output and inflation) does not respond to pure asymmetric shocks, the geographical composition of output and inflation will change.

The central bank minimises a loss function given by[12]

$$L_u = \frac{1}{2}\left[y_u^2 + \chi(\pi_u - \tilde{\pi}_u)^2\right] \tag{5}$$

In (5), the objective function of the central bank is assumed to penalise departures of union-wide output and inflation from desired values set to zero and $\tilde{\pi}_u$, respectively.[13] The latter is assumed to adopt a fixed and credible value, as a result of this also being the case for country-level inflation targets. The union's central bank has no incentive to surprise the private sector with inflation, and there thus is no inflation bias. Parameter χ is the weight of inflation aversion of the central bank relative to the aim of achieving output stabilisation.

Taking averages over (1), we get

[11] This is a natural assumption and could be generated, for example, by a central bank board with representatives from each participating country that bargained over monetary policy decisions.

[12] Recent work in macroeconomics, most prominently by Woodford (2003), shows that quadratic loss functions such as (5) here can be, under certain conditions, interpreted as a second order approximation to the welfare of the representative agent. The present paper makes the standard simplifying assumption that the marginal rate of substitution between the target is independent of the economic structure. This assumption is however relaxed in the context of optimising frameworks. For an analysis of the dichotomy between economic structure and policy objectives, see Walsh (2005).

[13] Union-wide variables are weighted averages using weights $\varphi_i \in (0, 1)$.

$$y_u = \alpha_u \left(\pi_u - \pi_u^e\right) + \sum \varphi_i \varepsilon_i + \sum \varphi_i (\alpha_i - \alpha_u)(\pi_i - \pi_i^e) \tag{6}$$

We assume that the union's public knows α_i, β_i, δ_i, θ_i, $\tilde{\pi}_i$, the distribution of the disturbances ε_i, ς_i and ε_i^f, for all i, and that it observes the nominal interest and exchange rates. We also assume that there is *full information*, in the sense that the central bank, producers and foreign exchange market participants all observe current output, prices and nominal exchange rates. With this information, and knowledge of the structure of the model, they are in a position to deduce the sources of the shocks that hit the economy. A state-contingent reaction function is then feasible.

The sequence of events is standard. The private sector forms expectations on prices, conditionally on the information available at that time. The output shock is realised and, finally, monetary policy is set. Monetary authorities, therefore, have an informational advantage with respect to private agents. The game is solved by backward induction.

Replacing (6) into (5), differentiating with respect to π_u to get the first-order condition and imposing rational expectations, we derive an expression for optimal inflation under discretion:

$$\pi_u = \tilde{\pi}_u - \frac{\alpha_u}{\alpha_u^2 + \chi} \left[\sum \varphi_i (\alpha_i - \alpha_u)(\pi_i - \pi_i^e)\right] \tag{7}$$

where we have also used the result that $\pi_u^e = \tilde{\pi}_u$. It is reasonable to assume that the latter holds through the corresponding equalities at the country level, that is, $\pi_i^e = \pi_{i,+1}^e = \tilde{\pi}_i$, which means that expected inflation equals expected targeted inflation not only at the union level, but also for each country. As a result, in (4), $r_i = R - \tilde{\pi}_i$. Using these results, alongside expressions (1), (2), (3), (6) and (7), permits us to obtain the (union level) monetary policy reaction function:

$$R^{opt} = \frac{1}{A}\left[-a\sum \varphi_i \alpha_i' \varepsilon_i + \sum \varphi_i \alpha_i' b_i \varsigma_i + \sum \varphi_i \alpha_i' c_i \varepsilon_i^f + \sum \varphi_i \alpha_i' b_i \tilde{\pi}_i\right] \quad (8)$$

where $A \equiv \sum \varphi_i \alpha_i' d_i$, $\alpha_i' \equiv 1/\alpha_i$, $a \equiv \frac{\chi}{\alpha_u^2+\chi}$, $b_i \equiv 1 + \frac{\alpha_u}{\alpha_u^2+\chi}(\alpha_i - \alpha_u)$, $c_i \equiv d_i \frac{\delta_i}{\theta_i}$, $d_i \equiv b_i\left(\beta_i + \frac{\delta_i}{\theta_i}\right)$. Expression (8) formulates the reaction of the nominal interest rate, which is the central bank's policy instrument, to aggregates of shocks and inflation targets at the country level. As expected, R is raised in response to adverse supply and risk premium shocks, favourable demand shocks and higher desired inflation, judging from the aggregates that appear in (8). If shocks are asymmetric in the sense that they equal zero at the aggregate level, R could still be changed depending on country-specific parameter values. However, if the supply schedule parameter α_i shows no cross-country variation, then pure asymmetric shocks to ε_i and ς_i would have no impact on monetary authorities' decisions. If in addition, the bunch of model parameters grouped as c_i shows no cross-country variation, then the same conclusion can be reached regarding pure asymmetric shocks to ε_i^f.

We use (6), (7) and (8) to derive expressions of union-wide output and inflation in terms of aggregates of country-level shocks and inflation target levels:

$$y_u = -\sum \varphi_i \alpha_i' f \varepsilon_i + \sum \varphi_i g_i \varsigma_i + \sum \varphi_i h_i \varepsilon_i^f + \sum \varphi_i k_i \tilde{\pi}_i \quad (9)$$

$$\pi_u = \tilde{\pi}_u - \sum \varphi_i \alpha_i' l \varepsilon_i + \sum \varphi_i m_i \varsigma_i + \sum \varphi_i n_i \varepsilon_i^f + \sum \varphi_i p_i \tilde{\pi}_i \quad (10)$$

where $f \equiv \frac{B}{A}a$, $g_i \equiv 1 - \frac{B}{A}\alpha_i' b_i$, $h_i \equiv \frac{\delta_i}{\theta_i}\left(1 - \frac{B}{A}\alpha_i' d_i\right)$, $k_i \equiv \left(\beta_i + \frac{\delta_i}{\theta_i}\right) - \frac{B}{A}\alpha_i' b_i$, $l \equiv 1 - f$, $m_i \equiv 1 - \frac{B}{A}b_i$, $n_i \equiv \frac{\delta_i}{\theta_i}\left(1 - \frac{B}{A}d_i\right)$, $p_i \equiv \left(\beta_i + \frac{\delta_i}{\theta_i}\right) - \frac{B}{A}b_i$, and $B \equiv \sum \varphi_i \alpha_i' \left(\beta_i + \frac{\delta_i}{\theta_i}\right)$. Equations (9) and (10) indicate that union-wide output and inflation hover around their desired values. Inspection of coefficients entering both expressions leads to a natural interpretation uncovering that stabilisation policy is at work, helping partially offset shocks impacting output and inflation.

Inspection of (9) and (10) uncovers how deviations of y_u and π_u from desired levels are determined. Unexpected developments in each and every country i contribute to determine y_u and π_u, while also inducing monetary policy responses. Macroeconomic developments are driven by country-level shocks and inflation targets, their impact also reflecting the relative importance of the countries involved and the reactions in each of them as influenced by country-level structural parameters. Country-level shocks and inflation targets and the union's interest rate reaction also contribute to determine output and inflation in any country. More concretely, in the case of supply shocks, the second terms in (9) and (10) reflect the following mechanism: if any country i is subjected to such shock the reaction of union-wide output and inflation will be increasing on both the size of that country, φ_i and the latter's responsiveness of inflation to output, α_i'. A tradeoff is captured by coefficients f and l, which add up to one, which means that the overall effect of supply shocks is exhausted by being distributed among output and inflation. The direct impacts of both the inflation targets and shocks other than those affecting the supply schedules are likewise influenced by structural parameters. They also reflect to some extent offset by monetary policy (as can be seen in the minus signs entering the corresponding coefficients), their overall impact once more depending on the distribution of parameter values and shocks across countries.

Use of (8), (9) and (10) lead to a new expression for the realised loss function (5) at the optimum:

$$L_u = \frac{a}{2}\left[s\sum \varphi_i \alpha_i' \varepsilon_i + \sum \varphi_i \alpha_i' t_i \varsigma_i + \sum \varphi_i \alpha_i' u_i \varepsilon_i^f + \sum \varphi_i \alpha_i' v_i \tilde{\pi}_i\right]^2 \qquad (11)$$

where $s \equiv \alpha_u + \frac{C}{A}a$, $t_i \equiv (\alpha_i - \alpha_u) - \frac{C}{A}b_i$, $u_i \equiv \frac{\delta_i}{\theta_i}\left[(\alpha_i - \alpha_u) - \frac{C}{A}d_i\right]$, $v_i \equiv \left(\beta_i + \frac{\delta_i}{\theta_i}\right)(\alpha_i - \alpha_u) - \frac{C}{A}b_i$, and $C \equiv \sum \varphi_i \alpha_i' \left(\beta_i + \frac{\delta_i}{\theta_i}\right)(\alpha_i - \alpha_u)$.

The expected loss in the currency union, $E(L_u)$, can be derived by taking

unconditional expectations on loss function (5), which gives

$$E(L_u) = \frac{a}{2}\left[s^2 \sum \varphi_i^2 \alpha_i'^2 \sigma_{\varepsilon_i}^2 + \sum \varphi_i^2 \alpha_i'^2 t_i^2 \sigma_{\varsigma_i}^2 + \sum \varphi_i^2 \alpha_i'^2 u_i^2 \sigma_{\varepsilon_i^f}^2 + \sum \varphi_i^2 \alpha_i'^2 v_i^2 \tilde{\pi}_i^2 + \Phi\right] \tag{12}$$

where $\Phi \equiv \sum_{i \neq j} \varphi_i \varphi_j \alpha_i' \alpha_j' \Phi_{ij}$ and $\Phi_{ij} \equiv s^2 \sigma_{\varepsilon_i \varepsilon_j} + t_i t_j \sigma_{\varsigma_i \varsigma_j} + u_i u_j \sigma_{\varepsilon_i^f \varepsilon_j^f} + st_j \sigma_{\varepsilon_i \varsigma_j} + su_j \sigma_{\varepsilon_i \varepsilon_j^f} + t_i u_j \sigma_{\varsigma_i \varepsilon_j^f} + v_i v_j \tilde{\pi}_i \tilde{\pi}_j$. We denote the unconditional variance of any disturbance x by σ_x^2, and the unconditional covariance between any pair (x, y) by σ_{xy}. Constant C in (11) hovers around zero depending on country-specific parameter values. In order to simplify the interpretation of the results in both (11) and (12), we set $C = 0$ in (12).[14] As we shall see in the next subsection, this can be obtained, for example, by attaching plausible parameter values to $\left(\beta_i + \frac{\delta_i}{\theta_i}\right)$ for a given set of values for φ_i and α_i'. For $C = 0$ (a case we denote by using superscript §), the realised and expected loss functions in the currency union become:

$$L_u = \frac{a}{2}\left[s \sum \varphi_i \alpha_i' \varepsilon_i + \sum \varphi_i \alpha_i' t_i^{\S} \varsigma_i + \sum \varphi_i \alpha_i' u_i^{\S} \varepsilon_i^f + \sum \varphi_i \alpha_i' v_i^{\S} \tilde{\pi}_i\right]^2 \tag{13}$$

$$E(L_u)^{\S} = \frac{a}{2}\left[s^2 \sum \varphi_i^2 \alpha_i'^2 \sigma_{\varepsilon_i}^2 + \sum \varphi_i^2 \alpha_i'^2 t_i^{\S 2} \sigma_{\varsigma_i}^2 + \sum \varphi_i^2 \alpha_i'^2 u_i^{\S 2} \sigma_{\varepsilon_i^f}^2 + \sum \varphi_i^2 \alpha_i'^2 v_i^{\S 2} \tilde{\pi}_i^2 + \Phi^{\S}\right] \tag{14}$$

where $\Phi^{\S} \equiv \sum_{i \neq j} \varphi_i \varphi_j \alpha_i' \alpha_j' \Phi_{ij}^{\S}$, $\Phi_{ij}^{\S} \equiv \alpha_u^2 \sigma_{\varepsilon_i \varepsilon_j} + t_i^{\S} t_j^{\S} \sigma_{\varsigma_i \varsigma_j} + u_i^{\S} u_j^{\S} \sigma_{\varepsilon_i^f \varepsilon_j^f} + \alpha_u t_j^{\S} \sigma_{\varepsilon_i \varsigma_j} + \alpha_u u_j^{\S} \sigma_{\varepsilon_i \varepsilon_j^f} + t_i^{\S} u_j^{\S} \sigma_{\varsigma_i \varepsilon_j^f} + v_i^{\S} v_j^{\S} \tilde{\pi}_i \tilde{\pi}_j$, $t_i^{\S} \equiv (\alpha_i - \alpha_u)$, $u_i^{\S} \equiv \frac{\delta_i}{\theta_i}(\alpha_i - \alpha_u)$, and $v_i^{\S} \equiv \left(\beta_i + \frac{\delta_i}{\theta_i}\right)(\alpha_i - \alpha_u)$.

In (14), $E(L_u)$ is a positive function of the variances of shocks in each member country. These variances are weighted by the square of the share of each participant to the union and also affected by the square of the supply schedule parameter α_i'. In particular, a relatively high variance of shocks in

[14] Keeping parameter C at zero turns out to imply that we should also allow for some cross-country variation in $\beta_i + \frac{\delta_i}{\theta_i}$.

one country has a limited impact on the union insofar as this country is not too large.

Turning to the role of country-specific inflation targets $\tilde{\pi}_i$, (13) and (14) indicate that a configuration in which larger countries have lower desired inflation than that targeted by smaller countries in the union, this configuration contributes positively to the stabilisation performance of a currency union. The opposite holds if the distribution of $\tilde{\pi}_i$ across countries is reversed.

A deeper understanding of welfare implications requires the consideration of different types of shocks according to their distribution across the union. Indeed, the cross-country cross-products of shocks in (13) and the cross-country covariances of shocks in the term $\Phi^{\S}$ in (14) have different welfare implications depending in particular on their sign. In the case of each shock considered here (be it either a supply, demand or risk premium shock), we examine the three types of shocks, namely: (i) asymmetric shocks; (ii) idiosyncratic ("national") shocks; and (iii) common shocks.[15] Shocks are normalised to be of unit magnitude for country I, which is the focus of our comparisons across regimes. Asymmetric shocks are defined to be shocks such that they add up to zero at the currency union level; in particular, country I of size φ_I is assumed to face a shock equal to 1, while each of the remaining countries faces a shock equal to $-\varphi_I/(1-\varphi_I)$. Idiosyncratic shocks are those in which shocks to country I equal 1, and shocks to any other country equal 0. Finally, common shocks are defined to be shocks such that they add up to one at the currency union level; in particular, all countries are assumed to face a shock equal to 1. In terms of the unconditional cross-country covariances in (14), an asymmetric shock implies a negative such covariance between country I and the remaining countries in the union, an idiosyncratic shock amounts to a zero covariance

[15] Some authors argue that increased trade integration might lead to higher cross-country correlation of shocks, that is, more likely common shocks (see Frankel and Rose, 1998). This implies that if, as discussed before, the formation of a currency union induces deeper trade integration, it could thus indirectly increase the likelihood of common shocks. In the case of East Asia, Lee, Park and Shin (2004) analyse whether the nature of this trade (inter- *versus* intra-industry) also matters.

between country I and the remaining countries in the union, and a common shock means that the covariance between country I and each of the remaining countries in the union is 1.

Against this background, the impact of idiosyncratic demand and risk premium shocks on the union's welfare is constrained to the hit country's economic magnitude within the total. Idiosyncratic shocks, by being concentrated in one single country, are only in part offset by union-wide interest rate responses. This means that the hit country's inflation and output developments are to some extent shaped by the disturbances in question. It is worth saying that, even in this case where no shocks are affecting other countries, monetary policy has an effect on the latter's macroeconomic developments. Depending in particular on whether the hit country's size is bigger or smaller, the effects of monetary policy on inflation and output everywhere else in the union could prove to be larger or more subdued.

From a very general point of view, the cross-country distribution of supply, demand and risk premium shocks as well as the values of inflation targets affect the union's welfare loss in either realised or expected terms - as in L_u or $E(L_u)$, respectively - in a way that depends on specific parameter values. The only result that is parameter-free regarding cross-products or covariances of shocks is that the distribution of supply shocks across the union has a positive welfare contribution if shocks are negatively correlated and a negative welfare contribution if shocks are positively correlated. In other words, the sign of cross-country covariances of supply shocks is the same as that of their influence on the monetary union's stabilisation properties.[16] The reason is that asymmetric supply shocks tend to offset each other, thereby facilitating monetary policy response to this type of shocks which directly affect the trade-

[16] Looking at a problem that is different from the one discussed here, the optimal currency area literature finds that the sign of cross-country covariances of supply shocks is the *opposite* of that of their influence on member countries' welfare. The intuition behind the latter result is that if the incidence of shocks is similar across partner countries, then the need for policy autonomy is reduced and the net benefits from adopting a single currency might be higher.

off between objective variables output and inflation.[17] Beyond this particular case, one benchmark situation is when the supply slope parameter is uniform across the union. In this case, $\alpha_i = \alpha_u$ for all i, and any configuration of demand and risk premium shocks across countries do not have any impact on welfare as measured by either L_u or $E(L_u)$. Neither do country-specific inflation targets $\tilde{\pi}_i$. In case α_i displays variation across countries, cross-products of shocks in L_u and the corresponding covariances in $E(L_u)$ are weighted by the cross-products of both participant's shares φ_i and supply schedule parameters α_i', and so are cross-products of inflation targets as well. In addition, these cross-terms involve δ_i/θ_i in the case of risk premium shocks and $(\beta_i + \delta_i/\theta_i)$ for inflation targets. In particular, weighing by the cross-products of participant's shares φ_i means that, regardless of how these shocks are distributed across the union, smaller countries have less of an impact on overall welfare considerations.

We now turn to the study of common and asymmetric demand and risk premium shocks. When the participants to the currency area differ in supply structure, with discrepancies captured by the wedge $\alpha_i - \alpha_u$, common shocks' impact on either realised or expected welfare loss in general depends on specific parameter values. However, in any case, given the common nature of the shocks, there is a factor that would dampen welfare losses: for any country I with parameter α_I above union's average α_u undergoing a shock of size 1, there must be at least some country J (with $I \neq J$) with parameter α_J below union's average α_u also experiencing a shock of size 1. In this sense, the impact of demand and risk premium shocks on welfare tends to be dampened the more common these shocks are. The offsetting effect involved is consistent with the result that if these shocks are common, it is easier for the central bank to respond to them by interest rate changes that reasonably accommodate for each country's needs.

[17] The need for no monetary policy action in the case of pure asymmetric shocks means that individual countries adjust fully to them.

The presence of asymmetric shocks tends to entail the largest of costs to monetary stabilisation at the union level. To see this, the argument behind the dampening effect of common shocks works here in reverse. For any country I with parameter α_I above union's average α_u undergoing a shock of size 1, there must be at least some country J (with $I \neq J$) with parameter α_J below union's average α_u experiencing a negative shock equal to $-\varphi_I/(1-\varphi_I)$. As a result, the effect of demand and risk premium shocks on welfare tends to be magnified in the presence of asymmetric disturbances. The amplifying effect involved is consistent with the result that if these shocks are asymmetric, the central bank's response to them by interest rate changes is more muted, leaving to a large extent each country to face the consequences of the shocks.

To conclude, we have seen that the distribution of cross-products or cross-covariances of supply shocks across the union matters, having a positive welfare contribution if shocks are negatively correlated across countries and a negative contribution if shocks are positively correlated. Taking as a benchmark the case when the supply slope parameter is uniform across the union, demand and risk premium shocks across countries fail to have an impact on welfare, and so do country-specific inflation targets. Furthermore, we have stressed that the gap between country-level supply parameter α_i and its union-wide counterpart, α_u plays an important role in judging welfare effects of demand and risk premium shocks, as well as in assessing the stabilisation policy implications of country-specific inflation targets. When allowing for cross-country variation in the supply slope parameter, the analysis shows that the participation of a small open economy in a currency union may entail costs to the latter if demand and risk premium disturbances are idiosyncratic or asymmetric. Such costs will in general depend on specific parameter values, and in particular on the size of the country or countries hit, with smaller countries having smaller welfare implications and bearing most of the effects in the absence of domestic correcting factors. Common shocks instead exhibit a built-in dampening

factor, thereby enhancing the case for monetary stabilisation in a currency area.

4 Assessment of monetary integration prospects in emerging East Asia

The analysis of realised and expected loss functions (11) and (14) highlights the importance of several structural aspects for the assessment of the relative performance of monetary stabilisation in a currency union. Interestingly, the assessment has to be conducted taking the different elements into account in a holistic fashion. The reason for this is that the effect of a given country's structural characteristics depends on other such features, and in addition, on the configuration of structural parameters across the union.

Against this background, the following three aspects of emerging East Asian (EEA) economies are analysed in turn. First, we gauge the degree of similarity or heterogeneity in supply conditions. The role of this factor as a key element of "real" convergence is apparent. As we have stressed, the gap between country-level supply parameter α_i and its union-wide counterpart, $\alpha_i - \alpha_u$, is important in judging welfare effects of demand and risk aversion shocks, as well as being a possibly amplifying factor to inflation target differentials. Gaps $\alpha_i - \alpha_u$ can be the result of non-tradable sector specificities, or stem from differential degrees of trade openness.[18] In addition to slope parameter α_i, other supply determinants such as expected inflation π_i^e and productivity shock term ε_i are affected by structural factors once more concerning either the non-tradable or tradable sector. In this regard, the Appendix emphasises the role of tradable inflation. The latter can in part be explained by country-specific features relating to either idiosyncratic commodity compo-

[18] On a deeper level, cross-country supply-side differences are affected by technological developments, market structure, households' preferences regarding work, etc.

sitions of international trade[19] or idiosyncratic weights attached to different trading partners. The latter factors have the potential to create differential effective exchange rate effects within a currency union as a result of swings in union's extra-area bilateral exchange rates. Second, the size of a given country is important. In this regard, we have assessed that while smaller countries contribute by less to union-wide shocks, while they are the ones standing the most to lose from idiosyncratic or asymmetric shocks. The occurrence of these types of shocks in larger countries also affect their welfare but, due to the latter's larger size and thus their contribution to overall macroeconomic objectives, they are in a better position to benefit from stabilisation policy. Third, we turn to correlations of shocks across countries. As we have seen, such correlations can affect welfare at the currency-union level in different ways depending on parameter values as well as the nature of the shocks themselves.

4.1 Supply-side characteristics and size

We start by studying a number of characteristics of EEA countries that helps us gauge supply-side diversity. As a background to our analysis, it is worth bearing in mind that, over the last fifteen years, EEA's outstanding economic performance has been accompanied by considerable transformations in each and every country's production structure and trade and investment patterns. In particular, enhanced intra-regional specialisation has facilitated greater flows of trade and investment across EEA countries. EEA economies have expanded on a sustained basis over the last fifteen years, thereby increasing their share in global GDP from some 11.2% in 1990 to 20.2% in 2004 (Table 1). Almost 85% of this increase can be attributed to the emergence of China as a significant global economic player, its share in world output rising from 5.9% to 13.5% over the same period. Indeed, China has recorded the fastest output and export growth rates of the EEA region and has attracted the bulk

[19] We abstract from the possibility of cross-country differential inflation for any given type of tradable goods.

of FDI to the region. This performance has been partly due to high productivity growth and capital accumulation brought about by the liberalisation and opening up of its economy to global trade and capital flows. The aggregate of ASEAN-5 countries increased its share in global GDP by around 1% over the same period, now accounting for about 5% of the total. Moreover, EEA's economic expansion has been outward-oriented in nature. The share of the region's exports in the world total has risen from 12.4% to 20.4% between 1990 and 2004 (Table 2). Over 60% of this improvement stems from China's outstanding export growth, with the country becoming the third largest exporter in the world in 2004 (the euro area and the United States being the two largest). Most other countries in the region have also managed to exhibit an increase above world average in their penetration of foreign markets.

The sizes of different EEA countries look rather uneven, ranging from larger China (currently the world's sixth economy by size) to the smaller economies of Malaysia, Philippines and Hong Kong. The remaining economies stand in an intermediate position. In terms of our currency union analysis, the monetary authorities would tend to react more strongly to shocks hitting China, and in a second place some of the other larger economies (for instance, Singapore, Korea or Taiwan). The smaller economies in the union would have much less of an impact, being left to face a considerable share of the shocks hitting them. Of course, this conclusion abstracts from using any information about the correlation of shocks across EEA countries - an issue we discuss in more detail below.

One other factor directly influencing supply parameter α_i is the degree of openness of an economy, as shown in the Appendix. One way to quickly assess *large* cross-country discrepancies in openness is by comparing the shares of each country in world GDP and exports. (The reason why we emphasise "large" is that shares in world GDP are PPP-adjusted while those in world exports are not, which can prevent too precise comparisons between them.) We

do observe marked differences between the shares in world GDP and exports in some countries, with the city states of Hong Kong and Singapore standing out as the most open economies in the region.

We now turn to the analysis of some indicators that help us gauge the degree of similarity of EEA supply structures. Lacking direct estimates of supply slope parameters α_i and factors underpinning supply shock ε_i, we initially have a look at structural factors relating to rather aggregate supply characteristics of different EEA countries. After doing this, we shall more specifically investigate supply-side features regarding the tradable sector.

The more aggregate analysis of EEA supply characteristics includes the stage of development as measured by per capita income, the shares of different sectors in the economy, and scores in some competitiveness surveys looking at the quality of institutions and preparedness for technological advance. The rise of the region as a global player has been accompanied by a significant transformation of its economies. Growing levels of per capita real incomes have resulted to different degrees from a rapid absorption of workers into the industrial sector, an increasingly educated labour force, rapid capital accumulation and technological upgrading to improve the efficiency of resources. Taking a longer-term perspective, per capita income has risen since 1990 with no signs of deceleration from the pace exhibited prior to that (Table 3). In terms of their present well-being, three distinct groups of countries are easily identified: the richer city-states of Hong Kong and Singapore with income exceeding USD 20,000 per head, the maturing economies of Korea and Taiwan with per capita incomes of some USD 12,000-13,000, and the grouping of the remaining economies with incomes of USD 4,000 or less per person.

Higher aggregate productivity normally requires sectoral shifts in the workforce during the growth process from low productivity agricultural or rural sectors to relatively high productivity, non-agricultural or urban sectors. In this regard, EEA's development process appears to have evolved according

to international experience. The share of agriculture in aggregate output has declined and that of services has increased over time (Table 4). While the share of services has tended to increase overall in the higher per capita income countries of Hong Kong, Singapore, Korea and Taiwan, it has recently approached percentages of around two thirds or higher, which are comparable with those of advanced economies. The manufacturing sector currently represents less than a quarter of the economies of Hong Kong, about one quarter of those of Korea, Taiwan, Philippines and Singapore, and a higher share in Malaysia, Thailand and China.

Turning to the analysis of global competitiveness reports, we look at indicators produced by World Economic Forum (WEF), the Institute for Management Developments (IMD), and INSEAD and WEF. The WEF's *Global Competitiveness Report* computes an overall index for 104 countries that is composed of two sub-indices: first, the growth competitiveness index that assesses an economy's ability to attain economic growth over the medium and long term, and second, the business competitiveness index that measures the ability of firms to create valuable goods and services using efficient methods (see Table 5). IMD's world competitiveness scoreboard ranks 60 countries following a methodology that is broadly similar to that used by WEF for its business competitiveness sub-index. A more specifically designed index is the network readiness index reported for 104 countries by INSEAD and WEF in their Global *Information Technology Report*. This index focuses on an assessment of the role of information and communication technologies (ICT) in the development process (Table 5).

Table 5 shows that the different indicators rank EEA countries broadly similarly and that this carries over to even the more focused INSEAD/WEF's index of readiness for high-tech activities. In particular, the rankings tend to reflect the degree of economic development, as captured by the level of per capita income as previously discussed (Table 3). For instance, economies at

a more advanced stage of development, such as Singapore, Hong Kong, Korea and Taiwan, also tend to exhibit higher scores in most indicators. China, EEA's largest economy, tends to occupy lower places, similar to other relatively less developed countries in the region. The broad consistency between competitiveness indicators and stage of development is simply a consequence of the fact that competitiveness is to some extent determined by the growth process itself. Indeed, richer countries who count with more resources for the development of infrastructures that facilitate production and innovation. The similarity of rankings may further reflect the quality of institutions that underpin competitiveness, which may arguably also be correlated with a given country's stage of development.

Our study of supply-side characteristics relating to the tradable sector includes country-specific commodity and geographical compositions of trade, which contribute to determine imported inflation in foreign currency ($\pi_i^{*e}+\varepsilon_i^*$) and effective exchange rates ($s_i^e+\psi_i$), as discussed in the Appendix (see expression (A.2)). As members of a currency union, countries still face idiosyncratic determinants of their imported inflation and effective exchange rates, even if they face the same tradable inflation for any given good in foreign currency and have - as is the case of a currency union - both fixed bilateral rates among each other and common bilateral rates against third countries. In line with the study of the geographical compositions of trade, we compare the evolution of nominal and real effective exchange rates (NEER and REER, respectively) across EEA economies.

EEA countries exhibit some cross-country variation in their commodity composition of international trade (Tables 6 and 7). The largest SITC sector in terms of both imports and exports is given by machinery and transport equipment, with the exception of the shares reported by Chinese trade statistics and the one for Indonesian exports. In all other cases, in 2004 the shares of this category of goods ranged from roughly 30% to 60% of total imports,

and 40% to 65% of total exports.[20] Similar cross-country discrepancies can be detected in the other sectors. Moreover, the role of raw materials in total trade varies across EEA economies. China, Indonesia, and to a lesser extent Korea, Taiwan and Thailand exhibit large shares of imports of non-fuel crude materials, while Korea and Indonesia in particular stand out in the case of mineral fuel imports, their share in the total exceeding the 20% mark in 2004. The only large shares in exports of raw materials correspond to Indonesia (with mineral fuels and non-fuel materials explaining 26.2% and 8.4% of total sales abroad in 2004, respectively) and Malaysia and Singapore, each exporting more than 10% of the total in terms of mineral fuels. Finally, the share of trade in food has tended to be larger in the cases of some ASEAN-5 countries (such as Indonesia, the Philippines, and in the case of exports, Thailand).

The region's exceptional performance in GDP growth and export growth is associated with efficiency gains derived from increasing regionalisation of the production process within the region.[21] Enhanced regionalisation has contributed to a considerable rise in the importance of intra-regional trade among EEA economies over the last fifteen years (Table 8). Over this period, the share of intra-regional trade has roughly increased by some 10-20% for most economies, with the exception of China and Hong Kong whose bilateral trade has been affected by a downward structural shift towards more direct trade to and from China circumventing Hong Kong as a trading hub. As a result, there has been a convergence in the share of intra-regional trade across countries over the last fifteen years, while there still is some idiosyncratic vari-

[20] Lam, Sánchez and Tan (2004) present a more detailed examination of the two sectors registering the region's fastest export growth since the 1990s (except for the "not elsewhere specified" items), namely, machinery and transport equipment, and chemicals.

[21] The region's diverse pool of countries in terms of their stage in the development process allows for labour-intensive downstream stages of the production process to be shifted to lower per capita income countries such as China, while more mature industrial economies such as Korea and Taiwan specialise in exports of higher value-added machinery and components. As a result, the competitiveness of regional products as a whole has been fostered through economies of scale and a better organisation of the production process, using comparative advantages of each and every country.

ation in those shares. Hong Kong's and Malaysia's shares of intra-regional trade currently rank highest in the region. Most other countries exhibit a corresponding share of 30 to 40%. Given that China explains a large fraction of the recent gains in intra-regional trade, from the perspective of the creation of a currency union it would matter whether this country is in the union or not - its absence considerably reducing the degree of trade interaction in the region. Finally, it is worth stressing that the present analysis of trade does not distinguish between trade induced by EEA economies' domestic demand and other sources of trade (including processing trade aiming at third countries or even transactions of merchandise in transit - the latter playing an important role in the cases of Hong Kong and Singapore). The degree of export re-processing within the region has been rather high in recent years, thereby limiting the impact of intra-regional trade on inducing higher similarity of EEA production structures.[22]

With regard to extra-regional trade, the shares of Japan, US and euro area in total trade of each EEA country's trade are currently similar to those observed in 1990 (Table 8). Among the largest changes in individual country's shares with the world's three largest advanced economic areas, Korean trade with Japan lost ground to both trade with the US and intra-regional transactions, while Indonesian trade with Japan was to some extent replaced with intra-regional sales. In 2003, EEA economies' trade with Japan, the US and the euro area was rather evenly split among these three areas, with the euro area representing a smaller share of the Philippines' trade than each of the other two advanced economies, and a larger share of Indian trade against the same benchmark. The convergence in shares of extra-regional trade across countries could prove helpful in not further amplifying the large shocks at times hitting EEA countries as a result of sudden fluctuations in the value of

[22] See, *e.g.*, Rumbaugh and Blancher (2004), who estimate China's export re-processing to be about half of the country's total trade.

major currencies.[23]

The evolution of NEER and REER indicates that EEA countries' effective exchange rates have displayed considerable cross-country variability over the past fifteen years (Tables 9 and 10). This is the case even if we take out periods over which exchange rate behaviour was shaped by country-specific changes (such as China's decision to abandon its dual exchange rate regime in 1994) or when some countries reacted with the whole spectrum of intensity to major widespread shocks such as the Asian crisis of 1997-1998. It is worth stressing that the concepts of NEER and REER capture somewhat different factors. From a cross-country point of view, NEER respond to differential inflationary pressures as well as differential geographical compositions of international trade. REER adds to those discrepancies the ones about the structure of the economy under consideration, which influence price determination and the weights of different goods in its own deflator.

The evolution of REER is rather revealing about the trend of EEA competitiveness over the past fifteen years (Table 10). In comparison with 1990, all EEA countries' REER have lost some value with the exception of Hong Kong, which has appreciated in real terms, and Singapore, whose REER is roughly unchanged (Table 10). The extent of the real depreciation varies across countries, ranging from 10% to 25%. The weakening of the currencies was already evident in non-ASEAN-5 countries in the mid-1990s, a time in which China unified its exchange rates. The magnitude of these real depreciations increased during and after the period of the Asian financial crisis in 1997-98. However, also countries that did not experience significant nominal depreciations during the Asian financial crisis faced some sizeable real depreciations over the past fifteen years, foremost China with a 11.3% REER depreciation since 1990.

[23] McKinnon and Schnabl (2003) investigate the role of the yen/US dollar rate in East Asian economies, providing evidence that a major yen devaluation has a negative impact on their real economic activity. Kang, Kim and Wang (2005) qualify this conclusion by showing that the effects of the weakening of the yen against the US dollar exchange rate on the Korean economy are statistically significant only since the Asian crisis.

Overall, the weakening of the region's currencies over the past fifteen years is likely to have contributed to providing these countries with some further impetus in their export penetration of the global market.

In sum, EEA economies appear to have rather diverse supply characteristics. The aggregate study of EEA structural features indicates that the region displays significant cross-country variation in the stage of development, the shares of different sectors in the economy, size, the degree of openness and some key qualitative aspects such as the quality of institutions and preparedness for technological advance. Our analysis of supply-side characteristics relating to the tradable sector shows that EEA countries constitute a rather diverse pool in terms of commodity compositions of trade, while there has been some convergence in terms of their geographical compositions of trade. The former is a negative factor contributing to create nominal divergence via differential imported inflation, while the latter fares better in this same area by mitigating effective exchange rate variability in the presence of large swings in the value of major currencies. Enhanced geographical convergence in trade patterns has not however been enough to fully offset cross-country variability in EEA countries' effective exchange rates. The latter variability has been observed to some extent on a rather continuous basis, and not only in periods over which exchange rate behaviour was shaped by country-specific changes or when some countries reacted to major disturbances facing the region. Finally, it is worth saying that there are tradeoffs involved between these different supply-side characteristics. In particular, more intense and geographically convergent trade interactions are to some extent the result of structural diversity regarding economic development and sectoral specialisations. While the former factor is found in itself to have a positive contribution to monetary stabilisation in a currency area, the latter is - taken in isolation - a negative factor contributing to hamper union-wide stabilisation properties.

4.2 Correlation of shocks

This subsection continues to assess structural factors about EEA economies, while going beyond the focus on supply by reviewing the evidence on the correlation of a wide variety of shocks.

Bayoumi and Eichengreen's (1994) seminal work assesses the nature of disturbances using a sample of 9 East Asian countries over the period 1969–89, alongside 15 EU countries over 1963–90. They break down unexpected macro developments into demand and supply shocks à la Blanchard and Quah (1989), finding that there is little difference in the asymmetry of both shocks between Europe and East Asia. They detect high correlation of shocks particularly among some of the pairs involving Japan, Korea, Taiwan Hong Kong, Indonesia, Malaysia and Singapore.[24]

Eichengreen and Bayoumi (1999) complement Bayoumi and Eichengreen's (1994) analysis by employing an optimal currency area (OCA) index.[25] Some pairs of countries in East Asia are found to be somewhat plausible candidates for a monetary union as the members of the EU. These pairs are: Singapore-Malaysia, Singapore-Thailand, Singapore-Hong Kong, Singapore-Taiwan and Hong Kong-Taiwan. Other pairs, those including Indonesia, South Korea and the Philippines, do not rank high, while the Malaysia-Thailand pair displays a very weak score.

Bayoumi and Mauro (1999) update Bayoumi and Eichengreen's (1994) study using data for 11 East Asian countries over 1968–98 as well as the same 15 EU member states over 1969–89. Shocks are highly correlated among Hong Kong, Indonesia, Malaysia, Singapore, that is, a smaller club of East

[24] The authors also report relatively fast speed of adjustment to shocks in East Asia. Almost all of the change in output and prices in response to a shock takes place in the first two years, compared with at most half in Europe. These results are consistent with the notion that labour markets are relatively flexible in East Asia.

[25] The OCA index is based on a regression where the LHS variable is the standard deviation of the change in the logarithm of the end-year bilateral exchange rate between any two countries. The RHS variables measure the sectoral diversity of trade, the degree of openness, and size. The countries considered are Japan and its 19 leading trading partners (excluding China, due to lack of data availability) over the period 1976-1995.

Asian countries than in the original study. Focusing on ASEAN economies, the authors conclude that, while they are less suited for a regional currency arrangement than Europe, the difference is not large.[26]

Baek and Song (2002) cover a larger group of 14 East-Asian economies over the period 1970–1999. They identify a group of six countries (Hong Kong, Indonesia, Japan, Korea, Malaysia and Thailand) experiencing symmetric supply disturbances. Singapore and Taiwan share similar demand disturbances with this group, while China's economic disturbances are small in size and quickly absorbed. Thus, they claim that these nine countries are viable candidates for a currency union (EA9). Compared with the European Monetary Union prior to 1990, the EA9 economies show larger disturbances but faster adjustment speeds. With small disturbances and rapid adjustments, China is close to the European anchor country, Germany.

More recently, Clavel, Rüffer, Sánchez and Shen (2005) have deviated from Blanchard and Quah's approach to identification.[27] Using sign-restricted VAR models and controlling for external developments, they analyse the 10 largest Emerging Asian countries over the period 1979-2003. They relate three types of domestic shocks (supply, real demand and monetary) across Emerging Asia in terms of correlation and principal component analysis. In some cases, some degree of co-movement between pairs of individual countries' shocks is found, but by and large intra-regional factors do not appear to be particularly important. The results indicate that economic developments in Emerging Asia are largely driven by country-specific shocks, with some indication that exogenous shocks are becoming more important over time as the region is integrated into the global economy. Regionalisation, in contrast, seems to be of only limited importance. Taken altogether, these findings are consistent with the dynamic

[26] They also by and large confirm Bayoumi and Eichengreen's (1994) result on the relatively fast speed of adjustment in the countries under study.

[27] They make the observation that the use of Blanchard and Quah's approach is subject to econometric pitfalls, as a result of the small-sample bias stressed by Faust and Leeper (1997).

factor decomposition results of Kose, Otrok and Whiteman (2003). The latter find that in both Asia and Latin America, macroeconomic fluctuations are largely explained by domestic factors, while extra-regional and especially intra-regional developments play a considerably more modest role.

Finally, Girardin (2005) examines the similarities of GDP growth-cycle features of 10 East Asian countries over 1978–2002. He computes contemporaneous correlations of smoothed probabilities of two regimes, namely, the growth-recession and rapid growth regimes between China or Japan and other East Asian economies. For the overall period, growth-recessions in China or Japan are substantially correlated both with Indonesia and Thailand, while Hong Kong, South Korea and Malaysia also correlate with China, and Singapore and Taiwan with Japan. In Girardin's subsample results for the 1990s, all countries, except Taiwan, are correlated with the two North East Asian economies, but in almost all cases correlations with China are much larger than with Japan. The degree of correlation of most East Asian countries with China is comparable to that found in Europe over 1970–1996. Overall, on the basis of the experience of the 1990s with growth-cycle synchronisation, Girardin concludes that China would be a better candidate for monetary integration with East Asian countries than Japan, but not yet a perfect candidate.

The papers on the correlation of shocks in EEA reviewed above are not strictly comparable. They constitute a heterogeneous whole in terms of objectives, methodologies and samples. Our review of this literature indicates that the evidence produced is not very clear, with different analyses pointing to different groups of plausible partners for monetary cooperation (or no such group at all) based on the similarity of various shocks and sometimes the speed of adjustment. One tentative conclusion that, at present, we can draw from this diverse pool of studies is that there is not very compelling evidence that shocks are highly correlated across the region. The analysis of shock correlations among EEA countries remains a fruitful area for further research.

4.3 Inflation targets

As we have seen, inflation targets are treated in our model as a parameter, and are thus not strictly comparable to a shock. They enter however welfare considerations, with higher levels of inflation targets having, *ceteris paribus*, a more adverse effect on stabilisation properties the larger the country is.

In order to assess the role of inflation targets in EEA countries, we focus on those middle-income countries in the region that have recently adopted inflation targeting (IT) in the post-Asian-crisis period. The latter economies have at the same time moved towards somewhat larger exchange rate flexibility. Such decisions were taken by South Korea in 1998, Indonesia in 2000, Thailand in 2000, and the Philippines in 2001. Inflation rates have declined to some extent relative to the crisis and pre-crisis periods in Korea, Thailand and the Philippines (although factors such as the contractionary effects of the crisis were also important in this process), while the situation for Indonesia is not altogether clear. If we start the analysis from the time of implementation of IT in these four countries, the inflation performances of the new regimes against their stated targets have thus far been commendable, with Thailand, Korea and the Philippines have tended to be within target, although Korea also surpassed its 2001 and 2002 targets and the Philippines undershot its targets in 2002 and 2003, and overshot it in 2004 (Table 11). Indonesia has in the meantime experienced difficulties keeping its inflation within its target range, its move to a more realistic target since 2003 perhaps signalling that the country might sustain a better future performance in this area.

In sum, the larger countries among the group of inflation targeters have showed lower desired inflation than that proposed by smaller countries in the subgroup. This configuration contributes positively to stabilisation performance of a currency union, as previously analysed. However, the smaller economies of Indonesia and the Philippines exhibit relatively high inflation targets by international standards, implying that running a currency union

including them would entail welfare losses for monetary policy. This would be less of a crucial issue for monetary stabilisation if the union comprises the entire EEA region, but it is a potentially important matter if one considers ASEAN monetary integration.

5 Conclusions

This paper proposes a simple analytical framework for the study of currency unions of small open economies, with a focus on the conduct of monetary policy in the presence of different types of shocks. The model results are then used to empirically assess the prospects for monetary integration between emerging East Asian (EEA) economies. Our model extends the previous literature by allowing for a richer setup with a broad set of shocks, the role of inflation targets and the choice of interest rates as the instrument of union-wide monetary policy. In doing so, it sheds light on an important, albeit no so well understood, aspect of monetary integration, namely, that of monetary policy stabilisation among small open economies forming a common currency area. Further work on the theoretical front could extend the present framework by introducing forward-looking behaviour beyond interest rate determination, informational frictions and lag structures.

Our empirical investigation looks at a number of characteristics of EEA countries that helps us gauge supply-side diversity, distinguishing between aggregate and more specifically tradable sector structural features. Moreover, we discuss the evidence on the cross-country variation of disturbances hitting the region, as well as recent data on inflation targets. Overall, our analysis shows that EEA economies display rather diverse supply characteristics, the evidence that shocks are highly correlated across the region is not very compelling and some countries declare relatively high desired levels of inflation. In the case of the latter aspect, our analysis suggests that desired inflation rates in the two ASEAN-5 inflation targeters (Indonesia and the Philippines) would

be less of a crucial issue for monetary stabilisation if the union comprises the entire EEA region, but it is a potentially important matter if one considers strict ASEAN monetary integration. A better factual understanding of welfare implications of monetary integration in EEA would benefit from future empirical work concerning estimation of structural parameters for the region's economies as well as further investigation of the cross-country properties of disturbances. The present paper does not assess other important aspects that have attracted interest in the literature on monetary integration in Asia, such as the current state of institutional development concerning economic and in particular financial regional integration, the financial market integration between EEA countries (constrained by the presence of capital controls and insulated banking sectors in some countries) and the lack of strong political will to push the regional integration efforts forward (see, *e.g.*, Eichengreen and Bayoumi, 1999, Kwack, 2005, Williamson, 2002, and Wyplosz, 2002).

The previous analysis may help explain why the major issue for monetary integration in EEA at present is not a formation of a currency union, but rather monetary coordination under a variety of forms. Having said this, it is important to bear in mind that integration via trade, financial and financial flows go hand in hand with each other. For this reason, increasing trade, financial and investment interdependence could reinforce each other over time, leading to a different conclusion regarding the degree of maturity of the conditions for deeper economic integration and in particular a monetary union. Understanding the implications of increasing spillovers would also necessitate the use of approaches that deviate from our small open economy assumption, incorporating the flavour of either two-country or core-periphery models, depending on the specific configuration taking place. In addition, further progress in real and monetary integration may prove instrumental in shaping ongoing developments in the sphere of domestic policies (including monetary and exchange rate policies) and regional financial cooperation efforts.

Appendix: Derivation of aggregate supply schedule

This Appendix derives aggregate supply schedule (1) from assumptions about changes in the prices of domestic goods and imports. Deviations of non-tradable inflation, π_i^N, from its expected value are driven by above-potential aggregate output (capturing marginal cost effects) and a domestic supply shock, ε_i^N :

$$\pi_i^N = \pi_i^{Ne} + \lambda_i y_i + \varepsilon_i^N \tag{A.1}$$

Tradable inflation, π_i^T, is the sum of two parts: *i)* expected plus unexpected foreign inflation, $(\pi_i^{*e} + \varepsilon_i^*)$, and *ii)* expected plus unexpected nominal effective exchange rate depreciation, $(s_i^e + \psi_i)$:

$$\pi_i^T = (\pi_i^{*e} + \varepsilon_i^*) + (s_i^e + \psi_i) \tag{A.2}$$

All error terms in (A.1) and (A.2) are assumed to be white noise with constant variance.

Using (A.1) and (A.2), aggregate supply schedule (1) can then be derived, with country i's overall actual and expected inflation being defined as $\pi_i \equiv (1-\gamma_i)\,\pi_i^N + \gamma_i \pi_i^T$ and $\pi_i^e \equiv (1-\gamma_i)\,\pi_i^{Ne} + \gamma_i\,(\pi_i^{*e} + s_i^e)$, respectively. Parameter γ_i reflects the weight of non-tradables in the economy. In (1), coefficient α_i equals $1/[(1-\gamma_i)\,\lambda_i]$, while aggregate supply shock ε_i can be decomposed into its domestic and external determinants as follows:

$$\varepsilon_i = (-1/\lambda_i)\varepsilon_i^N - \frac{\gamma_i}{(1-\gamma_i)\,\lambda_i}(\varepsilon_i^* + \psi_i) \tag{A.3}$$

The first term in (A.3) captures shocks arising from unexpected non-tradable inflation. The second term is a composite shock to tradable inflation driven by unexpected developments in either tradable prices in foreign currency or nominal effective exchange rates. The latter two developments can in turn

be traced back to country-specific commodity compositions of international trade (abstracting from different inflation facing different countries for the same tradable goods) and idiosyncratic weights attached to different trading partners, respectively.

Note that we do not assume anything in particular about the covariation of supply shock ε_i's components. However, the latter might not be simply uncorrelated among each other. For instance, shocks to foreign prices as captured by ε_i^* could be correlated with shocks to effective exchange rate shocks in ψ_i. In this regard, for advanced economies, Jiménez-Rodríguez and Sánchez (2005) show empirically that oil shocks induce a real exchange rate appreciation in some countries (such as the US and Germany) while inducing a real exchange rate depreciation in others (such as other euro area countries and Japan). Further work could help establish the exact statistical interaction between supply shock's components, also incorporating small open developing economies.

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Table 1: Emerging Asia's share in world real GDP

in %, PPP-adjusted

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Emerging East Asia	**11.2**	**12.1**	**13.1**	**14.2**	**15.2**	**16.1**	**16.8**	**17.2**	**17.1**	**17.6**	**18.1**	**18.6**	**19.3**	**19.8**	**20.2**
China	5.9	6.4	7.2	8.0	8.7	9.3	9.8	10.3	10.8	11.2	11.5	12.1	12.7	13.1	13.5
Hong Kong	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Korea	1.4	1.5	1.6	1.7	1.7	1.8	1.9	1.9	1.6	1.5	1.5	1.6	1.6	1.6	1.6
Taiwan	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ASEAN-5	2.8	3.0	3.1	3.3	3.4	3.6	3.7	3.7	3.3	3.4	3.5	3.5	3.6	3.7	3.7
Indonesia	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.5
Malaysia	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2
Philippines	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Singapore	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.7	1.5	1.6	1.7	1.7	1.8	1.8	1.8
Thailand	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.1	0.9	0.9	0.9	0.9	1.0	1.0	0.9

Source: IMF's *World Economic Outlook* .

Table 2: Emerging East Asia's share in world exports

in %

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Emerging East Asia	**12.4**	**13.7**	**14.5**	**16.2**	**17.0**	**17.3**	**17.3**	**17.7**	**17.0**	**17.2**	**18.5**	**17.8**	**18.6**	**19.0**	**20.4**
China	1.9	2.1	2.3	2.5	2.8	2.9	2.9	3.3	3.4	3.4	3.9	4.3	5.1	5.8	6.9
Hong Kong	2.4	2.8	3.2	3.6	3.6	3.4	3.4	3.4	3.2	3.1	3.2	3.1	3.1	3.0	2.9
Korea	2.0	2.1	2.1	2.3	2.4	2.6	2.6	2.6	2.5	2.5	2.7	2.4	2.5	2.6	2.7
Taiwan[2)]	2.0	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.0	2.1	2.3	2.0	2.0	1.9	1.9
ASEAN-5	4.1	4.6	4.8	5.5	6.0	6.1	6.2	6.2	5.9	6.0	6.4	5.9	5.9	5.7	6.0
Indonesia	0.8	0.8	0.9	1.0	0.9	0.9	0.9	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.8
Malaysia	0.9	1.0	1.1	1.3	1.4	1.5	1.5	1.4	1.4	1.5	1.5	1.4	1.5	1.4	1.5
Philippines	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5
Singapore	1.6	1.7	1.7	2.0	2.3	2.3	2.4	2.3	2.0	2.0	2.2	2.0	1.9	1.9	2.0
Thailand	0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1

Source: IMF's *Direction of Trade Statistics* (unless otherwise stated).

[1)] Taiwan's data comes from its Ministry of Finance.

Table 3: Emerging East Asia's per capita income[1)]
in USD, PPP-adjusted

	current USD			constant USD 1995 = 100		
	1980	**1990**	**2003**	**1980**	**1990**	**2002**
China	220	320	1100	708	1482	4054
Hong Kong	5780	12520	25860	11068	18274	23833
Korea	1760	5740	12030	4197	8389	15009
Taiwan[2)]	2345	8106	13162	3996	9151	11437
ASEAN-5						
Indonesia	500	620	810	1346	2087	2857
Malaysia	1830	2380	3880	3730	5079	8080
Philippines	690	740	1080	3830	3574	3694
Singapore	4830	11840	21230	8926	13435	21296
Thailand	720	1520	2190	2291	4116	6208

Sources: World Bank's *World Development Indicators* and Asian Development Bank's *Key Indicators*.

1) Unless otherwise indicated, per capita Gross National Income (GNI) estimated according to World Bank Atlas method of converting data in national currency to current US dollars. The Atlas method averages the exchange rate for a given year and the two preceding years, adjusted for differences in rates of inflation between the country and the G-5 countries (France, Germany, Japan, the United Kingdom, and the United States). The resulting total GNI estimate is then divided by the mid-year population to obtain per capita GNI.

2) Output data in USD is obtained by dividing current GNP in local currency by the corrresponding bilateral exchange rate. Deflated by US GDP deflator, rebased to 1995 = 100 to obtain the constant USD series.

Table 4: Emerging East Asia's shares of major sectors in GDP[1)]
in %

	Agriculture			Industry						Services		
				All			Manufacturing only					
	1980	1990	2003	1980	1990	2003	1980	1990	2003	1980	1990	2003
China	30.1	27.0	14.6	48.5	41.6	52.3	44.2[4)]	37.0[4)]	45.3	21.4	31.3	33.1
Hong Kong[2)]	0.8	0.3	0.1	31.7	24.3	12.0	23.7	16.8	4.4	67.5	71.3	84.6
Korea	14.9	8.5	3.2	41.3	43.1	34.6	29.7	28.8	23.4	43.7	48.4	62.2
Taiwan	7.7	4.2	1.8	45.7	41.2	30.4	36.0	33.3	25.5	46.6	54.6	67.8
ASEAN-5												
Indonesia	24.8	19.4	16.6	43.4	39.1	43.6	11.6	20.7	24.7	31.8	41.5	39.9
Malaysia	…	15.2	9.5	…	42.2	48.6	…	24.2	31.2	…	44.2	45.5
Philippines	25.1	21.9	14.5	38.8	34.5	32.6	25.7	24.8	23.1	36.1	43.6	53.5
Singapore	1.3	0.4	0.1	38.1	33.0	32.7	29.1	25.8	26.1	60.6	67.8	66.4
Thailand	23.2	12.5	9.8	28.7	37.2	44.0	21.5	27.2	35.2	48.1	50.3	46.3

Source: Asian Development Bank's *Key Indicators.*

1) Agriculture corresponds to ISIC divisions 1-5 and includes forestry and fishing. Industry comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas (ISIC divisions 10-45), Manufacturing refers to industries belonging to divisions 15-37, Services correspond to ISIC divisions 50-99. Unless otherwise indicated, GDP data are at current market prices.

2) The latest observation refers to 2002.

4) Includes mining and electricity, gas and water.

Table 5: Emerging East Asia's standing in global competitiveness surveys, 2004

Country rankings, in descending order[1)]

						ASEAN-5				
Source	**Category**	**China**	**Hong Kong**	**Korea**	**Taiwan**	**Indonesia**	**Malaysia**	**Philippines**	**Singapore**	**Thailand**
WEF	**A) Growth Competitiveness Index**	**46**	**21**	**29**	**4**	**69**	**31**	**76**	**7**	**34**
	Macroeconomic environment	62	34	9	2	73	27	61	11	43
	Quality of public institutions	55	9	53	41	27	68	38	99	10
	Technological progress	24	13	35	9	63	20	69	1	23
	B) Business Competitiveness Index	**47**	**11**	**24**	**17**	**44**	**23**	**70**	**10**	**37**
	Sophistication of company operation and strategy	39	15	21	12	38	28	50	13	36
	Quality of national business environment	47	10	28	20	46	23	77	8	36
IMD	**World Competitiveness Scoreboard**	**24**	**6**	**35**	**12**	**58**	**16**	**52**	**2**	**29**
INSEAD/WEF	**Network Readiness Index[2)]**	**41**	**7**	**24**	**15**	**51**	**27**	**67**	**1**	**36**
	Environment	51	21	26	15	65	29	57	8	40
	Readiness	35	17	12	7	62	29	70	1	36
	Usage	51	16	8	7	64	38	54	2	47

Sources: World Economic Forum's (WEF) *Global Competitiveness Report*, Institute for Management Developments' (IMD) *World Competitiveness Yearbook* and INSEAD/WEF's *Global Information Technology Report*.

[1)] The number of total countries analysed by the surveys is 104 in the cases of WEF and INSEAD/WEF, and 60 for IMD.

[2)] The overall index is not necessarily bounded by the values of the sub-components due to adjustments made by the source.

Table 6: Commodity composition of imports of Emerging East Asia's economies

as a percentage of each country's total imports, by SITC section, selected years

A) 1995

					ASEAN-5				
	China	Hong Kong	Korea	Taiwan	Indonesia	Malaysia	Philippines	Singapore	Thailand
Food and live animals	4.6	3.9	4.4	3.6	7.4	4.1	7.4	2.9	2.9
Beverage and tobacco	0.3	1.3	0.4	0.9	0.4	0.3	0.6	1.1	0.4
Crude materials excluding fuels	7.7	2.2	8.7	6.3	9.0	2.4	4.3	1.2	5.4
Mineral fuels, etc.	3.9	1.9	14.1	6.9	7.4	2.2	9.2	8.1	6.5
Animal, vegetable oil, and fats	2.0	0.3	0.3	0.2	0.3	0.2	0.1	0.4	0.1
Chemicals	13.1	7.5	9.7	13.3	15.4	7.1	9.2	6.5	10.1
Basic manufactures	21.8	20.5	15.7	17.8	16.4	13.9	13.9	10.9	20.6
Machines, transport equipment	6.3	37.1	36.6	40.2	40.1	60.1	32.5	57.9	49.0
Miscellaneous manufactured goods	39.8	25.0	8.0	7.6	3.5	4.9	3.5	9.9	2.6
Unclassified goods	0.5	0.3	2.1	3.2	0.1	4.9	19.2	1.2	2.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

B) 2004

					ASEAN-5				
	China	Hong Kong	Korea	Taiwan	Indonesia	Malaysia	Philippines	Singapore	Thailand
Food and live animals	1.6	2.6	4.1	2.5	8.4	4.2	5.9	2.1	3.0
Beverage and tobacco	0.1	0.5	0.2	0.6	0.4	0.3	0.6	0.7	0.3
Crude materials excluding fuels	9.9	1.1	6.0	4.2	8.2	2.6	2.5	0.5	4.3
Mineral fuels, etc.	8.6	2.4	22.4	12.4	24.4	6.3	11.7	15.0	14.0
Animal, vegetable oil, and fats	0.8	0.1	0.2	0.1	0.2	0.7	0.3	0.2	0.1
Chemicals	11.7	6.1	9.2	12.3	16.5	8.0	7.9	6.5	10.5
Basic manufactures	13.2	15.5	13.7	13.5	13.6	11.0	8.7	6.7	20.0
Machines, transport equipment	8.9	50.8	33.6	42.6	25.7	57.7	38.1	58.7	42.0
Miscellaneous manufactured goods	45.0	20.9	8.8	10.5	2.5	5.9	3.4	8.6	2.7
Unclassified goods	0.3	0.1	1.6	1.4	0.0	3.1	21.1	1.1	3.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: National sources for trade statistics.

Table 7: Commodity composition of exports of Emerging East Asia's economies

as a percentage of each country's total exports, by SITC section, selected years

A) 1995

					ASEAN-5				
	China	Hong Kong	Korea	Taiwan	Indonesia	Malaysia	Philippines	Singapore	Thailand
Food and live animals	6.7	1.6	2.1	3.4	7.9	2.4	7.7	2.1	19.1
Beverage and tobacco	0.9	1.2	0.1	0.1	0.4	0.2	0.2	1.4	0.3
Crude materials excluding fuels	2.9	1.8	1.4	1.8	11.1	6.5	3.0	1.4	5.8
Mineral fuels, etc.	3.6	1.0	2.0	0.7	25.3	7.0	1.5	8.3	0.6
Animal, vegetable oil, and fats	0.3	0.2	0.0	0.0	3.0	6.8	4.8	0.4	0.0
Chemicals	6.1	6.2	7.1	6.8	3.4	3.0	2.0	6.0	3.1
Basic manufactures	21.7	16.6	21.7	23.2	23.0	8.8	6.4	6.3	18.1
Machines, transport equipment	0.7	32.4	52.9	48.1	8.4	55.2	22.2	65.7	33.9
Miscellaneous manufactured goods	57.1	38.5	10.5	15.9	17.3	8.7	12.9	7.5	18.2
Unclassified goods	0.0	0.6	2.1	0.1	0.1	1.3	39.3	0.9	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

B) 2004[1)]

					ASEAN-5				
	China	Hong Kong	Korea	Taiwan	Indonesia	Malaysia	Philippines	Singapore	Thailand
Food and live animals	3.2	0.6	1.0	1.2	5.4	2.1	4.2	1.1	12.4
Beverage and tobacco	0.2	0.3	0.2	0.0	0.4	0.3	0.3	0.6	0.2
Crude materials excluding fuels	1.0	1.0	1.0	1.4	8.4	2.6	1.1	0.6	5.1
Mineral fuels, etc.	2.4	0.2	4.2	3.1	26.2	11.7	1.4	12.2	3.2
Animal, vegetable oil, and fats	0.0	0.0	0.0	0.0	6.2	5.6	1.5	0.1	0.2
Chemicals	4.4	5.0	9.3	9.3	5.5	5.7	1.1	11.7	6.8
Basic manufactures	17.0	13.0	14.7	18.4	18.2	7.8	3.2	3.7	16.3
Machines, transport equipment	0.8	50.1	62.9	52.4	15.9	54.2	42.3	61.1	45.4
Miscellaneous manufactured goods	71.0	29.6	5.8	13.8	13.6	8.5	6.7	7.9	8.7
Unclassified goods	0.0	0.1	1.0	0.3	0.4	1.5	38.2	1.0	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: National sources for trade statistics.

[1)] Data for the Phillipines is for 2003.

Table 8: Bilateral trade of Emerging East Asia's economies[1)]
as a percentage of each country's total trade, selected years

A) 1990

				ASEAN-5					Subtotal			
	China	Hong Kong	Korea	Indonesia	Malaysia	Philippines	Singapore	Thailand	Emerging Asia	Japan	US	Euro area
China		39.6	0.6	1.2	1.0	0.2	2.5	1.1	46.2	15.0	14.2	13.8
Hong Kong	28.1		0.5	3.0	0.7	0.9	0.6	3.4	1.1	38.3	10.1	13.1
Korea	0.5	3.5		1.1	1.5	0.5	2.0	1.0	10.1	21.3	24.6	9.6
ASEAN-5												
Indonesia	2.9	2.3	3.2		1.3	0.3	4.9	1.0	16.0	21.1	12.0	13.4
Malaysia	2.1	2.7	3.8	1.1		0.8	22.4	2.9	35.6	19.2	16.1	10.6
Philippines	1.3	5.0	3.5	0.7	2.3		4.1	1.4	18.2	20.5	27.7	11.5
Singapore	2.5	5.0	2.5	2.1	11.5	0.8		4.1	28.4	13.7	17.2	10.2
Thailand	2.3	3.2	2.5	0.9	3.0	0.5	8.3		20.7	24.3	15.4	14.7

B) 2003

				ASEAN-5					Subtotal			
	China	Hong Kong	Korea	Indonesia	Malaysia	Philippines	Singapore	Thailand	Emerging Asia	Japan	US	Euro area
China		16.7	7.1	1.0	2.0	0.8	2.4	1.4	31.4	15.7	18.7	14.3
Hong Kong	31.1		3.6	0.4	1.8	1.2	3.7	1.3	43.2	7.8	8.5	6.1
Korea	16.2	4.5		1.3	2.1	1.2	2.7	1.2	29.1	14.3	16.4	10.3
ASEAN-5												
Indonesia	9.1	2.1	5.3		3.6	0.8	7.5	2.5	30.9	12.0	12.2	12.2
Malaysia	9.1	4.5	4.2	1.8		2.2	18.8	4.5	45.1	13.1	18.8	10.8
Philippines	9.0	7.2	5.9	1.0	5.7		7.5	3.8	40.1	20.0	22.5	11.7
Singapore	7.5	6.2	3.6	2.6	13.0	2.0		3.8	38.7	8.3	13.0	9.8
Thailand	7.8	3.8	2.9	1.5	5.4	1.8	6.7		29.8	18.4	13.7	9.7

Source: IMF's *Direction of Trade Statistics*.
[1)] No comparable data is available for Taiwan.

Table 9: Emerging East Asia's nominal effective exchange rates[1)]

1990=100

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
China	100.0	90.5	80.1	64.3	58.2	57.5	60.0	63.9	66.8	65.4	67.2	70.2	69.6	64.8	61.8
Hong Kong	100.0	99.5	97.2	99.3	96.7	91.5	95.6	102.7	109.4	106.1	108.9	115.1	113.6	104.8	98.7
Korea	100.0	94.8	86.3	83.6	80.7	79.9	80.8	74.6	52.3	59.0	63.4	58.7	60.4	58.5	57.5
Taiwan	100.0	98.8	102.7	97.7	94.4	89.5	90.5	92.7	83.4	83.6	88.2	86.0	83.6	77.8	76.0
ASEAN-5[2)]															
Malaysia	100.0	99.2	107.1	111.1	110.3	110.3	113.7	110.6	85.0	86.0	88.2	93.3	92.7	86.5	82.3
Philippines	100.0	88.0	94.8	89.3	91.7	93.9	92.2	83.3	59.2	61.9	55.0	47.4	46.9	44.6	43.1
Singapore	100.0	103.9	107.3	109.2	112.4	114.8	121.2	123.7	116.3	110.7	111.4	113.4	112.4	106.7	104.0
Thailand	100.0	101.4	100.2	102.0	104.8	102.1	104.3	93.0	76.9	80.9	78.1	74.2	76.1	74.2	73.5

Sources: BIS and IMF's *International Financial Statistics* .

[1)] An increase (decrease) in the value of this variable implies a nominal exchange rate appreciation (depreciation).

[2)] No data is available for Indonesia.

Table 10: Emerging East Asia's real effective exchange rates[1)]

1990=100

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
China	100.0	91.0	90.4	105.0	75.8	79.6	84.5	90.3	95.1	89.8	92.2	96.8	94.5	90.0	88.7
Hong Kong	100.0	106.3	109.9	118.6	121.6	122.9	133.8	149.1	160.8	148.4	144.0	147.4	139.8	123.9	114.7
Korea	100.0	99.5	93.5	92.5	93.1	94.7	98.7	93.0	69.4	78.3	84.7	80.5	84.4	83.8	84.2
Taiwan	100.0	98.8	102.7	97.7	94.4	89.5	90.5	92.7	83.4	83.6	88.2	86.0	83.6	77.8	76.0
ASEAN-5															
Indonesia[2)]	100.0	100.6	99.2	101.1	99.9	98.3	101.6	94.4	47.6	72.6	70.0	67.4	81.2	86.0	79.8
Malaysia	100.0	97.7	104.4	105.5	101.4	101.7	106.2	105.0	83.4	85.8	88.0	92.8	92.9	85.4	80.5
Philippines	100.0	97.0	105.6	97.3	104.0	102.6	113.5	106.7	84.7	90.3	87.7	94.2	97.9	93.9	88.6
Singapore	100.0	102.8	105.1	106.3	110.2	112.2	117.6	119.9	110.6	105.0	105.6	107.0	104.7	98.6	96.2
Thailand	100.0	101.8	100.3	101.2	104.1	102.7	107.2	98.0	85.3	88.7	85.7	81.3	82.9	81.2	80.9

Sources: BIS and IMF's *International Financial Statistics* (unless otherwise stated).

1) An increase (decrease) in the value of this variable implies a real exchange rate appreciation (depreciation).

2) Data for Indonesia comes from JP Morgan.

Table 11: Actual versus targeted inflation rates in Emerging East Asia[1)]

in percent per annum, selected countries

	1999		2000		2001		2002		2003		2004		2005	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Korea	3.0	0.8	2.5	1.8	2.5	3.6 (3.2)	2.5	3.7 (3.1)	2.5	3.4 (2.8)	2.5 - 3.5	3.0 (2.9)	2.5 - 3.5	
Indonesia			3 - 5	9.4	3 - 5	12.5	3 - 5	10.0	8 - 10	5.1	4.5 - 5.5	6.4	5 - 7	
Thailand			0 - 3.5	1.4 (0.8)	0 - 3.5	0.8 (1.2)	0 - 3.5	0.7 (0.4)	0 - 3.5	1.8 (0.2)	0 - 3.5	2.7 (0.4)	0 - 3.5	
Philippines					6 - 7	6.1	4.5 - 5.5	3.1	4.5 - 5.5	3.5 (3.4)	5	6.0 (5.7)	5	

Sources: Bank of Korea, Bank Indonesia, Bank of Thailand, and Bangko Sentral ng Pilipinas websites.

[1)] Headline CPI inflation, with core inflation rates between parentheses in countries reporting the latter measure.

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