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Structural Changes in Asia
and Growth Prospects After the Crisis

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AND GROWTH PROSPECTS AFTER THE CRISIS**

Table of Contents

RÉSUMÉ

Fin 1998, la reprise de la croissance dans les pays émergents d'Asie de l'Est demeurait incertaine, et l'on se demandait si ces économies se relèveraient de la crise financière de 1997. Cette crise était interprétée comme une crise structurelle, traduisant la remise en cause d'un processus de croissance antérieur qui reposait trop sur l'accumulation massive de capital, avec peu de gains de productivité. Autrement dit, cette crise marquait la nécessité de passer d'un mode de croissance extensif à une croissance intensive. L'ampleur de la tâche de restructuration du secteur financier et des entreprises, nécessaire pour améliorer l'efficacité du capital, paraissait devoir constituer pour longtemps un obstacle à la croissance.

Cependant, les politiques macro économiques mises en œuvre et un environnement extérieur favorable ont permis de redresser l'activité économique de ces pays, notamment à partir du troisième trimestre 1999. De façon générale, l'état des finances publiques avant la crise a permis aux pays asiatiques d'utiliser le stimulant budgétaire non seulement pour relancer la demande mais également pour faciliter la restructuration des systèmes bancaires et industriels. Les effets de la relance budgétaire, bien que tardifs se sont traduits par une reprise de la consommation interne. La politique monétaire a également contribué à la reprise asiatique. Les politiques monétaires restrictives menées en début de crise (pour contenir l'inflation, stabiliser les taux de change et reconstituer les réserves de change) ont été rapidement desserrées du fait des résultats satisfaisants obtenus. Par ailleurs, ces pays ont enregistré de bonnes performances à l'exportation, grâce à la dévaluation de leurs monnaies, après quelques mois d'hésitation dus à la crise de liquidité des entreprises, période pendant laquelle le redressement financier avait reposé sur la baisse des importations. La région a également bénéficié de conditions externes favorables : demande soutenue en provenance des États-Unis, montée du yen, forte demande émanant du secteur électronique et reprise du commerce intra asiatique.

La reprise des pays asiatiques bien qu'indéniable n'en reste pas moins fragile puisque soumise à certains risques. Tout d'abord, étant donné que la reprise actuelle se fonde notamment sur des débouchés externes, un ralentissement aux États-Unis serait néfaste à la croissance des pays asiatiques. De même, un ajustement du Yuan s'avérerait négatif pour l'ensemble des pays de la région. En outre, au niveau interne, les restructurations bancaires et industrielles doivent être menées à bien pour consolider la confiance et pour permettre aux économies de pouvoir asseoir leur croissance sur des bases saines. Le crédit bancaire a joué un rôle important dans le financement de la croissance des pays asiatiques. Avec la reprise de la demande et la baisse des taux d'intérêt, les entreprises pourraient être amenées à de nouveaux recourir aux banques pour augmenter leurs fonds propres. Cela ne pourra toutefois se faire que si les banques sont rassurées quant à la restructuration de la dette privée et en mesure de répondre de façon saine à leurs besoins. Par ailleurs, le coût fiscal des restructurations devrait limiter la marge de manœuvre des politiques monétaires et budgétaires. Enfin, l'observation d'évolutions favorables à court terme ne dispense pas d'examiner les facteurs qui pourraient, à moyen et long terme, ralentir la croissance potentielle des pays d'Asie par rapport aux tendances observées antérieurement.

Le principal objectif de cette étude est de déterminer les facteurs structurels qui ont contribué à la croissance des économies d'Asie de l'Est de manière à pouvoir estimer dans quelle mesure la crise a pu modifier leur potentiel de croissance.

4

Suite à la remarquable reprise en V observée en 1999, l'activité économique devrait rapidement retourner vers sa trajectoire de croissance potentielle de moyen terme. Néanmoins il est peu probable que les taux de croissance restent à leurs niveaux historiques de 7-8% et cela pour deux raisons : premièrement en raison du ralentissement mécanique lié au processus de rattrapage décrit dans les modèles standard de croissance néoclassique (et qui était déjà prévisible bien avant la crise), et deuxièmement du fait que la crise, de part ses effets, a pu remettre en cause certains des changements structurels en place dans ces économies avant la crise.

Nous proposons une estimation économétrique, basée sur une fonction de production néoclassique augmentée estimée en données de panel pour les pays d'Asie de l'Est sur la période 1968/1996, pour quantifier les facteurs considérés comme ayant contribué de manière significative à la croissance de ces économies. Ensuite, en nous basant sur nos résultas économétriques et sur un calibrage complémentaire, nous calculons la croissance en Asie pour différentes périodes précédant la crise, et la perte potentielle de croissance à laquelle nous pouvons nous attendre à moyen terme. Enfin, nous construisons des scénarios de croissance pour la période 1996/2010 et essayons d'évaluer la part de ralentissement de la croissance attribuable respectivement à l'effet de rattrapage et à celui des changements structurels. Bien que ces deux effets soient évalués, le ralentissement économique dû aux effets de la crise sur les changements structurels est plus prononcé.

Mots clés : Croissance, Asie de l'Est.
Classification : O47, O53.

Summary

The main objective of this paper is to determine the structural factors at the root of the East Asian growth so as to assess how the crisis might alter the potential growth of the countries the most affected by the crisis.

After the brilliant v-shaped recovery observed in 1999, economic activity should come back rather rapidly to its potential medium term growth path. This does not imply, by all means, that economic growth rates will stay at the historical 7-8 percent levels, both because of the mechanical slowdown which was predictable even before the crisis, based on the catch up process described in the standard neo-classical growth models, and because the crisis has threatened some of the structural changes at work in these economies.

In this respect, we propose an econometric estimation based on an augmented neo-classical production function estimated from panel data for the East Asian countries for the period 1968/1996, to quantify factors that we consider have been important to the growth process of these countries. Then by referring to our econometric results we estimate growth in Asia during the proceeding years before the crisis, and the loss of potential growth that can be expected in the medium run. Finally, we construct medium term growth scenarios for 1996/2010 and try to weigh up the share of the slowdown attributed respectively to the catch up effect as well as to structural changes. While both effects are gauged, the magnitude of the slowdown due to structural changes is more pronounced.

STRUCTURAL CHANGES IN ASIA AND GROWTH PROSPECTS AFTER THE CRISIS

By Jean-Claude Berthélemy and Sophie Chauvin [1]

INTRODUCTION

At the end of 1998, recovery in the wake of the financial collapse in Asia, in 1997, looked shaky. The crisis was interpreted as structural, questioning a form of growth based on the massive accumulation of capital accompanied by limited productivity gains. In short, the crisis indicated that East Asia had to shift from extensive to intensive growth. The restructuring of the financial and corporate sectors required for capital efficiency to improve however looked to be a long task.

Nevertheless favorable macroeconomic policies and a supportive external environment have spurred on recovery, especially since the third quarter of 1999. Overall the pre crisis healthy state of public finances has allowed the authorities to stimulate demand and facilitate the restructuring of banking and corporate sectors. Even if it has taken some time, countries have reaped the benefits of fiscal expansion through higher consumption. At the same time, while monetary policy became highly restrictive at the beginning of the crisis –to prevent inflation, stabilize exchange rates and build up reserves– it has subsequently been relaxed. Moreover, East Asian countries have registered strong export performance, due to the devaluation of their currencies, after a period of hesitation, during which the balance of payments recovery was based on drop in imports. The region has also benefited from a favorable external environment: sustained US demand; a rise of the yen; strong demand in the electronics sector; and a pick-up in intra-Asian trade. Once the first signs of an upturn were registered, capital movements began shifting back towards East Asia, though to a lesser extent than before the crisis.

Then, despite the fact that the magnitude of the crisis and that the pace of recovery have differed among countries, recovery is in process in most economies hit by the crisis in 1997. The only exception is Indonesia, in which no sound improvement is foreseeable. In **Chart 1** below, the growth evolution of the various countries in the quarter following their entry into the crisis is plotted. We have compared their profiles to those of Mexico in 1982 and 1995, which might be considered as representative of former financial crises. It is striking that the Asian crisis has been deeper, and more sudden, than the previous crises. Korea is recovering faster than Mexico did in 1995. A similar movement, though less acute is visible for Malaysia. On the other hand, in Thailand, crisis has been deeper and the process of recovery began only after two years from the beginning of the crisis, compared to one year for Korea. Indonesia is the only country which is not on an upward trend.

Figure 1: Quarterly GDP Index After the Beginning of Crisis
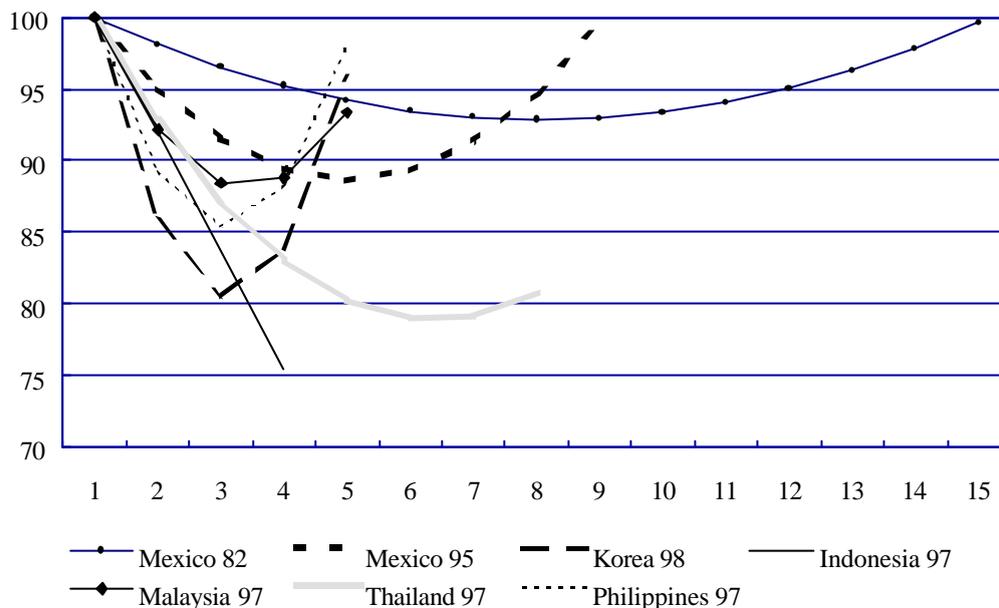
Source: This graph is based on quarterly data (WEFA) of GDP, and of industrial production for Indonesia and Thailand. Evolution has been smoothed by a temporal quadratic form. GDP is set to 100 on the first quarter of the crisis.

The forecasts of real GDP growth for 2000 established by the IMF (1999) have been revised upward and should reach: +5.5% in Korea, +4.0% in Thailand, +6.5% in Malaysia, +3.5% in Philippines and +2.6% in Indonesia.

Despite signs of recovery, the crisis might have altered the medium and long-term potential growth of the countries affected by the turmoil by changing the structural dynamics, which were in place before the crisis. While some of these structural changes should not be questioned in a long-term perspective, others will be; and the aim of this paper is to identify them.

The industrial restructuring driven as a consequence of the crisis will most probably be part of this second category. At the macro level, it is possible that the crisis may entail changes in specialization patterns, though at an uncertain pace. Traditional sectors seem to have been less affected by the crisis than the 'new ones'[2]. In this respect, the crisis should then slow down the renewal of comparative

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[2] See Berthélemy and Chauvin (1999). Several reasons may explain this phenomenon: Asian countries are competing on the same markets; certain sectors depend on imported inputs (which makes it difficult to reap the gains of the devaluation); public intervention through the use of industrial policies to enhance

advantages undertaken since the 1980s, which could imply that diversification might be questioned and future growth could be hampered[3].

Another important consequence of the collapse concerns the required financial restructuring which will probably be sold out by an absence of dynamism in this sector.

In contrast, other aspects of structural change which have contributed to the strong performance of Asian countries should not be questioned drastically. We will attempt to identify them in order to provide an overview of the structural factors of economic growth. Also, it is necessary to quantify the consequences of the slowdown mechanism that was already at work before the crisis, due to the rather extensive nature of the growth process[4]. This approach will allow us to assess the importance of the reduction of potential growth which may be expected in Asia, in the future.

In a first part, we will set up the analytical framework of our evaluation of past growth in East Asia, by distinguishing factors that we considered as being possibly threatened by the crisis from the others. Then we will use an augmented neo-classical production function estimated on panel data for the East Asian Countries for the period 1968/1996, to quantify these various factors. In a third section, we will refer to our econometric results to estimate growth in Asia during the years preceding the crisis. Finally, we will build medium term growth scenarios for the 1996/2010 period. The results will be summarized in the last section.

I. ANALYTICAL FRAMEWORK

As a result of the Asian crisis, several elements of structural changes might be questioned. Firstly we examine the question of economic diversification, a topic which has not been taken into account in most previous empirical work on growth. Secondly, we refer to other factors more commonly used in growth analysis such as financial deepening, openness, labor training (improvement of human capital), and the reallocation of production factors.

a. Economy Diversification

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growth has been associated with subsidies and selective investments in certain sector which have suffered from the credit crunch in 1997.

[3] The relationship between diversification and growth is analyzed in details in the section I a, below.

[4] On this topic, refer for example to Krugman (1994).

This section analyses the effects of diversification on growth. Our interest in diversification is based on the empirical observation[5] that rapid economic growth seems to be accompanied with a higher degree of diversification. Diversification is defined here as the spreading over production to a growing number of different outputs which do not necessarily imply different productivity levels.

The impact of diversification on income can be seen through two transmission mechanisms.

First of all, diversification enhances technical progress diffusion. In his model, Romer (1990) considers diversification, along the line of Adam Smith, as a factor for increasing labor productivity and human capital. Romer develops a model including four production factors (capital, human capital, labor and a technological index) and three sectors: the sector of Research & Development which uses human capital and the existing stock of knowledge to produce more knowledge (*i.e.* new designs); the sector of intermediate goods which exploits these new designs to produce a large range of intermediate goods; and lastly the sector of final goods which utilizes these products to provide consumer goods. Romer stresses that the more available differentiated intermediate goods are, the higher marginal capital productivity will be. Diversity of intermediate inputs enhances productivity of the final goods sector.

The idea that diversity of inputs enhances productivity and thus growth has been extended to diversity of output by Feenstra and alii (1999). The authors evaluate the link between increased product variety and productivity using sectoral data for South Korea and Taiwan. To measure product variety they use disaggregated exports from the two countries to the United States. Moreover, they consider two types of industries: primary industries, which rely more heavily on natural resources and secondary industries which rely on and produce differentiated manufactures. Finally, they find that the changes in relative export variety across the two countries have a positive and significant effect on productivity particularly for secondary industries[6].

Second of all, according to Acemoglu and Zilibotti (1997), production diversity provides a better allocation of capital by boosting investments in riskier and more profitable projects, by risk diversification. When diversification (defined by the authors as spreading financial risk) is low, economic agents will invest in low return, traditional projects for which potential growth is less significant. The impossibility of hedging the risk by investing in a diversified portfolio (with higher returns) will hamper capital productivity in the short run, and its accumulation in the long run. Berthélemy and Söderling (1999) have developed a general analytical framework in a simple model of portfolio allocation which supports this approach.

A suitable measure of diversification should take into account all goods and services of an economy. However, and due to the fact that disaggregated data on GDP are not available at a detailed level, we have used, like Feenstra et alii, an index of diversification based on the composition of countries'

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[5] Refer to Berthélemy and Söderling (1999) and their study on Africa.

[6] In this paper, we use more aggregated data which enable us to take into account exports not only to the United States but also to the rest of the world. Moreover it facilitates the use of a panel data approach. In addition while using more aggregate data, diversification is also apparent.

exports[7]. Non-tradable goods and services are left out of our estimate (cf. section II for a detailed explanation of this index). While using the diversification of exports as a proxy of output diversification may have some limitation, it has the benefit of focusing on the link between trade and growth. In this vein, Villanueva (1993) noticed: *"One of the robust empirical determinants of long term output growth in many countries, particularly the developing ones, has been the whole gamut of outward-looking exchange and trade policies designed to promote the expansion and diversification of the export sector."* Exports, and more specifically diversified exports of manufactured products, enhance productivity through learning effects, opening up of investment opportunities such as for supplying inputs increases, increased competition, technology transfer, improvement of human capital.

According to Gutiérez de Pineres and Ferrantino (1997), when the pace of diversification is too high, the impact on growth may be negative because of adjustment costs of production. We have referred to their methodology which consists in defining an index of export diversification as well as an index of exports structural changes[8].

Some South East Asian countries, like Indonesia, have experienced a rapid diversification of their exports, with uncertain consequences because of adjustment costs. In contrast, as a consequence of the crisis, the degree of diversification of Asian economies could be reduced by re focussing on their main comparative advantage. In this case, and in line with the theoretical framework developed above, an end to the diversification process could be a burden for future growth prospects in Asia.

b. Financial Development

In the 1990s, several studies have focused their attention on the role of financial deepening in growth[9]. According to such research, financial development has two main positive effects on growth. First, a more developed financial structure allows a better mobilization of savings and thus may support more investment. In Asian countries, investments have mainly been financed by banking credits. Second, within a more developed financial sector, available information on investment projects will be treated more efficiently and then boost investments in productive sectors. As the mismanagement of financial sector is one of the main factors that has triggered the crisis, it requires deep analysis. But first, a distinction has to be made between the short run and the long run. Though it is obvious that between 1995 and 1997, local financial systems have mismanaged foreign capital flows, which led to inefficient allocation of funds resources (into non-productive investments), financial sector performance has to

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[7] While Feestra et alii used very detailed export data base on bilateral trade data with the US, we have attempted here to compute our diversification index using the less detailed but more comprehensive data base built by the CEPII, the Chelem data base, which provides harmonized data on international trade for some 71 products. Feenstra and alii needed more detailed data because they worked on sectoral TFP, while our dependent variable is the aggregate GDP.

[8] This later indicator may be relevant as it captures the short-term effects of diversification by measuring the change in export composition taking place in a single year. Thus in the long run, even if economic growth is positively correlated to diversification, the later might have a negative impact on growth through the adjustment costs of production. In preliminary estimates, we introduced an index of exports structural changes which nevertheless was not significant.

[9] One can refer to the study of Berthélemy and Varoudakis (1996).

be analyzed in a long-term perspective. Berthélemy and Varoudakis (1996) have shown that the positive impact of financial deepening on growth depends from the pre-existing level of financial development, and tends to be significant only once a certain threshold has been reached. Therefore and according to their results, during their development process, South East Asian countries should have benefited from a positive impact of financial deepening, though the lack of financial regulations as well as government interventions with a view to pursue industrial policy objectives led to a misallocation of resources.

As theory does not provide a complete explanation of this topic, the follow up to the previous analysis can only be empirical. To assess the impact of financial deepening we refer to an index usually used in empirical investigation, which is the ratio of private sector bank credit to GDP.

Empirical results obtained are crucial to estimate the consequences of the Asian financial collapse on future economic growth prospects, insofar as one of the most probable consequences of the crisis should be a reduction in the dynamism of the financial sector, which has to be restructured.

c. Openness

The impact of openness on economic growth is without doubt a major topic of controversy in the literature on Asian growth[10].

The assumption of a positive impact of openness on economic growth is connected, among others, to the studies of Michaely (1977) and Moschos (1989). Michaely has studied the correlation between the change in exports (estimated by the rate of change of the proportion of exports in the national product) and the growth rate (represented by the rate of change of per capita output). According to his results, the positive link between the two variables is more visible among the more developed countries, which indicates that exports affect economic growth only once the economies have reached a minimum threshold of development (as it is the case of Asian emerging countries). Moschos has also analyzed the effects of export expansion on economic growth. His study contradicts the view that the positive effect of export expansion on economic growth is limited to 'more advanced' developing countries. As he noticed: *"…among 'less advanced' developing countries output growth is mainly influenced by export expansion and capital formation, its response to labor growth being highly insignificant… The effects of export expansion on economic growth tends to diminish as the stage of development passes the critical level."*

As a matter of fact, it seems requisite to test this effect insofar as openness might have been an active policy of development in Asia and which could be questioned in the future within a very pessimistic scenario.

d. Training Labor

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[10] While Young (1994) emits some reserve concerning the link between external orientation and greater growth, Fukuda and Toya (1995) show that the sizeable rates of growth in East Asia are largely attributable to export-oriented economic growth.

Labor training and schooling constitute a major structural transformation of emerging countries. South East Asian countries did invest in education and have certainly reaped the benefits of such a policy in terms of growth.

According to Islam (1995), it is not unusual that human capital[11] appears to be insignificant in a panel data approach. This is due to a time dimension problem of the human capital variable. Berthélemy, Dessus and Varoudakis (1997) have also explained that the human capital stock can have a significant and positive effect on economic growth, but which depends on the abilities of an economy to mobilize human resources through activities inducing technological progress (which will more probably occur if countries open their trade regime).

De Gregorio (1992) used both school enrollment indices and literacy rates as a measure of investment in human capital. While in the latter case, the effect on growth is positive, school enrollment indices do not appear to have significant effect on growth and even appear to be negatively correlated with growth in a few estimates.

Knight, Loyaza and Villanueva (1993) also found a significant negative impact of the human capital on growth when panel data are used while the estimated coefficient on the human capital proxy was significantly positive when using cross-sectional data.

In our first estimates, the introduction of a human capital stock variable was not significant. We have, however, tried to capture the effect of human capital growth on economic growth by constraining the corresponding elasticity beforehand in our growth accounting estimate. The crisis, by raising poverty incidence, especially in urban areas, might have a negative spillovers effect on the educational process by slowing down schooling.

e. Factor Reallocation

The reallocation of factors, which benefits from financial deepening, might have its own dynamic, resulting from natural labor movements out of agricultural sector, which arise at the beginning of the development process. This factor is distinct from economic diversification. Reallocation implies a movement of production factors from less productive sectors to more efficient ones, and may occur without economic diversification.

Traditionally, the reallocation effect is estimated with the Syrquin (1986) method[12]. This method captures the mechanical effect of factor transfers between sectors which have different levels of productivity. Both capital and labor transfers should be taken into account, though in practice few studies have tackled capital reallocation (because of a lack of data). Studies which address this issue show that the impact of capital reallocation is usually not significant compared to that of labor reallocation[13].

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[11] Human capital is frequently estimated by the average schooling years of the population.

[12] See Appendix 1 for more details on the Syrquin method.

[13] See for example the monograph of Dessus, Shea and Shi (1995) focussing on Taiwan.

Moreover, it appears that the main movement of reallocation revealed by the data concerns the movement of labor out of the agricultural sector. In this paper, we propose an accounting assessment of these movements, but we will not introduce them into our econometric estimation, because of the poor quality of annual data. Due to the regular evolution of this effect, one might consider that this phenomenon is entirely captured by temporal trend specific to each country. As a consequence of the crisis and the increase of poverty incidence, the reallocation of labor out of agriculture might be reduced or slowed down and this may hamper future growth prospects in Asia by reducing the potential average productivity gains stemming from factor reallocation.

II. PANEL DATA ESTIMATION

We propose a panel data analysis including five countries: Indonesia, Korea, Malaysia, Philippines and Thailand, over the period 1968-1996. We did not include 1997 in our analysis. Indeed as our aim is to construct medium term scenarios based on past performance, 1997 would have biased our results.

We use a production function to explain the long-term relationship between GDP on the one hand and capital stock and labor as well as other variables which can influence the total factor productivity on the other hand. Returns to scale are assumed to be constant, so we obtain the following production function:

$$Y = K^{\alpha} L^{1-\alpha} \, TFP$$

$$(Y/L) = (K/L)^{\alpha} \, TFP$$

With Y, the GDP, L, the labor force, K, the capital stock, and TFP, the total factor productivity determined by the following variables:

- an index of export diversification;

- a financial variable proxied by the share of credit to the private sector as a percentage of GDP;

- an openness variable calculated as the ratio of imports plus exports to GDP.

The index of export diversification which is derived from an index of concentration of the distribution of exports among products is defined as follows:

$$SPE_t = \sum_{i=1}^{n} (x_{i,t} / X_t)^2$$

With $x_{i,t}$, exports of product i in year t and X_t total national exports in year t.

By writing $s_{i,t} = x_{i,t}/X_t$

We have:

$$SPE_t = \sum_{i=1}^{n} (s_{i,t})^2$$

SPE, index of specialization, ranges between 0 and 1: a value close to 1 means a higher level of specialization (reliance on a single export) while a value close to 0 means a higher degree of export diversification.

The index of diversification is the inverse of SPE.

$$DIV_t = 1/\sum_{i=1}^{n} (s_{i,t})^2$$

This index increases with the degree of diversification. Oil exports are excluded from our calculation in order to minimize the impact of the terms of trade[14].

The evolution of the export diversification indices, as well as the evolution of per capita income are represented in figures 2 and 3 for the period 1967/96.

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[14] If oil is included in the index, a sudden increase of oil prices will entail an increase of the relative importance of the petroleum sector in the economy without providing additional information about the structural changes (Berthélemy and Söderling, 1999).

Figure 2: Evolution of Export Diversification Indices (Oil Excluded)
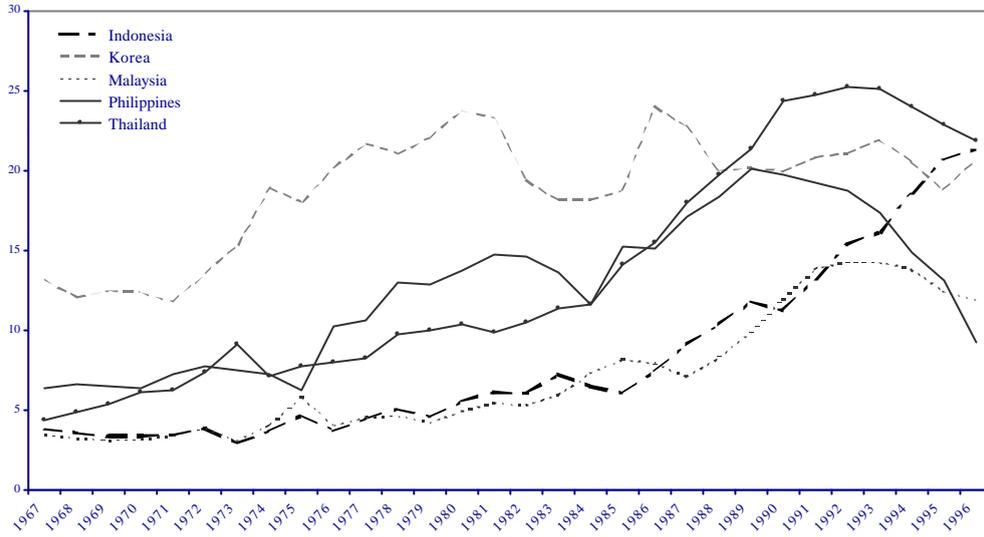
Source: Author's calculation based on the CEPII-Chelem Database.

Figure 3: Evolution of GDP per Capita (Real US$87), 1966-1996
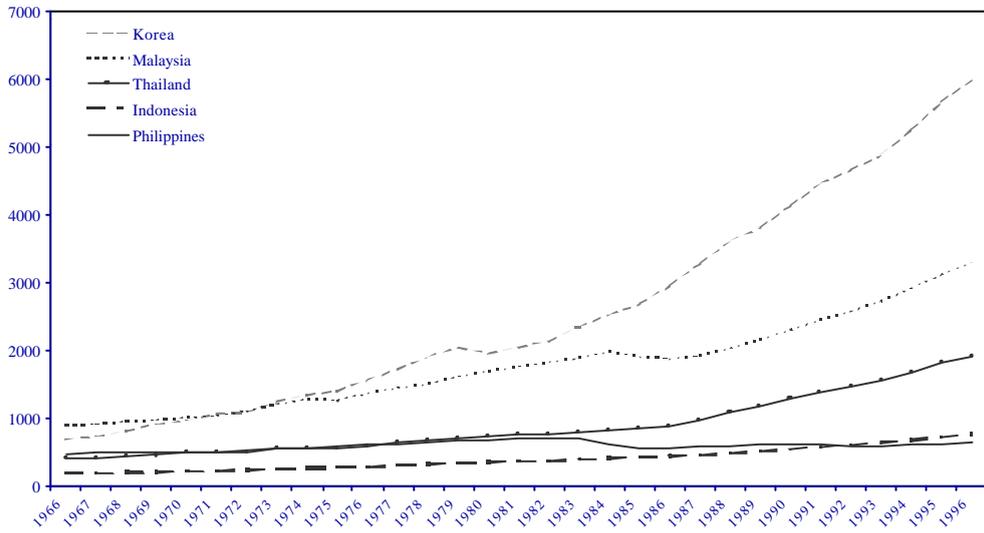
Source: World Bank Development Indicators 1998, World Bank.

16

Several comments can be made. Firstly, Korea, in 1967, was the country with the most diversified exports. Moreover this country has had the best GDP per capita growth performance. Thailand, which was less diversified than the Philippines in 1967 has diversified gradually with a more pronounced upward trend recorded since the mid 80's. The evolution of its GDP is regular. Malaysia was the least diversified country in 1967. Diversification in Malaysia has been more moderate than in Thailand though raising continuously. GDP per capita has nevertheless improved significantly in Malaysia over the period. While Indonesia started in 1967 with a level of exports diversification quite similar to the one of Malaysia, its index of diversification has followed a significant upward trend especially since the mid 80's. GDP per capita did not progress as fast as in other countries under the period. Finally, diversification in Philippines which was among the most diversified countries in 1967 has been more erratic and even recorded a downward trend since the end of the 80's.

In accordance with the analysis developed in the first section, two other common variables of TFP have been used in our econometric estimation. One variable reflecting financial deepening, and defined as the credit to the private sector as percentage of GDP, has been introduced to capture the role of credit as the main resource of financing growth (especially for industrial firms). Either through the policies led by governments of favoring the development of several, selected sectors or by facility (without any specific financial regulation) of the banking system to grant credit without hedging its positions, the growth has been partly due to financial deepening, though the later has been inefficient. The development of the financial and banking sector has been questioned since the crisis and more indirectly as a method for financing economic growth[15].

Lastly, trade policies and/or the degree of openness are usually pointed out as determining factors of Asian's success. One common measure used is the degree of openness estimated by the ratio of imports plus exports to GDP.

We have thus estimated a production function of GDP/labor depending on the ratio of capital stock to the labor force, as well as the variables previously mentioned. Neither the stock of human capital nor the effect of factor reallocation is included. Their regular trends cannot be dissociated from the data used for the temporal deterministic trend.

The equation to be estimated is:

$$\text{Log } (Y/L)_{it} = a_0 + a_1 \log K/L_{it} + a_2 \log DIV_{it} + a_3 \log CR_{it} + a_4 \log OPEN_{it} + a_5 ID_i xt + u_i + \boldsymbol{e}_{it} \tag{1}$$

With ID, a country dummy.

Unit root tests have been performed according to the method proposed by Levin and Lin (1993). This method consists of computing Dickey-Fuller statistics, aggregated across countries after normalization. The dependent variable (GDP/labor force), the capital stock divided by labor as well as the diversification index are I(1), while the credit to the private sector as a percentage of GDP and the index of openness are stationary.

We used the within (fixed effects) method in accordance with Hausman test.

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[15] Refer among others to Craft (1999), Borensztein and Lee (1999).

Unit root tests have been also performed on residuals. These residuals are I(0). This equation can therefore be interpreted as a co-integration relation.

All the coefficients have the right sign and are significant at the 1 or 5% levels.

Table 1: Panel Data Estimates of the Production Function[16]

Dependent Variable: LYL

	Coefficient	**Student's T**	**Significance threshold**
LKL	0.314125	4.50277	0.000
LDIV	0.056805	2.12210	0.034
LCR	0.062660	3.13818	0.002
LOPEN	0.113992	3.18159	0.001
T1	0.66822^{E-02}	1.12647	0.260
T2	0.025138	3.77941	0.000
T3	0.412568^{E-02}	0.760229	0.447
T4	-0.010141^{E-02}	-4.26062	0.000
T5	0.062660	2.59599	0.009

Estimation method : fixed effect.
Number of observations : 148.
Number of countries : 5.
Adjusted R^2 : 0.99.

The elasticity of capital to GDP, 0.31, corresponds to the usual results for emerging countries. The export diversification has a significant influence on growth, which is consistent with our preceding analysis. The degree of openness, with an elasticity equal to 0.11 also has a positive impact on growth in the long term. Lastly, credit to the private sector also contributes positively to economic growth. Without surprise, the Philippines is the only country which does not show a positive, deterministic trend. The Philippines is the only country of our sample which was struck by the debt crisis of the 1980s.

III. GROWTH ACCOUNTING

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[16] Variables description :

LYL = ln (GDP/Labor)

LKL = ln (Capital stock/labor)

LDIV = ln (Diversification index)

LCR = ln (Credit to the private sector as a percentage of GDP)

LOPEN = ln (Openness index)

T1-T5 (Indonesia, Korea, Malaysia, Philippines, and Thailand) are countries trends. Student's test are corrected from heteroscedasticity.

The above estimates can be used to assess the contribution to past growth in Asian emerging countries by the various factors studied here. This could be helpful to draw conclusions for the future. First of all, we breakdown growth according to the traditional method, by estimating the contribution of capital, labor and total factor productivity. Our results are presented in **Table 2**, for various period between 1968 and 1996, preceding the crisis of 1997.

This table highlights the significant contribution of the TFP in growth on the sub period 1968/76 and 1986/96 for all the countries.

Table 2: Growth Accounting

	Growth in GDP	Contribution of capital	Contribution of labor	Contribution of Total Factor Productivity Growth
Indonesia				
1968-1976	6.71	2.74	1.74	2.23
1976-1986	6.54	3.44	1.94	1.15
1986-1996	7.34	2.62	1.84	2.87
1968-1996	6.87	2.95	1.85	2.08
Korea				
1968-1976	10.34	4.34	2.12	3.88
1976-1986	7.74	3.71	1.81	2.22
1986-1996	8.04	3.28	1.43	3.33
1968-1996	8.59	3.74	1.77	3.09
Malaysia				
1968-1976	7.04	3.12	2.28	1.63
1976-1986	5.60	3.17	2.11	0.32
1986-1996	8.12	2.43	1.90	3.80
1968-1996	6.91	2.89	2.08	1.94
Philippines				
1968-1976	5.52	1.95	2.01	1.56
1976-1986	1.77	2.11	2.00	-2.34
1986-1996	3.62	0.83	1.91	0.88
1968-1996	3.50	1.61	1.97	-0.08
Thailand				
1968-1976	6.74	3.25	2.19	1.30
1976-1986	6.06	2.49	2.02	1.56
1986-1996	9.12	3.19	1.34	4.60
1968-1996	7.35	2.96	1.82	2.57

Source: Authors' calculation. Based on logarithm values.

The productivity gains we found, are higher than those obtained in the former studies of Young (1995) and Collins & Bosworth (1996). This can be explained in several ways. Firstly, the periods studied are different. Secondly, we did not remove of our TFP estimation the human capital accumulation effect as well as the Syrquin effect, as Collins and Bosworth did for the first one and Young for the second one. As noticed by Craft (1999): *"Another difference between researchers concerns the treatment of improvements in the quality of labor, in particular through education. Whereas Young (1995) and Collins and Bosworth (1996) adjust their raw labor force estimates on the basis of assumptions about the rates of return to observed increases in schooling, Sarel (1997) prefers to make no adjustment, with the implication that any unmeasured improvement in labor force quality will show up in residual, TFP growth. Moving to this procedure would typically add about 0.5 percent a year to Collins and Bosworth's TFP growth estimates."* Finally, by referring to the study of Collins and Bosworth and by comparing their results for the period 1973/94 to ours for the period 1968/96, our higher estimation may result from the fact that our period encompasses two sub-period of rapid growth (that is 1968/1973 and 1994/1996).

It may also be noticed that Thailand seems to have the best performance for the period 1986/96. This results not only from the reference period (during the period 1968/96, productivity growth in Thailand was only equal to 2.6 per cent), but also from a significant effect due to factor reallocation (see **Table 3** below).

In **Table 3**, we have calculated the contribution of the various variables introduced in our econometric estimation of the TFP growth. We have also indicated a global evaluation of the contribution of the two determinants of TFP which are merged with the temporal determinist trend in our econometric analysis, which are: human capital accumulation and the factor reallocation effect. Both the human capital and the reallocation effects are not resulting from our econometric estimate. Human capital effect is measured by the average schooling years growth weighted by an elasticity of 0.25, corresponding to the value usually found for this elasticity. The reallocation effect is based on the Syrquin method, and on data from the World Bank (World Development Indicators, 1998) on GDP distribution and labor force repartition between agriculture and non-agriculture sectors.

First of all, **Table 3** reveals that the contribution of the structural factors included in our econometric estimation to the total factor productivity is low. The highest contribution of diversification has been registered by Indonesia for the period 1986/96 as well as by Malaysia and Thailand for the period 1976/86. The contribution of this index represents respectively 0.6 and 0.4 per cent of growth for these periods. The overall weak evolution of diversification, which is even negative for Korea and Philippines for the period 1986/96, means that the effort of economic diversification has only contributed moderately (although significantly) to growth in Asia. In the following, if we assume that the structural transformation will stop in the medium run as a consequence of the crisis, it will represent a minor loss of growth, amounting to between 0.1 and 0.4 per cent of growth in these countries.

Table 3: Sources of TFP

	Variables of our econometric estimation	Additional variables

	Total Factor Productivity	Diversification effect	Financial development	Openness	Human capital	Reallocation effect	Residual (other)
Indonesia							
1968-1976	2.23	0.02	1.49	0.81	0.93	0.58	-1.60
1976-1986	1.15	0.40	0.03	-0.14	0.78	0.42	-0.34
1986-1996	2.87	0.60	0.58	0.26	0.68	0.45	0.30
1968-1996	2.08	0.37	0.64	0.27	0.79	0.48	-0.47
Korea							
1968-1976	3.88	0.37	0.16	0.77	0.88	0.68	1.02
1976-1986	2.22	0.10	0.25	0.08	0.78	0.89	0.12
1986-1996	3.33	-0.09	0.17	-0.01	0.39	0.50	2.37
1968-1996	3.09	0.11	0.20	0.24	0.67	0.69	1.18
Malaysia							
1968-1976	1.63	0.16	0.60	0.22	0.83	0.74	-0.91
1976-1986	0.32	0.39	0.72	0.20	0.67	0.63	-2.29
1986-1996	3.80	0.23	0.21	0.62	0.49	0.33	1.91
1968-1996	1.94	0.27	0.50	0.35	0.65	0.55	-0.40
Philippines							
1968-1976	1.56	0.31	0.17	0.45	0.36	0.40	-0.13
1976-1986	-2.34	0.22	-0.41	0.10	0.51	0.41	-3.17
1986-1996	0.88	-0.28	0.72	0.75	0.43	0.37	-1.11
1968-1996	-0.08	0.07	0.16	0.43	0.44	0.39	-1.57
Thailand							
1968-1976	1.30	0.36	0.63	0.22	0.42	1.40	-1.73
1976-1986	1.56	0.38	0.31	0.15	0.41	1.19	-0.87
1986-1996	4.60	0.20	0.60	0.59	0.33	1.01	1.87
1968-1996	2.57	0.31	0.50	0.33	0.38	1.18	-0.14

Source: Authors' calculation.

The development of the financial sector is another major structural transformation from the previous period which will probably slow down in the medium run due to the restructuring process. Financial deepening contributed very significantly to the past growth, especially in Indonesia, Malaysia and Thailand (respectively 0.6, 0.5 and 0.5 points of annual growth on the period 1968-96). This effect was also positive, while to a less extent for the same period in Philippines and in Korea (0.2 points). It is nevertheless likely that these gains in growth will be reduced in the medium run.

Economic openness has also boosted economic growth in the countries studied, except in Korea (which was open earlier). While the current policies implemented by the governments do not seem to question this trend, it might be possible that openness do not increase in the future, if only because the degree of openness has so far reached already a very high level.

Overall, our econometric estimation, though based on an attempt to highlight the structural factors of economic growth, contributes only modestly to explaining the productivity gains of the five Asian countries studied for various period, prior to the crisis. The use of human capital accumulation and the Syrquin effect are nevertheless useful to completing our analysis. Both of these effects explain

between 0.8 and 1.8 points of productivity growth in these countries. These two effects should not be questioned fundamentally by the crisis, even though they might be affected by its social consequences.

IV. MEDIUM TERM GROWTH SCENARIOS FOR 1996/2010

As previously mentioned, in the decade preceding the crisis, growth gains resulted not only from high capital accumulation but also from structural factors such as labor reallocation (out of agriculture), export diversification, financial deepening and openness. The crisis, through spillover effects, might have altered the potential growth of the East Asian countries in the medium and long term by affecting the dynamism of structural changes which were undertaken before the crisis.

Certain structural changes which contributed favorably to growth in the area prior to the crisis may be halted in the medium term and this in turn may slow down activity in the future. Industrial restructuring risks being accompanied by a redistribution of sectoral specialization, as can be seen through the recent restructuration of chaebols in Korea. A fall in export diversification is then likely, although this need not be totally detrimental in the long term, if it is accompanied by production rationalization. Similarly, banking restructuring to improve transparency and prudential regulation should favor a better allocation of resources in the long run. Nevertheless, it is not likely that East Asian countries might rely on credit to finance their growth in the short and medium run, due to the magnitude of restructuring efforts still needed in this sector (see **Table 4** below for the financial restructuring reforms that have already been undertaken).

Openness, which has also contributed to the past growth performance of theses countries, might have reached a threshold. We nevertheless remain confident regarding the evolution of intersectoral factor reallocation as well as improvement of labor skill even though negative consequences of the crisis on these factors have been considered in a pessimistic scenarios: the increase of poverty, especially in urban area, might lead to drop out; the social consequences of the crisis could also slow down the proportion of rural labor leaving the agricultural sector, and thus reduce the contribution of factor reallocation to growth.

Based on our neo-classical production function $Y = K^{\alpha} L^{1-\alpha}$ TFP (with TFP including diversification effect, financial development, openness, human capital and reallocation effect and $\alpha = a_l$ in equation (1)), we have constructed medium term growth scenarios for 1996-2010[17]. These scenarios include both the effects of gradual reduction of

Table 4: Structural Changes in the Financial System

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[17] See appendices 2 and 3 for data sources and more details on assumptions.

	Closures	**State take-overs**	**Mergers**
Indonesia	64 banks (18 percent)	12 commercial banks (20 percent)	4 of 7 state banks to be merged into a single bank (54 percent)
Korea	5 commercial banks, 17 merchant banks , and more than 100 nonbank financial institutions (15 percent)	4 commercial banks (25 percent)	9 banks and 2 merchant banks to create 4 new commercial banks (15 percent)
Malaysia	None	1 commercial bank, 1 merchant bank, and 3 financial companies under central bank control (12 percent)	6 mergers of finance companies and commercial banks (2 percent)
Thailand	57 finance companies (11 percent) and 1 commercial bank (2 percent)	7 commercial banks (13-15 percent) and 12 finance companies (2.2 percent)	5 commercial banks and 13 finance companies into 3 banks (20 percent)

Source: The Global Economic Prospects 2000 and the developing countries, the World Bank. Note: Figures in parentheses refer to percentage of assets in the financial sector.

growth through catch-up[18] and the consequences of the crisis in terms of a slowdown instructural changes as discussed above[19]. On the first point, it was assumed that the rate of savings is constant (external savings held to be zero). On the second point, various assumptions have been made. Above all the degree of openness of these countries and their economic diversification are assumed to have peaked before the crisis. Next, by using credit to the private sector as a proxy for the level of financial development, it is considered that financial deepening should remain at its pre-crisis level, despite the reduction of momentum in this area, brought about by the need for restructuring. Furthermore, two scenarios have been put forward concerning the sectoral reallocation of factors and human capital accumulation:

- the higher scenario assumes that both variables will follow a regular path, as was previously the case;

- the lower (pessimistic) scenario assumes that given the social consequences of the crisis, the propensity of rural workers to quit agriculture has been halted, which will reduce the contribution of the reallocation of factors to growth, while educational progress is also stopped, as people exit the educational system due to the rise of poverty.

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[18] According to Solow's model, conditional convergence of one country toward its stationary state is determined by its fundamentals. In this respect, an economy will grow all the faster that this economy is far from its own steady state. If two countries have the same stationary state, the poorer country will grow faster than the rich one and they will converge.

[19] Capital accumulation contributes to convergence toward a steady state. Structural changes are associated with a modification of this steady state. As our scenarios are constructed on a medium term basis, we can illustrate both of these effects and associate capital accumulation to a pure convergence effect.

Table 5 indicates a clear fall in growth (real GDP) in both cases. For Malaysia, the slightly faster rates of growth stem from both the higher savings rate (observed in recent years), and from faster labor force growth than elsewhere. Between the two scenarios, Thailand is encountering the largest differential of growth. This may be due to the stronger impact of the Syrquin effect which is particularly acute for this country.

Table 5: Medium Term Growth Scenarios

	1996/2010 (high)	**1996/2010 (low)**
Korea	3.75%	3.11%
Malaysia	4.55%	3.93%
Philippines	3.70%	3.15%
Thailand	3.08%	2.08%

Source: Author's calculation.

Indonesia has been left apart from our analysis because of the political and economical uncertainty facing the country.

Based on **Table 6** we can weigh up the share of the slowdown attributed respectively to catch up effect and to structural changes. In this respect, and by referring to the period 1968/96, we have assessed the slowdown attributable to the catch up effect as the difference of contributions of capital accumulation to economic growth before and after 1996, that is the change in the average growth rate of the stock of capital weighted by its elasticity ($\alpha = 0.31$). By difference, we have the contribution to slowdown attributable to structural change factors.

Table 6: Deviations from the 1968/1996 Trend

	GDP growth 1968/1996	**Deviation for the higher scenario**	**Deviation for the lower scenario**
Korea	8.97%	-5.22%	-5.86%
Malaysia	7.15%	-2.60%	-3.23%
Philippines	3.56%	0.14%	-0.41%
Thailand	7.63%	-4.55%	-5.55%

Source: Authors' calculation.

As can be seen from **Tables 7 and 8**, the shares obtained for the contribution of the catch up effect to economic slowdown are smaller than the contribution of structural changes in both the higher and lower scenarios[20]. In both cases Korea is recording the higher slowdown of physical capital accumulation. This is not surprising insofar as Korea has grown at a fastest speed in the previous period than the other countries so that the differential of growth might be more important. Moreover, Korea has already reached rather high level of capital deepening, much higher than in the other countries considered here. Thailand is also following a similar trend though the deviation resulting

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[20] Our results are contrary, in some ways, to Krugman's assertion (1994). Indeed, while both effects are gauged, the magnitude of the slowdown due to structural changes is more pronounced.

from a slowdown of structural changes are more pronounced than in Korea in the lower scenario. Malaysia records a lower deviation of GDP growth from the 1968/96 trend compared to Korea and Thailand but is nevertheless facing a significant slowdown of structural changes.

**Table 7: Estimates of the Share of the Slowdown Respectively
due to the Catch up Effect and to Structural Changes for the Higher Scenario**

	Deviation for the higher scenario	Deviation due to a slowdown of the catch up effect	Deviation due to a slowdown of structural changes
Korea	-5.22%	-1.81%	-3.42%
Malaysia	-2.60%	-0.62%	-1.98%
Philippines	0.14%	-1.06%	+1.20%
Thailand	-4.55%	-1.17%	-3.38%

Source: Authors' calculation.

**Table 8: Estimates of the Share of the Slowdown Respectively
due to the Catch up Effect and to Structural Changes for the Lower Scenario**

	Deviation for the lower scenario	Deviation due to a slowdown of the catch up effect	Deviation due to a slowdown of structural changes
Korea	-5.86%	-1.89%	-3.97%
Malaysia	-3.23%	-0.70%	-2.53%
Philippines	-0.41%	-1.12%	+0.71%
Thailand	-5.55%	-1.29%	-4.26%

Source: Authors' calculation.

V. CONCLUSION

The main objective of this paper was to assess the structural factors of Asian growth in the medium and long term. We have based this paper on the observation that short-term effects of the crisis have been absorbed in Korea and in the process of being absorbed in other countries, Indonesia remaining the exception. After the brilliant v-shaped recovery observed in 1999, economic activity should come back rather rapidly to its potential medium term growth path. This does not imply, by all means, that economic growth rates will stay at the historical 7-8 percent levels, both because of the mechanical slowdown which was predictable even before the crisis, based on the catch up process described in

the standard neoclassical growth models, and because the crisis has threatened some of the structural changes at work in these economies.

Our calibration of the neoclassical growth process, assuming domestic saving rates maintained at their high levels of 1997, suggest that the potential growth rate of the economies under study might drop by 0.62 percentage points (Malaysia) to 1.81 percentage points (Korea) by 2010[21].

As far as structural changes are concerned we have underlined three main structural factors: economic opening, export diversification and financial deepening. Although theses factors are significant from an econometric point of view, their magnitude remain relatively modest. Nevertheless, these different factors are not negligible when added to each other. As a consequence, an alteration of these different factors after the crisis will reduce to a significant extent the growth potential of these countries over the medium term. A total interruption of the contribution of these structural change factors to economic growth would lead to a further drop of economic growth by 1.98 (Malaysia) to 3.42 (Korea) percentage points. The Philippines are in this context an exceptional case, since this country did not have any positive gain of growth due to structural change in the decades preceding the crisis.

Finally, in a more pessimistic scenario, we have assumed also that the social consequences of the crisis would alter the growth potential through a reduction in human capital accumulation as well as in the movement of reallocation of labor out of agriculture to more productive non-agricultural jobs. In the lower scenario based on such assumptions, Thailand and Korea are recording the highest drop of economic growth, resulting from a slowdown of structural changes (amounting respectively to 4.26 and 3.97 percentage points). This underlines the negative economic impact that the crisis might have through possible social consequences.

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[21] Our results are a bit smaller compared to other projections of medium and long term growth rates of the Asian Economies. The projections of the World Bank (Global Economic Prospects 2000) for the East Asian countries (Indonesia, Malaysia, Philippines, Korea and Thailand) taken together are 5.3% over the period 2002/2008. According to the Japanese Economic Planning Agency (Annual Report on the Asian Economies 1999), the real GDP growth rates over the period 1996/2010 amount to 3.9% for Korea, 8.1% for Malaysia, 5.1% for the Philippines and 6.2% for Thailand.

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APPENDIX 1

Syrquin Effect

This method measures the effects of the sectoral reallocation of factor of production.

The theoretical framework, while relevant for k factors of production, is developed with a single factor of production: labor. The relationship between aggregate growth of the GDP and the N sectoral value added is derived from the definitions of value added, Y and of average labor productivity, y (=Y/L):

$$Y = \sum_{i=1}^{N} Y_i$$

and

$$y = Y / L = \sum_{i=1}^{N} Y_i / L = \sum_{i=1}^{N} Y_i / L_i * L_i / L = \sum_{i=1}^{N} g_i * y_i$$

with γ_i, the share of sector i in the total labor (L_i/L).

In growth rates, we have:

$$\dot{Y} / Y = \sum_{i=1}^{N} Y_i / Y * \dot{Y}_i / Y_i = \sum_{i=1}^{N} r_i \dot{Y}_i / Y_i$$

The growth rate of GDP equals the sum of the sectoral growth rates weighted by the sectoral share of the total value added ($\rho_i = Y_i/Y$)

and

$$\dot{y} / y = \sum_{i=1}^{N} r_i \dot{y}_i / y_i + \sum_{i=1}^{N} r_i \dot{g}_i / g_i \qquad \text{(by deriving y)}$$

Thus the growth rate of labor productivity is equal to the sum of:

- the average of sectoral productivity growth rates, weighted by the sectoral share of total value added;

29

-   the contribution of labor mobility to the growth rate of labor productivity. This derives from the reallocation of this factor, which equals the sum of sectoral labor growth rates in total labor γ_i/γ_i, weighted by the share of sector i in the total value added, ρ_i.

If productivity in two production sectors is different, the greater the importance of labor in the sector with the higher productivity, the greater will be the aggregate productivity. A shift of labor towards the sector with the highest productivity will automatically increase the average of labor productivity.

In a Cobb-Douglas production function with constant returns to scale, the total factor productivity, X, can be written in logarithm term as follows:

$$Ln\,(X) \quad = Ln(Y) - \alpha\,Ln(K) - (1-\alpha)\,Ln(L)$$

$$= \alpha\,Ln(Y/K) - (1-\alpha)\,Ln(Y/L)$$

with Y/K and Y/L are the logarithm of the average productivity of capital and labor respectively.

In terms of growth rates, we have:

$$Ln\,(X_t/X_{t-1}) = \alpha\,Ln\,((Y_t/K_t)/(Y_{t-1}/K_{t-1})) + (1-\alpha)\,Ln((Y_t/L_t)/(Y_{t-1}/L_{t-1}))$$

The TFP growth is thus the sum of the productivity average growth of capital and labor, weighted by their respective elasticity with respect to each factor.

In case of two factors of production, the total effect of reallocating the factors, R is the sum of the reallocation effect of each factor, Rl and Rk, weighted by the respective elasticities of value added to each factor:

$$Ln\,(R_t\,/\,R_{t-1}) = \alpha \sum_{i=1}^{N} \rho_{i,t-1}\ Ln(\mu_{i,t}\,/\,\mu_{i,t-1}) + (1-\alpha)\sum_{i=1}^{N} \rho_{i,t-1}\ Ln(\gamma_{i,t}\,/\,\gamma_{i,t-1})$$

With $\mu_{i,t}$, the share of capital in sector i to total capital.

APPENDIX 2

Data Sources

- The data for capital stocks, investments, human capital were collected from Nehru, Swanson and Dubey (1993).

- The diversification indices were calculated from the CEPII CHELEM database which encompasses 71 products.

- The data on GDP, labor force, exports and imports, credit to the private sector as percentage of the GDP, were taken from the World Development Indicators (World Bank, 1998). For the share of labor and value added in agriculture, the data were complemented by the FAO data and United Nations, World Population Prospects.

APPENDIX 3

Assumptions Concerning Medium-Term Growth Scenarios for 1996-2010

While for each scenario, specific assumptions have been made, common assumptions have also been applied. They concern the following variables:

Diversification is assumed to have reached a threshold, so we have considered the level of 1996 and maintained it constant for the following years. The same has been applied for the index CSX and the degree of openness. For the credit to the private sector as percentage of GDP, proxy of financial deepening, we have considered the data of 1997.

The measure of capital stock is based on perpetual inventory estimation with a common depreciation rate of 5 percent. To calculate the capital stock requires data on the gross domestic fixed investment. To extend our data on the gross domestic fixed investment, we based our calculation on the fact that investment equals internal plus external savings, the later tending to zero over the long run. We then used the gross domestic savings of 1997.

We have also used labor force data for our GDP estimates, by affecting this variable with a coefficient of $(1-a)$. To extend data on labor force, we have used projections of the United Nations World Population Prospects on age distribution in order to determine working age population. Using also data on total population, allowed us to have labor force estimation. As projections of the United Nations are available for 2000/2005/2010, we did interpolation for the lacking data.

Finally, we based the calculation of GDP on our econometric results.

<u>Lower Scenario</u>

This scenario assumes that, due to the social repercussion of the crisis, the level of the Syrquin effect and the stock of human capital do not progress during the period 1996/2010 and remain at their level of 1996.

<u>Higher Scenario</u>

This scenario assumes that the Syrquin effect and the stock of human capital will follow a regular path as was previously the case.

For the human capital stock[22], we extrapolated the data after 1996 using the past trend. For the Syrquin effect, we based our calculation on average growth rate on the period 1960/96 for the variables: agriculture in the labor force and in the value added (see appendix 1 for a detailed presentation of the Syrquin method).

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[22] The human capital stock is a total mean years of education. It encompasses: mean years primary education, mean years secondary education, mean years tertiary education. Based on the data on Nheru, Swanson and Dubey which stops in 1987, we extrapolated the data after 1987 using the estimated 1977/87 trend for the secondary and tertiary education level. For the primary education level, we referred to the method developed by Berthélemy and Söderling (1999).

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