Financial developments and the rate of growth of output: An alternative approach

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Abstract

This paper uses a new specification and approach to estimate the effects of financial developments on the steady state rate of growth of output in India, Malaysia, Korea, Thailand and the Philippines for the period 1970 to 2006. These growth effects, though small, are found to be significant except for the Philippines. The trend rate of growth of total factor productivity (*TFP*), which is due to the omitted but trended variables, is the highest for Malaysia and moderate for India and Thailand. However, *TFP* is insignificant or negative in the Philippines and Korea.

JEL Classifications: O1, O4, N1, O57
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1. Introduction

The effect of developments in the financial sector on economic growth is a debatable issue. Those who deny positive growth effects argue that financial developments have no significant long-run role in economic growth. In fact growth in the financial sector follows rather than leads economic growth; see Robinson (1952), Lucas (1988), Patrick (1966), Demetriades, and Hussein (1996), Singh (1997), Luintel and Khan (1999) and Ang and McKibbin (2007).[1] On the contrary, those who do believe in their positive effects argue that the financial system plays a critical role in reallocating resources to the most productive investments, which in turn lead to higher economic growth. This view was originally pioneered by Goldsmith (1969), McKinnon (1973) and Shaw (1973) and supported by a large body of cross-country empirical evidence by King and Levine (1993), Demirguc-Kund and Maksimovic (1998), Beck, Levine and Loyaza (2000), Levine, Loayza and Beck (2000), Beck, Demirguc-Kunt, Levine and Maksimovic (2001), Christopoulos and Tsionas (2004) and Luintel, Khan, Arestis and Theodoridis (2008).[2] Recently Demirguc-Kunt and Levine (2008) have comprehensively reviewed the controversy on the finance-growth relationship.

In the exogenous growth models financial markets have no role in promoting the long run economic growth. What matters as determinants of the steady state economic growth rate (*SSGR*) in the Solow (1956) model are technological progress and population growth. But with the development of the endogenous growth theories, this has changed. According to the endogenous growth theories, investment in the development of physical and human capital and expenditure on R & D are the main contributors to economic growth.[3]

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[1] Some like De Gregorio and Guidotti (1995) go even further. They show that in the Latin American countries financial intermediation is negatively linked to economic growth. Favara (2003) argues that at best the link between finance and growth is very weak. Gaytan and Rancieres (2004) show that the impact of finance on growth generally increases with income levels, and that financial deepening is weakly correlated with economic growth in low-income countries.

[2] Rajan and Zingales (1998) find evidence that the level of financial development is a good predictor of future rates of economic growth, capital accumulation, and technological change.

[3] Hoover and Perez (2004) note that there are more than eighty different growth enhancing variables used in the empirical works based on the endogenous growth models. Some even quip that the number of growth

However, financial developments also contribute to economic growth by providing an efficient mechanism that channels investment into its higher returns, increase liquidity insurance to reduce idiosyncratic risks, efficiently supply liquidity to transform illiquid assets into liquid liabilities, decrease information asymmetries by efficient financial institutions by screening and monitoring investment projects and allow an efficient pooling of risks among different investment projects. In spite of these arguments and the empirical evidence there is no consensus in the literature on the existence of a stable and a positive relationship between financial development and growth.

In this paper we provide new evidence on the relationship between financial developments and the long run growth rate or the *SSGR*. This is important because in the specifications used in the existing empirical works there is no clear distinction between the short and long run growth effects of any growth improving variables. Our results, with country specific time series data, indicate that the long run or the *SSGR* effects of financial developments are significant but seem to be smaller than found by many studies and the short run growth effects seem to be negligible. To illustrate our approach we have selected India, Malaysia, Korea, Thailand and the Philippines for the period 1970-2006. These countries are of growing importance in the world economic and political environment, accounting for about one third of the world income and trade in 2004. There have also been substantial financial and other reforms and their financial systems and capital accounts have been progressively liberalized over the past decades.

The outline of this paper is as follows. Section 2 reviews briefly the empirical literature on finance and growth relationships. Section 3 deals with the specification and estimation issues. Empirical results with a new specification are presented in Section 4 and Section 5 concludes.

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improving variables identified by the endogenous growth models is as many as the number of countries in a cross-country study; see Durlauf, Johnson and Temple (2004).

2. Financial development and Economic Growth

The traditional catalysts of growth are foreign capital flows, physical investment, high levels of education, human capital, productivity, high saving rates, macroeconomic stability and openness to trade. However, there has been a neglect of the role of financial variables in explaining economic growth. The East Asian economies began liberalizing their financial sectors from the beginning of the 1980s and completed most of these reforms by 1990. However, India's liberalisation policies started in earnest since the early 1990s. Its financial markets were gradually well developed by that time and liberalisation policies made these markets hopefully more efficient. These liberalization policies consisted of 1) deregulation of the domestic financial markets to decrease financial repression, 2) removing restrictions on capital account transactions to increase mobility of capital between countries and 3) opening financial services industries to foreign competition.[4] Further details with country specific measures are in Table A.1 in the appendix.

Since there are excellent surveys on the relationship between finance and growth by Levine (1997) and more recently by Demirgüç-Kunt and Levine (2008) our discussion of this topic will be brief.[5] For convenience the main features and findings of some key empirical works are summarised in Table A.2 in the appendix. There are two mainstream explanations of the positive correlation between financial developments and economic growth. The first one suggests that enterprise leads and finance follows. According to this view financial developments are a consequence of high growth of output that demands more and better financial services; see Robinson (1952), Patrick (1966) and Singh (1997) etc. A few empirical works support this view; see Demetriades, and Hussein (1996), Luintel and Khan (1999) and Ang and McKibbin (2007). The second and the most predominant view suggests that financial institutions and services stimulate investment in

[4] Although it should have been better to include Singapore, China and Indonesia in our study we have excluded them for various reasons. Singapore is already a matured economy and there are data gaps for China and Indonesia. Moreover, the pace of financial liberalisation among the is somewhat similar. We have included India, mainly for comparisons, because although many of its banks are still owned by the government. It made some significant economic progress, comparable to the other East Asian countries since the early 1990s.

[5] Christopoulos and Tsionas (2004) have also a good survey section.

more productive projects and therefore economic growth increases. Pioneering studies of this view are Goldsmith (1969), McKinnon (1973) and Shaw (1973). Goldsmith used data from 35 countries between 1860 and 1963 and found a positive correlation between economic growth and the size of financial system, using financial intermediary assets as proxies for financial progress. McKinnon (1973) and Shaw (1973) have developed basic models to affirm the important role of financial intermediaries in the process of economic growth. They argued that financial repression in the forms of interest rate ceilings, high reserve requirements, directed credit policies, and discriminatory taxation of financial intermediaries reduce the real interest rates which impede an efficient allocation of savings, and consequently these interventionist policies decrease output growth. Therefore, they recommend liberalizing the financial system to achieve higher rates of economic growth.

The message from these pioneering studies has remained somewhat dormant for nearly a decade. However, the globalization and liberalization movement of the 1980s, developments in the endogenous growth theory and encouragement by the IMF and the World Bank has stimulated many empirical works on the finance-growth relationship. King and Levine (1993), a pioneering work in this literature, is noteworthy for stimulating many subsequent empirical works with rigorous and formal econometric techniques. The controversial issue of whether finance causes growth or finance follows growth is also addressed by several works with the Granger causality tests. By and large these works have used panel data methods with panel durations of 5 years. The preferred method of estimation is the generalized method of moments (*GMM*). Their general conclusion, with a few exceptions, is that progress and reforms in the financial sector have large, significant and permanent (long run) growth effect on output; see Table A.2 for a summary.

Christopoulos and Tsionas (2004) has opened up a new approach by pointing that in almost all these panel data studies the stationarity properties of the variables have been ignored and their results are likely to be biased. They have used panel data methods of Pedroni (2000) for estimation with non-stationary variables and estimated finance-growth relationships with a panel of 10 developing countries.[6] Their results also showed that

[6] Other alternatives to Pedroni's method are Breitung (2003) and Mark and Sul (2003). Rao and Kumar (2008) have applied these three methods to estimate the demand for money in some East Asian countries.

finance has a significant and positive long run growth effects and there is no evidence to support the view that finance follows growth.

Studies on the growth-finance nexus with country specific time series data (instead of the widely used panel data methods) and time series techniques of unit roots and cointegration, are relatively new and few.[7] Recently Ang and McKibbin (20067) have used these methods for Malaysia. They found that finance follows growth and there is no evidence that finance causes growth. Bhattacharya and Sivasubramanian (2003) have studied the causal relationships between financial development and economic growth in India for the period 1970-1971 to 1998-1999. They used unit root and cointegration techniques to conclude that financial developments (represented by M3) caused GDP and not the other way around. Yet, Yang and Yi (2007) examined these causal relationships in Korea using annual data from 1971 to 2002. They employed super-exogeneity methodology to find that finance causes growth while rejecting that growth causes finance.[8]

In spite of many insights provided by these studies there seem to be some important limitations in them. Some are methodological in that there are no right or wrong answers. Each of the aforesaid three approaches viz., (1) panel data studies that ignore the time series properties, (2) panel data studies that use the unit roots and cointegration techniques and (3) country specific time series studies, claim that their approach is better. The first approach claims that the number of observations in the time series data is limited and the variations in the explanatory variables are small. This argument is known as the small signal to noise ratio argument which means that the variation in the growth rate (the

[7] There are a number of studies based on this methodology to analyse the contribution of many other growth enhancing variables like human capital, health, tourism, trade openness and globalization etc. However, many such works have used *ad hoc* specifications and somewhat controversial econometric techniques. To conserve space we have decided not list them in the references.

[8] Similarly, Shandre and Ang (2004) using financial indicators related to financial intermediaries in Australia found that economic growth causes financial development in Granger's sense. Yet, they argue, in a somewhat contradictory manner, that the incremental flow of services by the financial sector are essential for funding investment in research and development and thus for economic growth. We will discuss later the inappropriateness of the Granger tests to determine cause and effect between the variables.

dependent variable) is much more than the variation in the explanatory variables. Therefore, they generally use large cross section dimensions to increase the signal to noise ratio because variance in the explanatory variables will be higher between the countries and not so within a country.

Panel data methods that use cointegration and unit roots techniques claim that in comparison to the limited number of time series data points in the country specific studies, their samples have a large number of observations because of pooling cross sectional and time series data. Therefore, their panel unit root and cointegration tests are more powerful and yield better estimates. However, irrespective of the basis for this claim, it is well known that in the unit roots and cointegration tests what matters most is the length of the time period used and not the number of observations. In other words unit roots and cointegration tests based on say 50 annual observations are likely to be more robust than with 365 daily observations.

For the third approach, with country specific estimates, there is a strong methodological support by Greiner, Semler and Gong (2004). Besides the well known criticism that panel data methods make the doubtful assumption that one size fits all, Greiner et al. point out that cross-country studies assume that the forces of growth, as well as technology and preference parameters, are the same for all countries in the sample. Furthermore, deferent institutional conditions and social infrastructure in the countries under consideration will affect estimations and will make the countries heterogeneous, leading to deference in the estimated parameters. Others who take a similar sceptical view about cross-country studies are Bernard and Durlauf (1995, 1996), Durlauf and Johnson (1995), Sala-i-Martin (1997), Dinopoulos and Thompson (1999), Brock and Durlauf (2001), Luintel and Khan (2004) and more recently by Ang and McKibbin (2007) and Luintel, Khan, Arestis and Theodoridis (2008). It is particularly interesting to note that some tests by Luintel et al., (2008) show that their country specific time series approach is preferable to the panel data methods. Therefore, in spite of the limited availability of country specific time series data for longer periods, these models are worth estimating for insights into the effects of country specific factors on growth.

Often in the country specific time series studies the question of causality is examined with the Granger causality tests to determine whether financial developments follow growth or vice versa. This exercise has some limitations because these causality tests are not true cause and effect tests. The often cited justification that "cause occurs before the effect" depends on the selected time to distinguish between before and after. Granger (1988, p.201) explicitly says that "The name is chosen to include the *unstated assumption* that possible causation is not considered for any arbitrarily selected group of variables, *but only for variables for which the researcher has some prior belief that causation is, in some sense, likely*." (Italics added). The basis for any prior belief is a well justified theoretical argument. The Granger causality tests, therefore, are essentially tests on whether one of the right-hand side variables, say X_t changes when there is disequilibrium in the left-hand dependent variable *Y* in period *t-1*. This is the weak erogeneity test. If ΔX is also not affected by ΔY, *X* is strongly Granger exogenous implying that ΔX_t may be included in the *ARDL* of ΔY_t. Granger causality tests are essentially tests to develop specifications for the best equations to predict or forecast ΔY_t. For this reason, ΔX_t is not included to forecast ΔY_t because information on ΔX_t may not be available.

This view of the Granger causality tests is emphasized by Stock and Watson (2003, p.449) with the observation ``While `Granger predictability' is a more accurate term than `Granger causality' the latter has become part of the jargon of econometrics''. For these reasons routine applications of these causality tests to determine whether finance follows growth or finance causes growth do not seem to be meaningful.[9] A more appropriate approach is to assume that both are interdependent and develop models to determine the strength of the two relationships.[10]

In this paper we shall use country specific estimates and draw attention to other neglected weaknesses in all the above three approaches. In these studies often it is explicitly stated that their objective is to estimate the long run growth effects of financial developments or

[9] The Granger tests have been used in a similar way and without much use in other areas also the most notable being in the energy-output relationships.

[10] Ang and McKibbin (2007) take a similar view but they use a single equation approach and apply these tests. Estimation of a simultaneous equations model is beyond the scope of our present paper.

some growth enhancing variables. This long run growth rate is the same as the permanent growth rate or the steady state or the equilibrium growth rate of the theoretical growth models. Henceforth we shall refer to this growth rate as the steady state growth rate (*SSGR*). Next it is important to ask whether the specifications used for output or its rate of growth, in various types of empirical works, are appropriate to capture the effects of financial reforms (or other variables) on the *SSGR*. Commenting on the specifications used in the empirical works Easterly, Levin and Roodman (2004) observed that "This literature has the usual limitations of choosing a speci?cation without clear guidance from theory, which often means there are more plausible speci?cations than there are data points in the sample." Besides this, another fundamental weakness in the specifications is that annual or 5 year average growth rates of output do not accurately measure the unobservable *SSGR*. Conceptually *SSGR* is similar to the natural rate of unemployment. Therefore, its estimates should be derived by imposing the equilibrium conditions on an estimated non-steady state model with observable variables. Furthermore, simulations with the closed form solutions show that a typical economy takes several decades to reach its steady state even if the perturbations are small; see Sato (1963), Jones (2000) and Rao (2006). Our view that 5 year average growth rates, typically used in the panel data studies, are unsatisfactory to proxy *SSGR* is also corroborated by Easterly et al. (2004). When they have used panels of various lengths, instead of the 5 year averages in the well known paper on the effects of aid by Burnside and Dollar (2000), they found that some crucial parameters have become insignificant.

3. Specification

In light of the aforesaid problems and the need to derive the estimates of *SSGR* by estimating an appropriate dynamic non-steady state model, it may be said that what can be estimated with annual data and short panels, seems to be at best a production function. The production function can be modified to capture the permanent growth effects of variables like financial reforms or any other variables through their effects on the total factor productivity (*TFP*). Edwards (1998) and Dollar and Kraay (2004) have suggested a similar procedure to estimate the effects of trade openness on *SSGR*. However, our method is somewhat different from the growth accounting approach in Dollar and Kraay (2004) because this extension depends on the selected growth model for specification of output.

In this paper we select the Solow (1956) growth model for the following reasons. Firstly, this model, with a constant returns production function, is easy to extend and estimate compared to a variety of endogenous growth models. The latter need additional equations on how households and firms make saving and investment decisions and a system of non-linear dynamic specifications for estimation. Greiner et. al., (2004) have estimated such endogenous growth models with country specific time series data to determine the transitory and permanent growth effects of expenditures on R&D and education etc. In contrast to their approach, many empirical works use *ad hoc* growth equations claiming that they are based on one or another endogenous growth models. Secondly, there is no convincing evidence that endogenous growth models, with increasing returns, empirically perform better than the Solow model; see Jones (1995), Korcherlkota and Ke-Mu Yi (1996), Parente (2001) and Solow (2000). Solow (2000) observed that "The second wave of runaway interest in growth theory—the endogenous-growth literature sparked by Romer and Lucas in the 1980s, following the neoclassical wave of the 1950s and 1960s—appears to be dwindling to a modest flow of normal science. This is not a bad thing. Nevertheless, a wider variety of growth models is now available for trying out; and some of the main empirical uncertainties have been specified, and perhaps narrowed down even if not settled." Our extended Solow model may be called the Solow model with an endogenous framework. The well known extension to the Solow model by Mankiw, Romer and Weil (1991) is based on a similar approach. However, our extension differs somewhat but its underlying spirit is similar. Further, for reasons stated above, we ignore the Granger tests.

Let the Cobb-Douglas production function, with the constant returns and Hicks-neutral technical progress, be

$$y_t = A_t k_t^{a} \qquad 0<a<1 \qquad (1)$$

where y = per worker output, A = stock of technology and k = capital per worker. It is well known that $SSGR$ in the Solow model equals the rate of growth of A. The Solow model assumes that the evolution of technology is given by

$$A_t = A_0 e^{gT} \qquad (2)$$

where A_0 is the initial stock of knowledge and T is time.. Therefore, the steady state growth of output per worker ($SSGR$) equals g. It is also plausible to assume for our purpose that

$$A_t = f(T, FD_t) \quad f_T \text{ and } f_{FD} > 0 \tag{3}$$

where FD is a measure of financial developments. The effect of FD on TFP can be captured with a few alternative empirical specifications for (3). Simple linear and non-linear specifications of the extended production function of equation (1) are as follows.

$$y_t = A_0 e^{(g_1 + g_2 FD_t)T} k_t^{\ a} \tag{4}$$

$$y_t = A_0 e^{\left(g_3 - g_4 \frac{1}{FD_t}\right)T} k_t^{\ a} \tag{5}$$

Equation (5) with non-linear effects would be useful to test the validity of the finding in King and Levine (1993) and Beck and Levine (2002) if the growth effect of financial development on low and middle income countries, are larger than on the developed countries. A third alternative[11] is to introduce FD as a shift variable into the production function implying that

$$A_t = A_0 e^{gT} FD_t^b \tag{6}$$

and

$$y_t = \left(A_0 e^{gT} FD_t^b\right) k_t^a \tag{7}$$

These formulations can also be used, in a similar way, to test for the growth effects of other variables. It is also possible to introduce conditionality variables into our specifications. These alternative specifications imply that the corresponding $SSGR$s are:

[11] Luintel, Khan, Arestis and Theodoridis (2008) have used a similar specification with 2 variables to measure the developments in the financial sector. However, their specification seems to assume that the entire *TFP* is due to the financial developments and ignores the contribution of other variables. To allow for such effects Luintel et.al should have included time trend in their production function.

$$\Delta \ln y^* = g_1 + g_2\ FD \qquad (4')$$

$$\Delta \ln y^* = g_4 - g_5 FD^{-1} \qquad (5')$$

$$\Delta \ln y^* = g + b\ \Delta \ln FD \qquad (7')$$

These specifications are well suited to test, for example, that countries with higher financial development grow faster because the *SSGR* (denoted as Δy^* above) depends on *FD*. The intercept parameters in the above 3 specifications may be interpreted as *TFP* due to other ignored growth factors. These variables are generally highly trended and the intercept term is a reasonable measure of *TFP* due to these missing variables.

What are the best measures of financial development? There is no simple answer. Ang and McKibbin (2007) in some detail discuss the measurement issue. Christopoulos and Tsionas (2004) have used perhaps the simplest measure with the ratio of total deposit liabilities to *GDP*. On the other hand Luintel et al., (2008) have used a more complex and comprehensive measures where a number of variables are used to measure financial structure and financial depth. We settle for the somewhat an intermediate measure of Ang and McKibbin (2007) of combining with the principal components method three variables viz., the ratio of private credit to *GDP* (*CRAT*), the ratio of bank assets to the total assets of banks and the central bank (*ARAT*) and the ratio of *M3* to *GDP* (*M3RAT*). Various measures of financial depth are usually trended and highly correlated. Therefore, Christopoulos and Tsionas' simple measure may also yield good results.

4. Empirical Results

Ang and McKibbin (2007) have developed a useful framework to analyse financial developments with the Malaysian time series data. Their framework has many merits but it does not distinguish between the short and long run growth effects of financial developments. Their specification for the output equation is the inverted function of their financial determinants function. This is devoid of factor inputs and inappropriate to capture the output effects of financial developments. In contrast we use a proper production function. To illustrate the use of our approach we have selected India, Korea, Malaysia, the Philippines and Thailand for the period 1970 to 2006. A brief review of important developments in their financial sectors is in the appendix.

All the variables are tested for unit roots and found to be *I(1)* in levels and *I(0)* in their first differences. These test results are not reported to conserve space but may be obtained from us. Since we have used the Ang and McKibbin method to measure financial developments (*FD*), our *FD* variable is the first principal component of the three variables viz., *CRAT*, *ARAT* and *M3RAT*. The weights implied by the first principal component, reported in Table 1, are used for aggregation as in Ang and McKibbin.[12] To estimate the cointegrating equations we have used the Phillips and Hansen (1990) fully modified *OLS* (*FMOLS*) method and its merits, for country specific time series data, are discussed in detail by Luintel et al. (2008).[13] However, we have encountered a few problems due to the high co-linearity between the trend to capture autonomous *TFP* and the product of trend and $FD(T \times FD)$; see equation (4). Furthermore, estimates with specifications in equations (5) and (6) did not yield meaningful results. Therefore, we have dropped trend from equation (4) and estimated the cointegrating equations.[14] Estimates for the five countries are reported in Table-1.

Estimates of all the coefficients, except for the Philippines, are significant. It was necessary to introduce the East Asian Financial Crisis dummy variable (*DUMFC*) into the estimates for Thailand to make the coefficient of *FD* significant. Therefore, the financial crisis during 1997-98 seems to have permanently decreased its level of output.[15] The coefficient of the log of per worker capital (*log(k)*), which is the share of profits, is about its stylised value of one third for India, Malaysia and Korea and higher at 0.5 for Thailand.

[12] Ang and McKibbin have used the logarithms of these 3 variables but we have used the actual ratios. Ang and McKibbin's weights are almost equal at one third each. However, our weights for Malaysia are different because we found that *ARAT* is flat and negatively correlated with *CRAT* and *M3RAT*; see Table-1 below.

[13] *FMOLS* corrects for both short and long-run dependence across equation errors. Therefore, the standard distributions are valid for *t*-ratios. This estimator is super consistent and performs well in small samples. However, its distributional assumptions depend on asymptotic theory and therefore it is desirable to examine the distributional properties of the parameters through bootstrap simulations. However, we did not use this since in most cases the *t*-ratios of our estimated coefficients are generally large; see Table-1 below.

[14] When trend was included Microfit gave an error warning that the standard errors are small, implying that there was no convergence and the inverse matrix could not be computed.

[15] Ang and McKibbin have introduced 5 dummy variables into their cointegrating equation for Malaysia. We experimented with these dummy variables in the estimates for the Malaysian data. Although their coefficients were significant, these dummy variables did not affect the estimates of other coefficients.

It is low at 0.2 for the Philippines. However, the Wald test did not reject the null that they are not significantly different from one third.[16] The long run growth effects of *FD* are significant, except for the Philippines.

Table-1
Cointegrating equations (1970-2006)
Dependent Variable *log(y)*

	India	Malaysia	Korea	Thailand	Philippines
Intercept	-3.059 (-6.02)*	-7.643 (-13.43)*	0.622 (6.38) *	4.632 (4.52)	8.459 (10.37)
log(k)	0.397 (3.04)*	0.351 (6.09)*	0.306 (3.26) *	0.518 (5.69)	0.193 (2.71)
$T \times FD$	0.246E-3 (2.99)*	0.903E-4 (4.01) *	0.272E-3 (3.65)**	0.991E-4 (2.18)	0.723E-5 (0.33)
DUMFC			-0.196 (-3.75)*#	-0.087 (-2.01)	
DUM83-85					-0.028 (-0.64)
$\overline{FD}$ E_{yFD}	46.928 1.15%	89.389 0.81%	77.362 2.11%	78.274 0.78%	50.468 …..
$\Delta FD_{1970/2006}$	38	92	38	58	16
$\Delta SSGR_{1970/2006}$	0.94%	0.83%	1.02%	0.58%	…..
		Weights used for Principal Components			
M3RAT	0.342	0.522	0.355	0.336	0.346
CRAT	0.332	0.525	0.344	0.334	0.372
ARAT	0.326	-0.046	0.321	0.330	0.282

Notes: *FD* is the weighted average of the monetary variables where the weights (shown in the last 3 rows) are derived from the first principal component. E_{yFD} is the elasticity of long run output growth with respect to *FD* at its mean value. *t*-ratios are in the parentheses below the coefficients. * and** denote significance at 5% and 10% levels. $\Delta FD_{1970/2006}$ is the change in *FD* between 1970 and 2006 and $\Delta SSGR_{1970/2006}$ is increase in *SSGR* due to improvements in *FD* from 1970 to 2006.

[16] The c^2 test statistics with *p*-values in the square brackets are: India = 0.554[0.46], Malaysia = 0.790[0.37], Korea = 0.005[0.95] and Philippines =2.300[0.13]. Therefore the null could not be rejected at 5% level.

At the mean value of *FD* for India its elasticity is 1.15% implying that a 1% increase in *FD* increases its long run growth rate by 1.15%.[17] The elasticity of growth of output with respect to *FD* in Malaysia and Thailand are marginally smaller than for India. This elasticity is the highest at 2.1% for Korea. Improvements in *FD* from 1970 to 2006, $\Delta FD_{1970/2006}$ are the highest in Malaysia. These improvements in the financial sector, between 1970 and 2006, have added almost 1% to the *SSGR*s of India, Malaysia and Korea and about 0.6% in Thailand. These results are somewhat comparable to Levine's (1997) results with cross country methods. He found that if the mean *FD* increases from 0.2 to 0.6 i.e., by about 110%, the rate of growth of per capita incomes will increase by 1%.[18]

Since we did not get any significant results on the growth effects of *FD* for the Philippines, we experimented by introducing some alternative dummy variables to capture the effects of its persistent political instability. None of these alternatives yielded a significant coefficient for *FD*. Therefore, we proceeded with an alternative approach. Since the estimate of the profit share is significant but its point estimate is somewhat lower, we have increased its value by one standard error and computed the total factor productivity (*TFP*) as $\Delta \log(y) - a\Delta \log(k)$. This is a common practice in the growth accounting exercises and

[17] This is computed as follows:

$$E_{yFD} = \left[\frac{\partial \log(y) / DT}{\partial FD} \times \overline{FD} \right] \times 100$$

[18] Levine's cross country estimates are for the period 1960-1989. He found that the rate of growth of per capita income could increase by 1% due to an increase in *FD* by about 110%. In Malaysia, for example, our *FD* measure has increased by almost 100% causing an increase of 0.83% in the growth rate of per worker income. This is marginally less than in Levine because of a positive growth rate in the participation rate. However, it should be noted that Levine's *FD* measure is based on a single monetary ratio, comparable to our *M3RAT*, and he has introduced some control variables like trade openness, inflation and the ratio of government consumption expenditure to *GDP* etc., but their coefficients did not have the expected signs. Furthermore, the advantage of time series based country specific studies is that the growth effects of *FD* may differ across countries and this can be best captured this way. These effects are slightly higher than in Malaysia for both India and Korea and lower in Thailand and the Philippines (to be discussed shortly).

known as the Solow residual. This *TFP* is regressed on time, *FD* and a few dummy variables and the estimate is as follows.[19]

$$TFP_t = \underset{}{-0.0708} \underset{[0.00]^*}{-0.0004T} \underset{[0.46]}{+0.0045FD_t} \underset{[0.00]^*}{-0.060FD_{t-1}} \underset{[0.01]^*}{+0.0033FD_{t-2}} \underset{[0.01]^*}{} + \text{Dummy Variables} \quad (8)$$

$$\bar{R}^2 = 0.689;\ SEE = 0.019;\ c_{sc}^2 = 1.575[0.21];\ c_n^2 = 2.947[0.23]$$

$c^2 s$ are tests of serial correlation and normality of errors, p-values are in the square brackets and the standard errors are heteroskedasticity consistent Newey and White adjusted. Significance at the 5% level are denoted with an asterisk. Residuals of (8) are tested for unit roots with the *ADF* and *KPSS* tests and found to be *I(0)*. This equation implies that there are no significant autonomous *TFP* enhancing factors in the Philippines. The sum of the three coefficients of *FD* is $0.1737E^{-2}$ and the Wald test rejected the null that this is zero. The computed test statistic with p-value in the square brackets is $c_{(1)}^2 = 15.5065[0.00]$. Therefore, if *FD* increases by 10 points, its permanent growth effects are small at 0.1% for the Philippines but these are significant.

Improvements in *FD* may also have short run growth effects. Therefore, using the lagged values of the error correction terms, implied by the cointegrating equations in Table-1, we have estimated the short run dynamic equations for the rate of growth of output for India, Malaysia, Korea and Thailand. These estimates are in Table-2 and they are reasonably well determined. Current period changes in per worker capital are retained in the equations for Malaysia and Thailand to avoid serial correlation in the residuals. This may introduce some endogenous variable bias in the estimates of their coefficients. It was necessary to constrain the estimates of the coefficients of the lagged changes in *FD* for Malaysia to retain the significance of its lagged *ECM*.

[19] The dummy variables, all significant and negatively signed, are for political instability in 1983-85 (end years of Ferdinand Marcos' regime) 1988-89 and 1991 (political instability during the early regime of Aquino and natural disaster due to Mount Pinatubo eruption), 1997-98 East Asian Financial Crisis, and world wide recession in 2001.

Some dummy variables are added to all these countries which are significant and have only transient growth effects. *DUM1979* and *DUM1991* for India are for the negative effects of the political emergency in 1979 and the economic crisis in 1991. The latter lead India to heed the IMF and World Bank advice to implement market liberalisation policies. *DUMFC* is the 1997-98 East Asian Financial Crisis dummy and *DUM2001* is for the global recession. These two dummies were also used by Ang and McKibbin (2007). Details of these dummy variables are in the appendix.

The short run growth effects of *FD* seem to be very small or insignificant for India, Malaysia and Thailand. For example, for India, an increase in *FD* by 10 points will increase its short run growth rate by only 0.02% with a lag of two years. This lag seems to be reasonable because the corporate bond market is not well developed in India and there is a substantial lag between financing the projects with bank loans and their output effects. In Korea the coefficients of *FD* and its lagged values were insignificant and not shown to conserve space. In Malaysia and Thailand these short run effects are very small. They are insignificant in Thailand and perverse in Malaysia. Therefore, it may be said that financial reforms seem to have small but significant and permanent growth effects but their short run growth effects are negligible.

The short nun dynamic equation for Korea needs further explanation because it has caused a few problems. When it is assumed that *TFP* is constant from 1970 to 2006, the coefficient of trend was negative. Therefore, we have re-estimated this equation with a plausible assumption that *TFP* might have change after the East Asian financial crisis in 1997-1998. With the assumption that the trend of *TFP* in Korea changed after the financial crisis the underlying trend of *TFP* is positive and only 0.5%. However, the financial crisis of 1997-98 has worsened this and made it about -0.35%. These negative effects may disappear eventually when Korea makes the necessary structural adjustments. In comparison to Korea the *TFP* trend in Malaysia is 2.4% and in India and Thailand about 1%. These estimates may be interpreted as *TFP* due to the missing and trended growth improving factors.

Table-3

Short Run Dynamic Equations

	India	Malaysia	Korea	Thailand
Intercept	0.309E^{-2} [0.28]	-0.062 [0.08]**	0.028 [0.00]*	-0.037 [0.00]*
T	0.110E^{-2} [0.00]*	0.244E^{-2} [0.01]*	0.541E^{-3} [0.05]**	0.126E-^{2} [0.00]*
$T \times DUM1998$			-0.896E^{-3} [0.00]*	
ECM_{t-1}	-0.173 [0.00]*	-.246 [0.08]**	-0.310 [0.00]*c	-0.296 [0.00]*
$\Delta \log(k_t)$	…..	0.967 [0.00]*	0.310 [0.00]*c	1.359 [0.00]*
$\Delta \log(k_{t-1})$	0.226 [0.02]*	…..		-0.354 [0.00]*
ΔFD_t	…..	…..		0.682E^{-3} [0.63]
ΔFD_{t-1}	…..	-0.449E^{-3} [0.03]*^{C}		…..
ΔFD_{t-2}	0.190E^{-2} [0.05]*	-0.449E^{-3} [0.03]*^{C}		…..
$DUM1979$	-0.103 [0.00]*	…..	…..	…..
$DUM1991$	-0.049 [0.00]*	…..	…..	…..
$DUMFC$	…..	-0.060 [0.01]*^{C}	‘’’’	-.0758 [0.00]*
$DUM2001$	…..	-0.060 [0.01]*^{C}	-0.062 [0.00]	-0.039 [0.00]*
$\overline{R^2}$	0.651	0.518	0.751	0.816
c^2_{sc}	3.492 [0.06]	0.076 [0.78]	2.638 [0.11]	0.803 [0.37]
c^2_n	2.914 [0.23]	0.254 [0.88]	1.281 [0.527]	1.547 [0.46]

Notes: c stands for constrained estimate, c^2 are tests of serial correlation and normality of errors. *p*-values are in the square brackets and the standard errors are Newey and White adjusted. * and** denote significance at 5% and 10% levels.

5. Conclusions

In this paper we have estimated the effects of developments in the financial sector on the long and short run growth rates of five Asian countries. For this purpose we have used a new specification and approach. We derived the long run growth effects by estimating a modified production function to capture the long run growth effects. Our specification and approach are based on a valid theoretical growth model of Solow (1956) model, whereas, with the exception of Luintel et.al., (2008), somewhat *ad hoc* specifications have been used in most empirical works. Furthermore, our specification and methodology can also be easily used in the panel data studies by estimating a modified production function instead of growth equations. This will increase the number of observations and efficiency of estimates because annual data can be used instead of panels of 5 years.

We found that financial developments have significant long run growth effects but these are small. However, in the Philippines these growth effects are nil perhaps due to its political instability. In general a doubling of the strength of the financial reforms is likely to add about one percent to the long run growth rate. Their short run growth effects are negligible. While it is desirable to increase the pace of liberalisation of the financial markets it should be noted that the speed with which these reforms can be made seems to be slow. For example while in Malaysia the rate of growth of our *FD* variable has been 4% per year, on the average, in India this was low at 1.7%. At the current average growth rates it will take 40 years for India to double its *FD* whereas this can be achieved in 17 years in Malaysia. In spite of this financial reforms are desirable because they may also increase the growth effects of other policies.

There are a few limitations in our work. It was not possible to capture the growth effects of some omitted and trended variables along with *FD* because of multi-co-linearity between these two sets of variables. Our estimates of the growth effects of these other trended variables are based on an indirect approach. There is some endogenous variable bias in some equations of Table-2 because of the presence of the current period change in the capital stock. Although we proposed three alternative specifications only one of them gave meaningful results. Finally, a simultaneous equations model where financial developments and growth are mutually dependent is likely to give more insights into the growth effects of financial developments than the existing empirical work with single

equations and *ad hoc* application of the Granger causality tests. We hope that the merits and limitations of our specification and methodology will be further explored by other researchers.

References

Abidin, Z. (1986) "Financial Reform and the Role of Foreign Banks in Malaysia," in Hang-Sheng Cheng (ed.) *Financial Policy and Reform in the Pacific Basin Countries*, Lexington MA: Lexington Books, 305-309.

Aghion, P., Howitt, P. and Mayer-Foulkes, D. (2005) "The Effect of Financial Development on Convergence: Theory and Evidence," *Quarterly Journal of Economics*, 120 (1): 73-222.

Andrés, J., Hernando, I. and Lópes-Salido, J. (1999) "The Role of the Financial System in the Growth-Inflation Link: The OECD Experience," Banco de Espana Working Paper No. 20.

Ang, J., and McKibbin W. (2007) "Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia," *Journal of Development Economics*, 84 (1): 215-233.

Arestis, P., and Demetriades, P. (1997): "Financial Development and Economic Growth: Assessing the Evidence," *Economic Journal*, 107(442): 783-99.

Beck, T., Demirgüç-Kunt, A., and Levine. R, and Maksimovic, V. (2004): "Financial Structure and Economic Development: Firm, Industry, and Country Evidence," in Demirgüç-Kunt, A., and Levine. R., (eds.), *Financial Structure and Economic Growth: A Cross-Country Comparison of Banks, Markets, and Development*, MIT Press, Cambridge, MA.

Beck, T., Ross, L., and Norman L. (2000) "Finance and the Sources of Growth," *Journal of Financial Economics*, 58(1): 261-300.

Beck, T. and Levine, R. (2004) "Legal Institutions and Financial Development," NBER Working Paper No. W10417.

Bernard, A. B. and Durlauf, S. N. (1995) "Convergence in International Output," *Journal of Applied Econometrics*, 10(2): 97-108.

---------- and ----------. (1996) "Interpreting Tests of the Convergence Hypothesis," *Journal of Econometrics*, 71(1-2): 161-173.

Bhattacharya, P., and Sivasubramanian, M. (2003) "Financial Development and Economic Growth in India: 1970-1971 to 1998-1999," *Applied Financial Economics*, 13(12): 905-909.

Breitung, J. (2002) "Nonparametric Tests for Unit Roots and Cointegration," *Journal of Econometrics*, 108(2): 343-363.

Brock, W., and Durlauf, S. (2001) "Growth Empirics and Reality," *The World Bank Economic Review*, 15(2): 229-272.

Burnside, C., and Dollar, D. (2000) "Aid, Policies and Growth," *American Economic Review*, 90(4): 847-868.

Calderon, C., and Liu, L. (2003) "The Direction of Causality Between Financial Development and Economic Growth," *Journal of Development Economics*, 72(1): 321-334.

Christopoulos, D., and Tsionas, E. (2004) "Financial Development and Economic Growth: Evidence From Panel Unit root and Cointegration Tests," *Journal of Development Economics*, 73(1): 55-74.

De Gregorio, J. and Guidotti, P. (1995) "Financial Development and Economic Growth," *World Development*, 23(3): 433-448.

Demetriades, P., and Hussein, K. (1996) "Does Financial Development Cause Economic Growth? Time-Series Evidence From 16 Countries," *Journal of Development Economics*, 51(2): 387-411.

Demirgüc-Kunt and Levine, R (2008) "Finance, Financial Sector Policies, and Long-Run Growth," PRWP No. 4469, Washington: The World Bank.

Demirgüç-Kunt, A., and Maksimovic, V. (1998) "Law, Finance and Firm Growth," *Journal of Finance*, 53(6): 2107-2137.

Dinopoulos, E., and Thompson, P. (1999) 'Scale Effects in Schumpeterian Models of Economic Growth," *Journal of Evolutionary Economics*, 9(2): 157-185.

Dollar, D., and Kraay, A. (2004) "Trade, Growth and Poverty," *Economic Journal*, 114(493): F22-F49.

Durlauf, S. and Johnson, P. (1995) "Multiple Regimes and Cross-Country Growth Behaviour," *Journal of Applied Econometrics*, 10(4): 365-84.

Durlauf, S. N., Johnson, P. and Temple, J. (2005) "Empirics of Growth and Development," in *Handbook of Economic Growth*, Aghion, P. and Durlauf, S. N. (eds.), Amsterdam: North-Holland.

Easterly, W., Levine, R., and Roodman, D. (2004) "Aid, Policies and Growth: Comment," *American Economic Review*, 94(3): 774-780.

Edwards, S. (1998) "Openness, Productivity and Growth: What Do We Really Know?" *Economic Journal*, 108(447): 383-98.

Fase, M., and Abma, R. (2003) "Financial Environment and Economic Growth in Selected Asian Countries," *Journal of Asian Economics*, 14(1): 11–21.

Favara, G. (2003) "An Empirical Re-assessment of the Relationship between Finance and Growth," IMF Working Paper 03/123.

Gaytán, A., and Romain, R. (2004) "Wealth, Financial Intermediation and Growth," UPF Economics and Business Working Paper No. 851.

Glen, J., and Pinto, B. (1994) "Debt or Equity? How Firms in Developing Countries Choose," IFC Discussion paper No. 22, 1-16.

Goldsmith, R. (1969) "*Financial Structure and Development*," New Haven: Yale University Press.

Granger, C. (1988) "Some Recent Developments in a Concept of Causality," *Journal of Econmetrics*, 39(2): 199–211.

Greiner, A., Semler, W., and Gong, G. (2004) *The Forces of Economic Growth: A Time Series Perspective*, Princeton, NJ: Princeton University Press.

Guha-Khasnobis, B., and Bari, F. (2003) "Sources of Growth in South Asian Countries" in Ahluwalia, I., and Williamson, J. (eds.), *The South Asian Experience With Growth*, Oxford: Oxford University Press.

Habibullah, M. S. and Eng, Y-K. (2006) "Does Financial Development Cause Economic Growth? A Panel Data Dynamic Analysis for the Asian Developing Countries," *Journal of the Asia Pacific Economy*, 11(4): 377 – 393.

Henry, P. (1999) "Appendix of Major Policy Changes in Selected developing Countries, mimeo, Stanford University, Graduate School of Business.

Hoover, K., and Perez, S. (2004): "Truth and Robustness in Cross-country Growth Regressions," *Oxford Bulletin of Economics and Statistics*, 66(5): 765-798.

Howitt, P., and Mayer-Foulkes, D. (2005) "R&D, Implementation, and Stagnation: A Schumpeterian Theory of Convergence Clubs," *Journal of Money, Credit and Banking*, 37(1): 147-77.

Jones, C. (1995) "R&D-Based Models of Economic Growth", *Journal of Political Economy*, 103(4): 759-784.

---------- (2000) "A Note on the closed-form solution of the Solow model," available from Jones' homepage.

Ketkar, K. (1993) "Public Sector Banking, Efficiency and Economic Growth in India," *World Development*, 21(10): 1686-87.

King, R., and Levine, R. (1993) "Finance and Growth: Schumpeter Might be Right," *Quarterly Journal of Economics*, 108(3): 717-37.

Kohcerlakota, N., and Yi, K. (1996) "A Simple Time Series Test of Endogenous vs. Exogenous Growth Models: An Application to the United States," *Review of Economics and Statistics*, 78(1): 126-134.

Liang, Q., and Teng, J. (2006) "Financial Development and Economic Growth: Evidence From China," *China Economic Review*, 17(4): 395-411.

Levine, R. (2004) "Finance and Growth: Theory and Evidence," NBER Working Paper No. W10766.

Levine, R. (1997) "Financial Development and Economic Growth: Views and Agenda," *Journal of Economic Literature*, 35(2): 688-726.

Levine R., Loayza N., and Beck T. (2000) "Financial Intermediation and Growth: Causality and Causes," *Journal of Monetary Economics*, 46(1): 31-77.

Loayza, N. and Rancieres, R. (2005) "Financial Development, Financial Fragility, and Growth," IMF Working Paper No. 05/170.

Lucas, R. (1988) "On the Mechanics of Economic Development," *Journal of Monetary Economics*, 22(1): 3-42.

Luintel, K.B., Khan, M., (1999) "A quantitative Reassessment of the Finance-Growth Nexus: Evidence from a Multivariate VAR," *Journal of Development Economics*, 60(2): 381–405.

Luintel, K. B. and Khan, M. (2004) "Are International R&D Spillovers Costly for the US?" *Review of Economics and Statistics*, 86(4): 896-910.

Luintel, K. B., Khan, M., Arestis, P. and Theodoridis, K. (2008) "Financial Structure and Economic Growth, *Journal of Development Econ*omics, 86(1): 181–200.

Mankiw, N., Romer, D., and Weil, D. (1992) "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics*, 107(2): 407-37.

Mark, N., and Sul, D. (2003) "Cointegration Vector Estimation by Panel DOLS and Long-run Money Demand," *Oxford Bulletin of Economics and Statistics*, 65(5): 655–680.

McKinnon, R. (1973) *Money and Capital in Economic Development,* Washington, D.C.: The Brooking Institute.

Parente, S. (2001) "The Failure of Endogenous Growth," *Knowledge Technology and Policy*, 13(4): 49-58.

Patrick, H. (1966) "Financial Development and Economic Growth in Underdeveloped Countries," *Economic Development and Cultural Change*, 14(1): 174-189.

Pedroni, P. (2000) "Fully Modified OLS for Heterogeneous Cointegrated Panels," *Advances in Econometrics*, 15(1): 93–130.

Pineiro, J., Tamazian, A., and Vadlamanatti, K. C., (2008) "Measuring the Impact of Economic Reforms on Indian economy: Where are we & What lies ahead?" in *IUP on Indian Economy: Perspectives and the Road Ahead*, V V Ramani and Naveen Kumar (ed.), ICFAI University Press, Hyderabad, India, forthcoming.

Rajan, R., and Zingales, L. (1998) "Financial Dependence and Growth," *American Economic Review*, 88(2): 559-586.

Rao, B., and Kumar, S. (2008) "A Panel Data Approach to the Demand for Money and the Effects of Financial Reforms in the Asian Countries," MPRA Paper 6565, University Library of Munich, Germany.

Rao, B. B. (2006) "Investment Ratio and Growth," *ICFAI Journal of Applied Economics*, 3(4): 68-72.

Robinson, J. (1952) *The Rate of Interest, and Other Essays*, London: Macmillan.

Sala-i-Martin, X. (1997) "I Just Ran Two Million Regressions," *American Economic Review*, 87(2): 178–183.

Sato, R. (1963). "Fiscal Policy in a Neo-Classical Growth Model: An Analysis of Time Required for Equilibrium Adjustment," *Review of Economic Studies*, 30(1): 16-23.

Shandre, M., and Ang, J. (2004) "Financial Development and Economic growth in Australia: An Empirical Analysis," *Empirical Economics*, 29 (2): 247-260.

Shaw, E. (1973) *Financial Deepening in Economic Development*, New York: Oxford University Press.

Singh, A. (1997) "Financial Liberalisation, the Stock market and Economic Development," *Economic Journal*, 107(442): 771-782.

Solow, R. (1956) "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, 70(1): 65-94.

Solow, R. (2000): "Toward a Macroeconomics of the Medium Run," *Journal of Economic Perspectives*, 14(1): 151-58.

Stock, J., and Watson, M. (2003) *Introduction to Econometrics*, New York: Addison-Wesley.

Appendices

A.1.Data Appendix

Data Appendix

Variable	Source
Y is real GDP at constant 1990 prices (in millions and national currencies)	UN National accounts database.
L is labour force or population in the working age group (15-64), whichever is available	World Development Indicator CD-2007.
K is real capital stock estimated with the perpetual inventory method with the assumption that the depreciation rate is 4% (in million national currencies).	Data on total investment are from UN National accounts database.
ARAT is the ratio of bank assets to the total assets of banks and the central bank	Data are taken from the updated version (as for August, 2007) of Beck, T., Demirgüç-Kunt, A. and Levine, R. (2000).
CRAT is the ratio of private credit to GDP	Data are taken from the updated version (as for August, 2007) of Beck, T., Demirgüç-Kunt, A. and Levine, R. (2000).
M3RAT is the ratio of *M3* to *GDP*	Data are taken from the updated version (as for August, 2007) of Beck, T., Demirgüç-Kunt, A. and Levine, R. (2000).

Dummy Variables	Description
DUM1979	One in 1979 and zero in all other periods to capture the adverse economic effects of emergency rule in India.
DUM1991	One in 1991 and zero in all other periods to capture the adverse of foreign exchange reserves and its economic crisis in India.
DUM1998	One from 1998 and zero before to capture the break in the trend of *TFP* in Korea.
DUMFC	One during 1997 and 1998 and zero in all other periods to capture the effects of the East Asian financial crisis.
DUM2001	One in 2001 and zero in all other periods to capture the effects of world recession which affected the East Asian economies.

A.2. Review Appendix for Financial Developments

(Artur: Please check this again)

India

The Indian financial system was quite well developed even before the Independence and unrestricted until the 1960s when the government started to use controls for the purpose of directing credit towards development programs. By the end of 1960s, fourteen major commercial banks were nationalized and all commercial banks (private and public) were directed to lend to priority sectors. During 1970s, directed credit took the major share of domestic lending and controls on exchange rates and interest rates became the common components of this tightly restricted financial system. Thus, until the 1980s international capital inflows and outflows were highly restricted and the purchase of foreign assets by residents, direct investment by foreigners and private external borrowing were absolutely prohibited. Following the balance of payments crisis in 1991, a stabilization program was initiated with the help of IMF. By 1993-94, the rupee was made convertible on the current account with market determined rates. In 1994 India moved to full convertibility on current account transactions and formally accepted the obligations under Article VIII.[20,21]

Malaysia

Since its independence in 1957, Malaysian economy has generally enjoyed rapid economic growth with rising per capita incomes and relative price stability. Its financial system also experienced high growth and financial deepening. Liberalization and financial reforms proceeded gradually over the period meeting the financial needs of the economy. Malaysia's capital account has been progressively liberalized since the float of the ringgit in June 1973, and spot and forward exchange transactions were made free. More aggressive forms of financial liberalization and reforms started in the early 1980s with an intention to make the financial system to be more effective and efficient in mobilizing and allocating financial resources within the context of a more market-oriented environment. The recession in the mid-1980s, however, prompted the government to impose some control on the interest rates together with stronger prudential regulation. After the lift of

[20] Accepting this article the country provides confidence to the international community that it will not impose restrictions on the making of payments and transfers for current international transactions without Fund approval and will, therefore, pursue policies that will obviate the need for such restrictions.

[21] Pineiro, J., Tamazian, A. and Vadlamannati, K. C. (2008) offer an ample review of all reforms implemented in India.

these controls in 1987, the capital account was generally opened. Portfolio inflows were free of restrictions, portfolio outflows were also free except for resident exchange open position limits, applied to banks' foreign borrowing or lending in foreign exchange. Until 1997, local banks could provide forward cover against ringgit to non-residents, facilitating arbitrage between domestic and offshore markets. Following the Asian financial crisis, Malaysia imposed restriction on capital flows and fixed the exchange rate in September 1998. Nowadays, most of the restrictions for capital flows are abolished. Some non-resident restrictions on the housing sector are still there but considerably relaxed in 2007.

Thailand

In Thailand, attempts were made from the 1980s to gradually deregulate the interest rate. In 1990, Thailand accepted the obligation of Article VIII. Further liberalization followed, with the removal of limits on the amounts of foreign exchange that could be bought or take out of the country. Deposits rate ceiling were completely lifted in 1989-90 and interest rate ceiling on lending rates were removed in 1992. In contrast to the promotion of capital inflows, controls on capital outflows by residents were liberalized only gradually. In 1991 Thai residents were permitted to invest abroad or lend limited amounts to companies that had at least a 25% Thai equity participation.

The Philippines

The most important reforms in the financial sector cover important areas such as institutional reforms and the rehabilitation of the financial system, interest rate reforms and the liberalization of the foreign exchange market. Based on the several bank failures in 1980s, the government toughened prudential regulations during the late 1980s and early 1990s. These include regulations on 1) single borrower limit; 2) limits on DOSRI[22] loans

[22] These are guidelines on banks' lending to their own directors, officers, stockholders and related interests. Section 36 of the General Banking Law of 2000 limits banks' DOSRI exposure to an amount equivalent to the borrower's unencumbered deposits and book value of paid-in contribution in the bank. The unsecured loans and other DOSRI credit accommodations and guarantees must not exceed 30 percent of a bank's overall exposure. The law also prescribes that a bank's DOSRI exposure should not exceed 15 percent of its total loan portfolio or 100 percent of its net worth, whichever is lower, provided that the DOSRI lending will not exceed 30 percent of the aggregate ceiling or outstanding loans and other credit accommodations and guarantees, whichever is lower.

and interlocking directorship; 3) capital adequacy; 4) compliance with the minimum risk-asset ratio, and 5) provisions for loan loss or doubtful accounts. Consequently, the Philippines peso has been floated since September 1992, but payments restrictions still apply on both the Philippines current and capital accounts. In 1980, the Philippines began to partially liberalize interest rates. Capital flows are largely unrestricted in the Philippines though there are some restrictions on current transactions.

Korea

Korea followed a liberal managed float, introduced in March 1990, by which the exchange rate varied within bounds around a rate posted by the Bank of Korea. Controls remained on inwards FDI and on foreign borrowing by Korean firms and banks. Faced with a significant surplus in the current account balance of payments over the period 1988-89, Korean government progressively liberalized the import regime through a pre-announced schedule of measures. Restrictions on payment for current international transactions were relaxed and Korea accepted the obligation of IMF Article VIII in 1998. Capital outflows were also promoted by liberalizing direct investment, purchased of real estate overseas, and certain portfolio investments outflows by institutional investors. Foreign borrowing limits and restrictions in investing in overseas stock were partially eased in 1994. As a result of these reform efforts in deregulating both current and capital account transactions, Korea had developed a relatively liberalized capital account.

Table A.1 Main Financial Policy Developments

India	
1977	The government introduces measures to simplify the import licensing procedure; open general licensing is introduced for a number of products.
1979	The government liberalizes its industrial policy
1981	A new industrial policy is announced by the minister of industry; all industries except defense are open to the private sector.
1981	The government goes to the IMF to seek a loan.
1983	Import restrictions are raised
1986	Income tax raiders seize Rs 50M from Bombay's leading brokers; financial markets close.
1988	A three year import liberalization package is released
1988	The government liberalizes industry
1991	The Rupee is devalued by 18% and a new trade policy is established
1991	A new liberalized industrial policy is launched
1993	The Rupee is floated.
1997	Registered foreign institutional investors allowed to invest in government securities markets
Malaysia	
1973	Exchange controls are abolished
1978	Most interest rate restrictions abolished
1982	Informal restrictions on prime rate are reduced
1985	The government launches a 2 $M Billion New Investment Fund (NIF) to stimulate investment in priority areas.
1986	Foreign interests will be allowed up to 100% equity holding in manufacturing concerns.
1988	The Central Bank (CB) announces the final stage of a $M 1 Billion rescue plan for the country's Deposit Taking Cooperatives whose operations were frozen in 1986.
1989	The CB declares that domestic and foreign banks may now purchase limited amounts of shares in local companies
1989	The Malaysian Stock Exchange splits with Singapore
Korea	
1980	The Won is devalued by 17% and a program for drastic reform of the banking system is announced
1983	Access to the stock exchange is eased.
1984	Interest rates are liberalized
1988	Bank rates, lending rates and deposit rates are deregulated.
1991	Announce of the guidelines for the opening the stock market to foreigners
1993	Government disclosure a five year plan for the reform and liberalization of the financial system.
1994	The central bank announces that foreign banks are free to to establish branches in Korea in case they are one of the world's five largest in terms of assets.
Thailand	
1979	Thailand goes to the IMF for short term credits.
1981	The Baht is devalued by 10%.
1984	The Baht is devalued by 14.8%.
1984	Price controls are imposed and 20% of surcharge on imports is removed.
1990	The government raises the ceiling on loans to 16.5% for commercial banks and 19.5% for other institutions
Philippines	
1986	The IMF approves a stand by credit of $ 300M and a $ 200M compensatory financing facility.
1987	The World Bank approves a $ 300M economic recovery loan to be used to support tax reform and trade liberalization.
1989	National Bank of Philippines is privatized
1990	The reform on abolition of price controls; relaxation of controls on foreign investment; deregulation of financial markets; accelerated privatization; and reduction in import tariffs is approved
1991	The IMF approves a $ 905M financing package
1992	The foreign exchange rules are liberalized and stock market merged with Philippine one
1994	The entry and participation for foreign banks is liberalized

Source: Henry (1999); Glen and Pinto (1994); Ketkar (1993); Abidin (1986)

Table A.2 Summary of the Finance -Growth Relationships

Author(s)	Financial Development Measures	Method*	Principal Findings	C[a]	S[b]
Goldsmith (1969)	Financial Intermediary assets (% GNP)	CS	There is a positive relationship between financial development and growth.	35	+
King and Levine (1993)	They constructed four financial development indicators designed to measure the services provided by financial intermediaries. · Credit issued to nonfinancial private sector (% total credit , excluding credit to banks) · Liquid Liabilities (% GDP) · Deposit banks relative to the CB in allocating domestic credit · Credit issued to nonfinancial private firms (% GDP). They examined three averaged (1960-89) growth indicators: · Real per capita GDP · Growth in capital stock per person · total productivity growth	CS	They determined that financial development is robustly correlated with future rates of economic growth, physical capital accumulation and economic efficiency improvements.	77	+
Demetriades and Hussein (1996)	· Ratio of bank deposit liabilities to nominal GDP (Deposits at other financial institutions and quasi-banking institutions are excluded) · Ratio of bank claims on the private sector to nominal GDP.	CS	They find little systematic evidence in favour of the view that finance is a leading factor in the process of economic growth. In addition they found that for the majority of the under consideration, causality is bi-directional, while in some cases financial development follows economic growth.	16	±
Arestis, P., and D. Panicos (1997)	· Log real GDP per capita · Stock market capitalization ratio measured by the ratio of stock market value to GDP · Index of stock market volatility where the volatility is measured by the sixteen quarter moving standard deviation of the end-of-quarter change of stock market prices. · Log of ration M2 to nominal GDP (Germany) · Log domestic bank credit to nominal GDP (USA)	CS	In context of financial depth and growth they conclude that in case of Germany unidirectional causality appears from financial development to real GDP whilst in case of USA it is not the case. They argue that there is not sufficient evidence to suggest that the financial development in USA causes real GDP.	2	±

Table A.2 (Continued)

Levine and Zervos (1998)	· Bank credit to the private sector (% GDP) · Overall size of the market (market capitalization relative to GDP), · Stock market activity (the value of trades relative to GDP), · Market liquidity (the value of trades relative to market capitalization)	CS	The find that initial measures of stock market liquidity and banking sector development are both strong predictors of economic growth. Also, They show that the link between banks, stock markets and growth runs through productivity growth rather than physical capital accumulation.	42	+
Rajan and Zingales (1998)	· Capitalization ratio (domestic credit + stock market capitalization to GDP) · Accounting standards They also used several indicators at firm level.	CS	Find that financial institutions in countries with well-dev eloped financial systems, industries that are naturally heavy users of external finance grow relatively faster than other industries. They argue that the results are unlikely to be driven by omitted variables, outliers or reverse causality	42	+
Demirguç-Kunt and Maksimovic (1998)	· Market Capitalization to GDP · Market Turnover · Bank assets to GDP They considered other regressors such as: · Excess growth of firms and external financing · Inflation rate · The law and order tradition of the economy · Growth rate of real GDP per capita · Real GDP per capita · Government subsidies to private industries and public enterprises (% GDP) · Net fixed assets / Total assets	CS	They argue that an active, thought not necessarily large, stock market and a large banking sector are associated with externally financed firm growth. Thus, banking system development and stock market liquidity are positively related with the excess growth of firms, while the stock market size is not.	26	+
Luintel and Khan (1999)	· Ratio of total deposit liabilities of deposit banks to one period lagged nominal GDP · Log of real per-capita output measured as a ratio of real GDP to total population · Real interest rate deflated by inflation	CS	They propose an approach through which long-run relationship between financial development and economic growth is evaluated in a theoretically based multivariate VAR model. They find that the causality between financial development and output growth is bi-directional for all countries.	10	±

Table A.2 (Continued)

Andrés, J., I. Hernando, and J.D. Lópes-Salido (1999).	· The ratio of claims on the non-financial private sector to GDP. · The ratio of liquid liabilities (excluding currency in circulation and demand deposits) of the financial system to GDP · The ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets. · The ratio of claims on monetary authorities to demand deposits plus other deposits of banking institutions · The ratio of domestic shares on domestic exchanges in a year divided by GDP. For the list of non-financial variables considered in the study see Andrés et al., (1999) appendix 1.	PD	They fail to find a positive relationship between economic growth and financial depth.	21	-
Levine, Loayza and Beck (2000)	· Liquid Liabilities (% GDP) · Ratio of commercial bank assets divided by commercial bank plus central bank assets · Private credit (% GDP) For a sensitivity analyses they used: · Creditor rights · Contract Enforcement · Accounting standards	CS, DPD	They find that development of financial intermediaries exerts a large causal impact on growth. Yet, the legal and accounting system help to determine differences in financial development.	71	+
Calderon and Liu (2003)	· The ratio of broad money (M2) to GDP · The ratio of credits provided by financial intermediaries to the private sector to GDP	PD	They conclude that financial development enhances economic growth for all countries under consideration. Yet to take advantage of the positive interaction between financial and economic development, one should liberalize the economy while liberalizing the financial sector. Finally, they find that Granger causality from economic growth to financial development coexist	109	+
Fase and Abma (2003)	· Financial development proxied by balance sheet totals of the banking sector	CS	They argue that financial development matters for economic growth and that causality runs from financial structure to economic development	9	+

Table A.2 (Continued)

Dimitris K. Christopoulos and Efthymios G. Tsionas (2004)	· Total bank deposits liabilities to nominal GDP · The share of gross fixed capital formation to nominal GDP · Inflation rate measured using CPI.	DPD	They conclude that there is a single equilibrium relation between financial depth, growth and other control variables. They show that the only cointegrating relation implies unidirectional causality from financial depth to growth. Yet, they argue that there is no short run causality between financial deepening and output, so the effect is necessarily long run in nature.	10	±
Beck and Levine (2004)	· Turnover ratio (measure of market liquidity, which equals the value of the trades of shares on domestic exchanges divided by total value of listed shares) · Value traded (the value of the trades of domestic shares on domestic exchanges divided by GDP) · Deflated Market Capitalization · Deflated Bank credit, which equals bank claims on the private sector by deposit money banks divided by GDP They also control for other potential determinants of economic growth as: · Simple Conditioning information set (the initial real GDP per capita to control for convergence and the average years of schooling to control for human capital accumulation. · Policy Conditioning information set (information set plus either 1) the black market premium, 2) the share of exports and imports to GDP, 3) the inflation rate or 4) the ratio of government expenditures to GDP)	DPD	They find that stock markets and banks positively influence economic growth and these findings are not due to potential biases induced by simultaneity, omitted variables or unobserved country-specific effects.	40	+
Levine (2004)	Survey paper	-	He make an excellent review of existing literature related to financial depth and economic output at all levels, i.e., firm level, country level, industry level, etc…		

Table A.2 (Continued)

Aghion, Howitt and Mayer-Foulkes (2005)	· Liquid liabilities (measured as currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries, divided by GDP) · Bank assets (measured as the ratio of all credits by banks, but not other financial intermediaries to GDP) · Commercial-central bank measured as the ratio of commercial bank assets to the sum of commercial plus central bank assets They also employed productivity growth and other control variables. See (Aghion et al., 2005 for details)	CS	They developed and tested a Schumpeterian model of cross-country convergencewith financial constraints. It implies that all countries above some critical level of financial development should converge in growth rate, and that in such countries financial development has a positive but eventually vanishing effect on steady -state GDP. They test this by estimating a cross-country growth regression with an interaction term between financial development and the country's initial relative output. They find that the coefficient of this interaction term is highly significant and negative, and the direct effect of financial development is not significantly differs from zero.	71	±
Loayza and Rancieres (2005)	· Financial Intermediation measured by the ratio of private domestic credit to GDP. They used as control variables: 1) the initial level of GDP per Capita; 2) government consumption as ratio to GDP; 3) the structure-adjusted volume of trade as ratio to GDP; 4) the inflation rate. For robustness check they substitute private credit by liquid liabilities in all their regressions.	PD	They find that a positive long-run relationship between financial intermediation and output growth co-exists with a, mostly, negative short-run relationship.	82	±
Qi LIANG and Jian-Zhou TENG (2006)	· Real per capita physical capital stock · Real interest rate (deflated by inflation) · Trade ratio (total values of exports and imports in year t as a share of GDP) · The values of domestic credit by banking institutions divided by GDP · Real Interest Rate (bank deposit rate deflated by the inflation) · Log of real per capita fixed capital formation For robustness check they used: · Deposit Liabilities Ratio (total deposit liabilities of banking institutions to GDP)	-	They find that financial development, physical capital stock, international trade and real interest rate are all economically and significantly related to economic growth. However, there exists only a unidirectional causality from economic growth to financial development.	1	±

Table A.2 (Continued)

Ang and McKibbin (2007)	· Log of liquid liabilities to nominal GDP · Log of commercial bank assets to commercial bank assets plus central bank assets · Log of domestic credit to private sectors divided by nominal GDP	-	They find that financial depth and economic development are positively related whilst output growth leads to higher financial depth in the long-run.	1	±
Luintel, Khan, Arestis and Theodoridis (2008)	As a measure of Financial structure they employed: log of the ratio of stock market total Value traded to private credit, · Log of the ratio of stock market capitalization to private credit In addition, they used measures of financial development defined as: · Log of the product of private credit ratio and stock market capitalization ratio · Log of the product of private credit ratio and stock market value traded ratio	CS, PD	They find that financial structure and financial development matter for economic growth.	14	+

Note:

a) Indicates the largest number of countries considered in the study

b) Indicates the relationship between financial development and growth + indicates positive relationship; - exerts negative and; ± designates mixed results.

* CS = Cross Section; PD= Panel Data; DPD= Dynamic Panel Data