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FINANCIAL DEVELOPMENT, INSTITUTIONAL QUALITY AND ECONOMIC PERFORMANCE IN EAST ASIAN ECONOMIES

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This paper examines the effects of financial development and institutional quality on economic performance in the East Asian economies using the panel cointegration and panel group mean fully modified OLS estimations. The empirical results based on the Solow growth model indicate that well developed institutional quality and financial market lead to the improved output per capita in East Asian economies. The effect of financial development on economic performance is larger when the financial system is embedded within a sound institutional framework. Thus, institutional improvements in these economies are important, not only in promoting economic development but also to deliver the benefits of financial development.

JEL Classifications: G20 and E44

Keywords: financial development, quality of institutions, economic performance

INTRODUCTION

The East Asian economies in recent years has been characterised by trends towards increasing openness to world trade and higher degree of financial integration, and greater financial development. These economies have progressed rapidly towards financial liberalisation and undergone different structural and institutional reforms since 1980s. The increased liberalisation and openness have motivated high rate of increase in cross-border capital and direct investment flows. Prior to the East Asian financial crisis of 1997-98, the East Asian real GDP growth has been portrayed as something of a miracle and the success of this region served as a model for other countries to emulate. Even though much research has been conducted to explain why East Asia has done so much better than other regions of the world, both the role of institutions and financial development in influencing the economic performance is still lacked of empirical analyses in this region. Rodrik (1997) finds that an index of institutional quality does exceptionally well in rank-ordering East Asian countries according to their economic performance. Pistor *et al.* (1998) also point out that law and legal systems were important in promoting Asian economic growth, but they have been largely ignored by the literature.

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Recent literature on economic growth has witnessed that institutions and financial development are separately emerging as the key fundamental determinants of economic growth. It is now widely accepted that factor accumulation and technological change alone cannot adequately explain differences in growth performance across countries. According to North (1990), institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. Nelson and Sampat (2001) propose that institutions may be treated as ‘social technologies’ in the operation of productive economic activities, which involve patterned human interaction rather than physical engineering. A number of recent papers provide empirical evidence that institutions are vital for economic development¹. Rodrik *et al.* (2002) find that quality of institutions overrides geography and integration (international trade) in explaining cross-country income levels. Hall and Jones (1999) show that the differences across countries in institutions and government policies, in short social infrastructure, seems a plausible fundamental determinant both of productivity differences and differences in accumulation.

Rodrik (1997) examines the role of institutional quality on economic performance in eight East Asian countries, namely Japan, Singapore, Taiwan, Korea, Malaysia, Thailand, Indonesia and the Philippines. Three measures of economic performance are employed, namely growth of output per worker, capital accumulation, and TFP growth, where the determinants are initial income, initial education, and the exogenous component of institutional quality. The empirical results demonstrate that institutional quality is statistically significant determinant of growth per worker in these economies. The coefficient on institutional quality indicate that a one point increase on this scale (which goes from 0 to 10) is associated with a 0.8 percent increase in the long-run growth of GDP per worker. Japan, Taiwan and Singapore have the best institutions and the highest growth rates, Indonesia and the Philippines have the worst institutions and the lowest growth rates, and Malaysia, Korea and Thailand are intermediate. However, the sample observations employed by Rodrik, dictated by limited data availability in the 1990s, means that his finding is, at best, tentative. Thus, it is crucial to examine the role of institutions in influencing the Asian economies using larger sample observations and more advanced econometric techniques.

Financial markets and systems play an important role in providing services that are essential in a modern economy, especially in transforming the funds from surplus units to deficit units. Well functioning financial systems can help to promote economic growth². The increased availability of financial instruments reduces transaction and information costs while larger and more efficient financial markets help economic agents hedge, trade, pool risk, raising investment and economic growth. Levine (2003) provides an excellent overview of a large body of empirical literature based on cross-country, panel data and microeconomic studies. He suggests that financial development can robustly explain differences in economic growth across countries.

The empirical evidence on the relationship between financial development and economic growth with respect to individual countries over time is broadly consistent with that obtained from cross-section studies in the sense that it is usually a positive and significant one. However, according to Arestis and Demetriades (1997), causality between financial development and growth typically varies across countries. For instance, Demetriades and Hussein (1996) investigate the relationship between financial development and economic growth in 16

developing countries and find that 7 out of 16 countries exhibit bi-directional causal relationship. Habibullah (1999) finds that the direction of causation between finance and economic growth is country specific. As such, it is very difficult to draw any policy implications for the positive association obtained between finance and growth in cross-country studies. Knowing where it does and where it doesn't is crucial for policy makers. Understanding why there is such variation across countries is an important next step for both policy makers and academics, as it holds the key to successful financial development.

The variation in causality between financial development and economic growth detected in time-series studies suggests that there are important differences in the way in which financial development influences economic growth across countries. Arestis and Demetriades (1997), for instance, suggest that it may reflect institutional differences across countries. This idea is developed further in Demetriades and Andrianova (2004), who argue that varying causal patterns may reflect differences in the quality of finance, which are, in turn, determined by the quality of financial regulation and rule of law. For example, an increase in financial development, as captured by standard indicators of financial development, may not result in increased growth because of corruption in the banking system or political interferences, which diverts credit to unproductive or even wasteful activities. While this is a plausible conjecture, there is as yet no hard empirical evidence to suggest that institutions do make a difference to the way in which finance affects economic growth. Such evidence is clearly the logical next step in the evolution of the literature on financial development.

The objective of this study is to examine the effects of institutional quality and financial development on economic performance in East Asian economies over 1980 – 2001. Given an impressive expansion role of institutions and financial development, this study also investigates whether the interaction between both variables has a separate positive influence on economic performance. The issue of whether institutions and financial development have any impact on economic development is interesting to be addressed. First, if both factors do indeed promote economic growth, this emphasizes the importance of finance and institutions to stimulate economic growth and policy makers should place financial and institutions reforms high on their agendas. Second, understanding the role of institutions in influencing financial development is important because higher financial development would facilitate economic growth, as shown by the extensive empirical literature.

This study represents an advance over previous empirical work such as Rodrik (1997) in the area in several important respects. First, it examines the effects of institutions and financial development on economic growth in East Asian economies, as well as to examine the interaction between both variables in influencing growth. Second, it uses a panel data set that is sufficiently large to enable robust conclusions to be drawn; specifically, the sample utilised in this paper consists of annual data from eight East Asian countries, covering the period 1980–2001. Third, the panel cointegration and panel group mean fully modified ordinary least squares (FMOLS) techniques are employed in the analysis, which both have a number of econometric advantages compared to traditional panel data estimation.

This paper is organised into four sections, including introduction and concluding remarks. Section 2 explains the empirical model, econometric methodology employed and the sources

of data collected, section 3 reports the estimated results, and the last section contains the conclusion.

Empirical Model, Methodology and the Data

In order to test the effects of financial development and institutions on economic growth, this study adopts the frameworks introduced by Mankiw *et al.* (1992), Knight *et al.* (1992, 1993) and Ghura and Hadjimichael (1996). Consider the following Cobb-Douglas production function:

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta} \quad (1)$$

where Y is real output, K is the capital stock, H is the stock of human capital, L is the raw labour, A is a labour-augmenting factor reflecting the level of technology and efficiency in the economy and the subscript t indicates time. Assuming that $\alpha + \beta < 1$, which implies that there are decreasing returns to all capital. Raw labour and labour-augmenting technology are assumed to grow according to the following functions:

$$L_t = L_0 e^{nt} \quad (2)$$

$$A_t = A_0 e^{gt+P\theta} \quad (3)$$

where n is the exogenous rate of growth of the labour force, g is the exogenous rate of technological progress, P is a vector of financial development and institutions policies and the other factors that can affect the level of technology and efficiency in the economy, and θ is a vector of coefficients related to these policies and other variables.

In this model, variable A depends on exogenous technological improvements, the degree of openness of the economy and the level of other variables. The technological improvements are encouraged by developments in financial markets, which tend to increase the productive sector's efficiency or increase the productivity of investment (Pagano, 1993) and also efficient institutions (North, 1990, Nelson and Sampat, 2001). Furthermore, in the steady state, output per worker grows at the constant rate g (the exogenous component of the growth rate of the efficiency variable A). This outcome can be obtained directly from the definition of output per effective worker as follows:

$$\begin{aligned} \frac{Y_t}{A_t L_t} &= (k_t)^\alpha (h_t)^\beta \\ \frac{Y_t}{L_t} &= A_t (k_t)^\alpha (h_t)^\beta \end{aligned} \quad (4)$$

The neoclassical model emphasizes that the evolution of the economy is determined by the following equations:

$$\dot{h}_{i,t} = s_k f(k_{i,t}, h_{i,t}) - (n + g + \delta)h_{i,t} \quad (5)$$

$$\dot{k}_{i,t} = s_k f(k_{i,t}, h_{i,t}) - (n + g + \delta)k_{i,t} \quad (6)$$

where the subscript i denotes the i th country ($i = 1, \dots, 8$) and the subscript t denotes the t th year ($t = 1, \dots, 22$). $k = K/L$, $h = H/L$, $y = Y/L$, stand for the capital labour ratio, average human capital and output per worker, respectively, s_k and s_h are the fraction of income investment in physical capital and human capital, respectively, and d is the rate of depreciation. The steady-state values of h and k are defined as

$$h^* = \left[\frac{(s^K)^\alpha (s^H)^{1-\alpha}}{(n + g + \delta)} \right]^{\frac{1}{1-\alpha-\beta}} \quad (7)$$

$$k^* = \left[\frac{(s^K)^{1-\beta} (s^H)^\beta}{(n + g + \delta)} \right]^{\frac{1}{1-\alpha-\beta}} \quad (8)$$

Substituting these two equations into the production function (Equation 4) and taking logs yields the expression for the steady state output.

$$\ln\left(\frac{Y}{L}\right) = \ln A + \alpha \ln k + \beta \ln h$$

where $A_t = A_0 e^{(gt+P\theta)}$

$$\ln\left(\frac{Y}{L}\right) = \ln A_0 + gt + P\theta + \frac{\alpha}{1-\alpha-\beta} \ln s^K + \frac{\beta}{1-\alpha-\beta} \ln s^H - \frac{\alpha+\beta}{1-\alpha-\beta} \ln(n+g+\delta) \quad (9)$$

Equation (9) indicates steady state output per worker where a vector of financial development and institutions policy proxies exist; s^K and s^H are the shares in output of physical capital and human capital; and d is the rate of depreciation of physical capital.

Largely because of data limitations, this study assumes that s^H does not vary over time but s^K and n can be assumed to vary over time. This means that $\ln A_0$ and s^H can be considered as a constant term β_0 in Equation (10). Then, the steady-state output per worker or labour productivity grows according to the following equation:

$$\ln\left(\frac{Y}{L}\right) = \beta_0 + gt + P\theta + \frac{\alpha}{1-\alpha-\beta} \ln s^K - \frac{\alpha+\beta}{1-\alpha-\beta} \ln(n+g+\delta) \quad (10)$$

where P consists of financial development and institutions. Rearranging Equation (10), it yields an estimating equation for the relationship between financial development, institutions and output per worker as follows:

$$\ln RGDPC = A_0 + A_1T + A_2FD + A_3INS + A_4 \ln KC - A_5 \ln(n + g + \delta) \quad (11)$$

where $RGDPC$ is real GDP per capita, T is time trend, FD is a financial development indicator, INS is institutions, KC is capital stock per capita, $(n + g + \delta)$: n is the rate of labour growth, g is the rate of technology growth or technological progress and δ is the rate of depreciation. The addition of g and δ is assumed to be constant across countries and over time, following Mankiw *et al.* (1992), $g + \delta$ is equal to 0.05. A_0 is constant term and A_1 , A_2 , A_3 and A_4 are the estimated parameters in the model.

In order to examine the interaction effects between financial development and institutions on growth, Equation (11) is extended to include the interaction term as follows:

$$\ln RGDPC = \beta_0 + \beta_1T + \beta_2FD + \beta_3INS + \beta_4(FD \times INS) + \beta_5 \ln KC - \beta_6 \ln(n + g + \delta) \quad (12)$$

Equations (11) and (12) provide the basis for the empirical models that are estimated in this paper. The time dummies are included in the above two models in order to take into account of structural break due to the 1997-98 East Asian financial and currency crisis.

Econometric Methodology

In this study, the panel cointegration test is employed to estimate Equation (11) in order to examine whether a cointegration relationship exists amongst real GDP per capita, institutions, financial development, physical capital and labour growth. The panel cointegration approach allows for both parameter and dynamic heterogeneity across groups, and is considerably more powerful than the conventional cointegration, whereas the panel group mean fully modified ordinary least squares (FMOLS) estimations are employed to determine the effects of institutions and financial development on economic performance as well as the impact of the interaction term between both variables.

Before conducting panel cointegration tests, a panel unit root test is carried out to determine the order of integration of panel data series based on Im *et al.* (1997, 2003) procedure. Im *et al.* (1997, 2003) propose two panel unit root test statistics, namely LM bar test and t -bar test based on the individual augmented Dickey-Fuller t -values. However, in this study, only t -bar test statistics are conducted since the statistic outperforms the LM bar test (Im *et al.*, 1997, 2003).

The Panel Cointegration Tests

The panel cointegration approach proposed by Pedroni (1997, 1999) is employed to examine the presence of cointegration in heterogeneous panels. Pedroni (1997, 1999) propose several test statistics based on the residuals of the Engle and Granger (1987) cointegrating regression in a panel data model that allows for considerable heterogeneity. In this case, the test statistics are constructed using the residuals from the following hypothesised cointegrating regression based on Equation (11),

$$\ln RGDP_{i,t} = \alpha_i + \beta_i T + \beta_{2i} FD_{2i,t} + \beta_{3i} INS_{3i,t} + \beta_{4i} \ln KC_{4i,t} - \beta_{5i} \ln(n+g+\delta)_{5i,t} + \varepsilon_{i,t} \quad (13)$$

with tests for the null of no cointegration being based on the residuals $\hat{\varepsilon}_{it}$ using:

$$\hat{\varepsilon}_{it} = \rho_i \hat{\varepsilon}_{i,t-1} + \nu_{it} \quad (14)$$

Since the α_i and the various β_i are allowed to vary across the i members of the panel, this approach allows for considerable short- and long-run heterogeneity – in effect the dynamic and fixed effects can differ across the individuals in the panel data and the cointegration vector can also differ across members under the alternative hypothesis.

Based on the cointegrating residuals, ε_{it} , Pedroni (1997, 1999) develop seven panel cointegration statistics. Four of these statistics, called panel cointegration statistics, are within-dimension based statistics which are constructed by summing both the numerator and the denominator terms over the N dimension separately. The other three statistics, called group mean panel cointegration statistics, are between-dimension based statistics and are constructed by first dividing the numerator by the denominator prior to summing over the N dimension. In terms of power, Pedroni shows that the group-*adf* statistic generally performs best; followed by the panel-*adf* statistic, while the panel variance and the group statistics do poorly.

Panel Group Mean Fully Modified OLS Test

Having tested for cointegration, the next stage of the investigation is to estimate the cointegrating vectors of Equations (11) and (12). The group mean fully modified ordinary least squares (FMOLS) estimator proposed by Pedroni (2000) is employed to obtain the panel data estimates for β_i . This estimator incorporates the Phillips and Hansen (1990) semi-parametric correction to the ordinary least squares (OLS) estimator to eliminate the bias due to the endogeneity of the regressors. Specifically, Pedroni (2000) shows that the group mean panel FMOLS *t*-statistic for β is given as:

$$\bar{t}_{\hat{\beta}_{NT}} = N^{-1} \sum_{i=1}^N \hat{L}_{11i}^{-1} \left(\sum_{t=1}^T (x_{it} - \bar{x}_i)^2 \right)^{-1/2} \left(\sum_{t=1}^T (x_{it} - \bar{x}_i) y_{it}^* - T \hat{\tau}_i \right) \rightarrow N(0,1) \quad (15)$$

where

$$y_{it}^* = (y_{it} - \bar{y}_i) - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} \Delta x_{it},$$

$$\hat{\tau}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^0 - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} \left(\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^0 \right) \quad (16)$$

where the $\hat{\Omega}_i$ and $\hat{\Gamma}$ are covariances and sums of autocovariances obtained from the long-run covariance matrix for the Equation (11) [or (12)] and the associated t -statistic follows standard normal distribution. In this study, the between-group panel FMOLS tests are carried out in the empirical analysis, which these tests have more advantages compared to within-group panel (Pedroni, 2000)⁵.

The Data

The data set consists of a panel of observations for eight East Asian economies namely: China; Indonesia; Japan; Korea; Malaysia; Philippines; Singapore; and Thailand for the period 1980–2001. Annual data on real GDP per capita (1995 US\$), gross fixed capital formation, total labour force, and three alternative financial development indicators (liquid liabilities or M3, private sector credit and domestic credit provided by banking sector, all expressed as ratios to GDP) are collected from the World Development Indicators (World Bank CD-ROM 2003). The stock of physical capital is constructed from the gross fixed investment figures following the perpetual inventory method. Initial capital stocks are calculated using the assumption that over long periods of time capital and output growth at the same rate. A depreciation rate of 6 percent and the average growth rate of the initial 3 years are used to generate the initial level of capital stock⁶. Capital stock per capita is derived as a ratio of the total capital stock to total population.

The data set on institutional quality indicators employed in this study was assembled by the IRIS Center of the University of Maryland from the International Country Risk Guide (ICRG) – a monthly publication of Political Risk Services (PRS). Following Knack and Keefer (1995), five PRS indicators are used to measure the overall institutional environment, namely: (i) *Corruption* (ii) *Rule of Law* (iii) *Bureaucratic Quality* (iv) *Government Repudiation of Contracts*, and (v) *Risk of Expropriation*. The above first three variables are scaled from 0 to 6, whereas the last two variables are scaled from 0 to 10⁷. Higher values imply better institutional quality and vice versa. The institutions indicator is obtained by summing these five indicators⁸.

Table 1 reports descriptive statistics of all variables in eight East Asian countries. There is a considerable variation in real GDP per capita across these countries, ranging from a low of US\$398.60 in China to a high of US\$36674.80 in Japan. In terms of quality of institutions, Japan and Singapore receive high grades; follow by Malaysia and Korea, while Indonesia and the Philippines score particularly low. As shown in this table, higher institutional quality is associated with higher economic performance and vice versa. For instance, Japan and Singapore have high quality institutions and high real GDP per capita, whereas the Philippines, Indonesia and China have lower quality institutions and lowest real GDP per capita. This finding is consistent with Rodrik (1997), and tend to suggest that institutions differences have an impact on economic performance, which is in line with the growing evidence demonstrates by Hall and Jones (1999), Acemoglu *et al.* (2001) and Rodrik *et al.* (2002).

The correlation results indicate that institutions and financial development indicators have a strong positive relationship with real GDP per capita. The interaction between financial development and institutions also reveals higher correlation with real GDP per capita. These

results prompt us to examine whether higher financial development and better institutions in influencing economic development in East Asian economies.

Table 1
Descriptive Statistics and Correlations

Panel A: Descriptive Statistics

	<i>GDPC</i>	<i>(n+g+d)</i>	<i>KC</i>	<i>LIA</i>	<i>PRI</i>	<i>DOC</i>	<i>INS</i>
China	398.60	0.07	31.10	78.28	81.24	82.99	32.61
Indonesia	761.63	0.08	25.15	34.70	31.72	34.61	23.87
Japan	36674.78	0.06	29.15	171.15	173.05	248.24	46.72
Korea	7723.25	0.07	32.34	56.84	64.16	67.08	35.61
Malaysia	3275.10	0.08	31.86	99.38	91.80	109.33	36.06
Philippines	1098.26	0.08	22.66	42.30	36.85	50.40	20.18
Singapore	17634.68	0.08	37.24	108.88	99.90	79.04	43.68
Thailand	1927.17	0.07	31.13	71.92	86.74	97.94	34.42
Mean	8686.68	0.07	30.08	82.93	83.18	96.21	34.15
Max	36674.78	0.08	37.24	171.15	173.05	248.24	46.72
Min	398.60	0.06	22.66	34.70	31.72	34.61	20.18
Std Dev	12696.39	0.01	4.50	43.96	44.08	66.01	8.93

Panel B: Correlations

	<i>GDPC</i>	<i>(n+g+d)</i>	<i>KC</i>	<i>LIA</i>	<i>PRI</i>	<i>DOC</i>	<i>INS</i>
GDPC	1.00						
NGD	-0.31	1.00					
KC	0.37	-0.03	1.00				
LIA	0.70	-0.48	0.41	1.00			
PRI	0.65	-0.51	0.53	0.91	1.00		
DOC	0.62	-0.58	0.35	0.90	0.93	1.00	
INS	0.62	-0.34	0.53	0.83	0.79	0.74	1.00
LIA x INS	0.72	-0.46	0.47	0.98	0.90	0.87	0.93
PRI x INS	0.70	-0.49	0.55	0.94	0.97	0.90	0.91
DOC x INS	0.68	-0.55	0.44	0.94	0.94	0.96	0.89

Note: GDPC = real GDP per capita (US\$); n+g+d = labour growth (per cent); KC = capital stock per capita; LIA = liquid liabilities (percent); PRI = private sector credit (percent); DOC = domestic credit (percent); INS = institutions.

Estimation Results

The Panel Unit Root Test Results

Table 2 reports the results of panel unit root test suggested by Im *et al.* (1997, 2003). All *t*-bar statistics failed to reject the null hypothesis of non-stationary at the level for constant with trend and without trend models. Nevertheless, the *t*-bar statistics can be rejected at the 5% significant level when estimating first differences. Overall, the panel unit root test results support the presence of a unit root at the level and the absence of any unit root after first differencing. Thus, the panel data series are stationary at first difference or generated by an I(1) process.

Table 2
Im et al. (1997, 2003) Panel Unit Root Test Results

	<i>With Trend</i>	<i>Without Trend</i>	<i>With Trend</i>	<i>Without Trend</i>
	<i>Level</i>		<i>First Difference</i>	
RGDPC	-1.9208	2.3290	-5.3837**	-6.4443**
(n+g+d)	-0.9166	-0.2112	-8.8456**	-9.3709**
KC	-1.5221	-1.1692	-5.0554**	-6.6602**
LIA	0.0041	0.8470	-10.2638**	-9.6921**
DOC	-1.2553	0.0065	-5.6936**	-6.4208**
PRI	0.0103	0.4719	-4.8525**	-5.4584**
INS	-0.6346	0.7187	-5.0342**	-6.1225**

Notes: GDPC = real GDP per capita (US\$); n+g+ δ = labour growth (percent); KC = capital stock per capita; LIA = liquid liabilities (percent); DOC = domestic credit (percent); PRI = private sector credit (percent); INS = institutions. The critical values at 5% significance level are -1.99 and -2.94 ($N=7$ and $T=25$) for constant without trend model and constant with trend model, respectively. ** denotes rejection of the null of non-stationary at the 5% level of significance.

The Panel Cointegration Tests Results

Table 3 reports the Pedroni (1997, 1999) panel cointegration tests based on Equation (13) using three alternative proxies for financial development. Models 1–3 are estimates without time dummies, whereas models 4–6 are included time-specific dummies to allow for the possibility that residuals are correlated across countries. For three without time dummies models, the estimated results indicate that three out of seven statistics reject the null hypothesis of no cointegration. On the other hand, the three models with time dummies reveal that four out of seven statistics reject the null hypothesis. Therefore, the evidence from these panel tests tend to

Table 3
Panel Cointegration Test Results

<i>Test Statistics</i>	<i>No Trend</i>			<i>Trend</i>		
	<i>Model 1:</i> <i>LIA</i>	<i>Model 2:</i> <i>PRI</i>	<i>Model 3:</i> <i>DOC</i>	<i>Model 4:</i> <i>LIA</i>	<i>Model 5:</i> <i>PRI</i>	<i>Model 6:</i> <i>DOC</i>
Panel v-stat	-2.45	-1.95	-2.69	4.59**	6.75**	6.42**
Panel rho-stat	-1.97**	-1.67*	-2.65*	-1.91*	-2.05*	-1.97*
Panel pp-stat	1.56	0.82	1.45	0.01	0.11	0.36
Panel adf-stat	1.48	1.01	1.58	0.32	0.37	-0.80
Group rho-stat	-1.95*	-2.63**	-2.78**	-2.35**	-1.97**	-1.94*
Group pp-stat	-0.18	1.25	1.46	-0.70	-1.37	-1.22
Group adf-stat	-1.79*	-1.70*	-1.83*	-1.74*	-1.83*	-1.91*

Notes: LIA = liquid liabilities (per cent); PRI = private sector credit (per cent); DOC = domestic credit (per cent). Panel v denotes a non-parametric variance ratio statistic; Panel (or group) rho is a non-parametric test statistic analogous to the Phillips and Perron (PP) rho statistic. PP denotes a non-parametric statistic analogous to the PP t-statistic. ADF denotes a parametric statistic analogous to the augmented Dickey-Fuller statistic. Rejection of the null of no cointegration is one-sided and involves:

- variance ratio: large positive values indicate cointegration (at 5% significance, reject null of no cointegration if $v > 1.645$)
- other six: large negative values indicate cointegration (at 5% significance, reject null of no cointegration if statistic < -1.645)
- ** and * denote that the null of no cointegration is rejected at 1% and 5%, respectively.

support the presence of a cointegrating relationship amongst real GDP per capita, institutions, financial development, capital formation and labour growth in the sample of East Asian economies.

Panel Group Mean FMOLS Results

Table 4 reports estimates of Equation (11) with time trend⁹ that utilise FMOLS for three alternative financial development proxies (liquid liabilities, private sector credit, and domestic credit), where the null hypothesis of β (group mean of the slope) is equal to zero. Generally, the signs of the coefficients on the physical capital and labour growth are consistent with theory. In all models, three financial development indicators¹⁰ and institutions are positive and statistically significant determinants of output per capita. The time dummies of the 1997-98 East Asian financial crisis are negative and statistically significant at one percent level, which reveal that the financial and currency turmoil has affected the Asian economic performance severely.

Table 4
Panel Group FMOLS Results
(Dependent Variable: Real GDP Per Capita, 1980 - 2001)

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
ln (n+g+ δ)	-0.68 (-1.85)*	-0.60 (-1.95)*	-0.45 (-1.03)
ln KC	0.24 (1.80)*	0.24 (1.89)*	0.10 (1.54)*
INS	0.32 (2.00)**	0.40 (2.05)**	0.34 (2.08)**
FD = LIA	0.36 (3.34)***	-	-
FD = PRI	-	0.43 (3.13)***	-
FD = DOC	-	-	0.36 (2.37)**
Time Trend	0.20 (2.12)**	0.23 (2.34)**	0.19 (2.15)**
DUM ₁₉₉₇	-0.11 (-4.36)***	-0.07 (-3.29)***	-0.08 (-2.87)***
DUM ₁₉₉₈	-0.09 (-3.32)***	-0.06 (-3.15)***	-0.07 (-2.96)***

Notes: FD = financial development; n+g+ δ = labour growth (per cent); KC = capital stock per capita; LIA = liquid liabilities (per cent); PRI = private sector credit (per cent); DOC = domestic credit (per cent), DUM = time dummy. Figures in parentheses are t-statistics. Significance at 1%, 5% and 10% denoted by ***, ** and * respectively. Time dummies were jointly significant.

The empirical results also indicate that the private sector credit variable has the strongest impact on economic performance, as reflected in its larger coefficient compared to those of the other two financial development indicators. This finding is consistent with Beck *et al.* (2000) and Levine *et al.* (2000), who find that economic growth is faster in countries where private credit is higher. This indicator, which comprises credit to private firms and households from banks and nonblank financial intermediaries (but which excludes central banks lenders and

government and state owned enterprises as borrowers), seems a good proxy variable for the extent to which private sector agents have access to financial intermediation (Greenwood and Jovanovic, 1990) or access to loans (Banerjee and Newman, 1993).

Table 5 presents the empirical results of Equation (12), which includes the interaction term between financial development and institutions. Both the financial development indicators and institutions retain their positive sign and statistically significant determinants of economic performance. The interaction term between financial development and institutions, however, performs better. It is, statistically significant at the conventional levels in three models and the coefficients of the interaction term are much higher than financial development and institutions individually. These findings tend to suggest that both financial development and institutions have large direct and indirect effects on economic performance. Improving both financial development and institutional quality in East Asian economies is, therefore, likely to boost economic performance. The time dummies of the 1997-98 East Asian financial crisis also indicate adverse impact on economic performance, which is similar to those obtained by FMOLS results in Table 4.

Table 5
Panel Group FMOLS Results
(with interaction term between financial development and institutions)
 (Dependent Variable: Real GDP Per Capita, 1980 - 2001)

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
ln (n+g+ δ)	-0.62 (-1.21)	-0.91 (-1.87)*	-0.91 (-1.15)
ln KC	0.15 (1.70)*	0.06 (2.09)**	0.21 (2.00)**
INS	0.31 (2.30)**	0.30 (2.35)**	0.31 (2.74)**
FD = LIA	0.33 (2.22)**	-	-
FD = PRI	-	0.36 (4.20)***	-
FD = DOC	-	-	0.35 (2.10)**
LIA x INS	0.50 (3.28)***	-	-
PRI x INS	-	0.54 (3.36)***	-
DOC x INS	-	-	0.51 (3.17)***
Time Trend	0.17 (2.14)**	0.20 (2.36)**	0.14 (2.25)**
DUM ₁₉₉₇	-0.10 (-3.21)***	-0.09 (-2.86)***	-0.08 (-2.68)***
DUM ₁₉₉₈	-0.09 (-2.87)***	-0.07 (-2.74)***	-0.06 (-2.66)***

Notes: FD = financial development; n+g+ δ = labour growth (per cent); KC = capital stock per capita; LIA = liquid liabilities (per cent); PRI = private sector credit (per cent); DOC = domestic credit (per cent), DUM = time dummy. Figures in parentheses are t-statistics. Significance at 1%, 5% and 10% denoted by ***, ** and * respectively. Time dummies were jointly significant.

Table 6 reports the results of using subcategories of institutional quality indicators in the analysis, which consists of corruption, rule of law, bureaucratic quality, government repudiation of contracts, and risk of expropriation. The estimations, however, are conducted using the private sector credit as a financial development since this indicator has the strongest impact on economic performance relative to liquid liabilities and domestic credit as shown in Table 4. The empirical results indicate that all subcategories of institutions are statistically significant determinants of economic performance, where the corruption and rule of law are statistically significant at one percent, and the other three institutional quality indicators are significant at five percent level. This result reveals that a higher level of rule of law and the lower level of corruption are most potent in delivering long-run economic benefits in East Asian economies. The absence of rule of law creates avenues for corruption, which spreads cancerously into the society and political system. All efforts to promote economic growth must therefore be associated with equally strong attempts to establish and promote rule of law.

Table 6
Panel Group FMOLS Results
(with sub-categories of PRS institutions indicators)
 Dependent Variable: Real GDP Per Capita, 1980 - 2001
 Financial Development = Private Sector Credit (PRI)

<i>Variable</i>	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>	<i>Model 10</i>	<i>Model 11</i>
$\ln(n + g + \delta)$	-0.66 (-1.55)	-0.60 (-1.60)	-0.62 (1.51)	-0.61 (-1.75)*	-0.62 (-1.65)*
$\ln KC$	0.27 (1.81)*	0.26 (1.74)*	0.22 (1.83)*	0.24 (1.80)*	0.26 (1.89)*
PRI	0.42 (3.26)***	0.43 (3.11)***	0.46 (3.39)***	0.40 (3.23)***	0.44 (3.24)***
INS = Corruption	0.02 (2.66)***	-	-	-	-
INS = Rule of Law	-	0.04 (3.61)***	-	-	-
INS = Bureaucratic Quality	-	-	0.01 (2.03)**	-	-
INS = Repudiation of Government Contracts	-	-	-	0.02 (2.26)**	-
INS = Expropriation Risk	-	-	-	-	0.02 (2.42)**
Time Trend	0.20 (2.17)**	0.18 (2.21)**	0.21 (1.87)*	0.22 (1.84)*	0.20 (1.92)*
DUM_{1997}	-0.11 (-3.14)***	-0.08 (-2.68)***	-0.08 (-2.83)***	-0.10 (-3.25)***	-0.09 (-2.78)***
DUM_{1998}	-0.10 (-2.65)***	-0.06 (-2.69)***	-0.07 (-2.59)***	-0.08 (-2.62)***	-0.07 (-2.68)***

Notes: INS = institutions; $n+g+\delta$ = labour growth (per cent); KC = capital stock per capita; PRI = private sector credit (per cent), DUM = time dummy. Figures in parentheses are t-statistics. Significance at 1%, 5% and 10% denoted by ***, ** and * respectively.

CONCLUSIONS

This study constructs the modified augmented growth model to examine whether the institutions and financial development would facilitate economic growth in the East Asian economies over the period 1980–2001. The evidence of panel cointegration among real GDP per capita, institutions, financial development, physical stock per capita and labour growth suggests that these variables are bound together by common trends or that a long-run equilibrium condition exists. The panel group mean results indicate that different financial development and institutions can largely explain differences in output per capita across the East Asian countries. Improvements in financial development are likely to deliver much larger direct effects on economic performance than institutions itself.

The empirical results also suggest that financial development has larger effects on economic growth when the financial system is embedded within a sound institutional framework. Well financial development, when combined with good institutions would serve to boost economic growth. Both are also likely to have positive indirect effects, through the financial systems and this implies that ‘quality-adjusted finance’ is important to promote economic growth in East Asian countries. Good institutional quality not only has an impact on economic performance, but they also play a pivotal role in ensuring that financial development does promote greater economic performance. In term of policy implication, efforts should be concentrated to promote well-developed financial systems as well as to improve quality of institutions. Several aspects of improving institutions, for example, enhance rule of law, securing property rights, cracking down on corruption and reducing uncertainty, by enhancing investor confidence, play a key role in the functioning of financial systems, and seem, therefore, to hold the key for delivering long-run economic benefits in East Asian economies.

NOTES

1. Aron (2000) provides an excellent review of literature that tries to link quantitative measures of institutions with economic growth across countries and over time.
2. See for example King and Levine (1993); Beck *et al.* (2000), Levine *et al.* (2000).
3. At a given time—time 0 for simplicity.
4. The main aim of panel cointegration techniques is to pool information on common long-run relationships but, at the same time, allow for short-run dynamics and fixed effects to be heterogeneous across the different members of the panel.
5. The reasons are, first, the group mean FMOLS estimator has relatively minor size distortions in small samples. Second, the between-group approach allows for greater flexibility in the presence of heterogeneity across the cointegrating vectors where bi is allowed to vary. Under the within-group approach, bi would be constrained to be the same value for each country under the alternative hypothesis. Third, the point estimates of the between-group estimator can be interpreted as the mean value of the cointegrating vectors.
6. See Hall and Jones (1999) and Bernanke and Gurkaynak (2001).
7. The scale of corruption, bureaucratic quality and rule of law was first converted to 0 to 10 (multiplying them by 5/3) to make them comparable to the other indicators.
8. Due to strong correlations among these separate indicators, with the consequent risk of multicollinearity, the five PRS variables have been added to form an institutions index (Knack and

- Keefer, 1995). Numerous studies have employed this data set in the empirical analysis, among others, Easterly and Levine (1997), Hall and Jones (1999), Chong and Calderon (2000) and Clarke (2001).
9. The FMOLS results without time trend estimation are not conducted due to the model specification (see Equation 11) contains time trend. In addition, Bassanini and Scarpetta (2001) point out that the time trend is a good proxy for human capital in the growth model since the human capitals in most countries are increasing over time.
 10. The institutions are very robust to these changes in different weighted average of five institutional quality indicators that used to construct the overall institutions index. The coefficient on this term measure remains positive and statistically significant determinant of economic growth. The results are not reported but are available upon request.

REFERENCES

- Acemoglu, D., Johnson, S. and Robinson, J. A. (2001), The Colonial Origins of Comparative Development: An Empirical Investigation. *American Economic Review*, 91, 1369–1401.
- Arestis, P. and Demetriades, P. O. (1997), Financial Development and Economic Growth: Assessing the Evidence, *Economic Journal*, 107(), 783–799.
- Aron, J. (2000), Growth and Institutions: A Review of the Evidence, *The World Bank Research Observer*, 15, 99–135.
- Assanini, A. and Scarpetta, S. (2001), Does Human Capital Matter for Growth in OECD Countries? OECD Economics Department Working Papers No. 282.
- Beck, T., Levine, R., and Loayza, N. (2000), Finance and Sources of Growth. *Journal of Financial Economics*, 58, 261–300.
- Benerjee, A. V. and Newman, A. F. (1993), Occupational Choice and the Process of Development. *Journal of Political Economy*, 101, 274–298.
- Bernanke, B. and Gurkaynak, R. S. (2001), Is Growth Exogenous? Taking Mankiw, Romer and Weil Seriously. *National Bureau of Economic Research Working Paper* No. 8365.
- Chong, A. and Calderon, C. (2000), Institutional Quality and Income Distribution, *Economic Development and Cultural Change*, 48, 761–786.
- Clarke, G. R. G. (2001), How the Quality of Institutions Affects Technological Deepening in Developing Countries, *Country Economics Department Working Paper* No. 2603, World Bank.
- Demetriades, P.O. and Hussein, K. (1996), Does Financial Development Cause Economic Growth? Time Series Evidence from 16 Countries, *Journal of Development Economics*, 51, 387–411.
- Demetriades, P. O. and Andrianova, S. (2004), Finance and Growth: What We Know and What We Need to Know, Goodhart, C. ed., *Money, Finance and Growth*, Routledge, forthcoming.
- Easterly, W. and Levine, R. (1997), Africa's Growth Tragedy: Policies and Ethnic Divisions, *Quarterly Journal of Economics*, 112, 1203–1250.
- Engle, R. F. and Granger, W. J. (1987), Cointegration and Error-Correction: Representation, Estimation and Testing, *Econometrica*, 35, 251–276.
- Ghura, D. and Hadjimichael, M. T. (1996), Growth in Sub-Saharan Africa, *IMF Staff Paper*, 43, 605–635.
- Greenwood, J. and Jovanovic, B. (1990), Financial Development, Growth and the Distribution of Income. *Journal of Political Economy*, 98, 1076–1107.
- Habibullah, M. S. (1999), Financial Development and Economic Growth in Asian Countries: Testing the Financial-led Growth Hypothesis, *Savings and Development*, XXIII, 271–290.

- Hall, R. and Jones, C. (1999), Why Do Some Countries Produce So Much More Output per Worker than Others? *Quarterly Journal of Economics*, 114, 83–116.
- Islam, N. (1995), Growth Empirics: A Panel Data Approach, *Quarterly Journal of Economics*, 110, 1127–1170.
- King, R. and Levine, R. (1993), Finance and Growth: Schumpeter Might be Right. *Quarterly Journal of Economics*, 108, 717–737.
- Knack, S. and Keefer, P. (1995), Institutions and Economic Performance: Cross-country Tests Using Alternative Institutional Measures, *Economics and Politics*, 7, 207–227.
- Knight, M., Loayza, N. and Villaneura, D. (1992), Testing the Neoclassical Theory of Economic Growth: A Panel Data Approach, *IMF Working Paper*, No.106.
- Knight, M., Loayza, N. and Villaneura, D. (1993), Testing the Neoclassical Theory of Economic Growth, *IMF Staff Paper*, 40, 512–541.
- Levine, R., Loayza, N. and Beck, T. (2000), Financial Intermediation and Growth: Causality and Causes. *Journal of Monetary Economics*, 46, 31–77.
- Levine, R. (2003), More on Finance and Growth: More Finance, More Growth? *Federal Reserve Bank of St. Louis Review*, 85 (4), 31–46.
- Mankiw, N. G., Romer, D. and Weil, D. N. (1992), A Contribution to the Empirics of Economic Growth, *Quarterly Journal of Economics*, 107, 407–437.
- Nelson, R. R. and Sampat, B. N. (2001), Making Sense of Institutions as a Factor Shaping Economic Performance, *Journal of Economic Behavior & Organization*, 44, 31–54.
- North, D. C. *Institutions, Institutional Change, and Economic Performance*, Cambridge University Press, 1990.
- Pagona, M. (1993), Financial Markets and Growth: An Overview, *European Economic Review*, 37, 613–22.
- Pedroni, P. (1997), Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests, with an Application to the PPP Hypothesis: New Results, Department of Economics Working Paper, Indiana University.
- Pedroni, P. (1999), Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors, *Oxford Bulletin of Economics and Statistics*, 61, 653–670.
- Pedroni, P. (2000), Fully Modified OLS for Heterogeneous Cointegrated Panels, in *Nonstationary Panels, Panel Cointegration and Dynamic Panels*. Baltagi, B.H. ed., *Advances in Econometrics*, 15, 93–130.
- Phillips, P. C. B. and Hansen, B. E. (1990), Statistical Inference in Instrumental Variables Regression with I(1) Processes, *Review of Economic Studies*, 57, 99–125.
- Pistor, K., Wellons, P. A., Sachs, J. D. and Scott, H. S. *The Role of Law and Legal Institutions in Asian Economic Development, 1960–1995*. Oxford University Press, 1998.
- Rodrik, D. (1997), TFPG Controversies, Institutions and Economic Performance in East Asia, *National Bureau of Economic Research Working Paper*: 5914.
- Rodrik, D., Subramanian, A. and Trebbi, F. (2002), Institutions Rule: The Primacy of Institutions over Integration and Geography in Economic Development, *IMF Working Paper*, 02/189.