Revisiting the institutions–growth nexus in developing countries: The new evidence

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(Received 13 June 2013; accepted 18 November 2013)

In this paper we revisit the institutions–growth nexus in developing countries including the East Asian region. The region has in the past three decades not only achieved spectacular economic growth, but also experienced one of the worst financial crises, i.e. Asian financial crisis (AFC) in 1997–1998. Utilising the neoclassical growth framework augmented with institutional controls and latest estimation technique in panel data analysis, this study finds evidence of positive institutions effect on growth. Nonetheless, the evidence is limited to security of property rights only with no similar evidence on efficient bureaucracy and strong government. This study also uncovers the channel of the institutional effects on economic growth, i.e. via total factors productivity. This study adds to the literature of East Asian growth, which hitherto, to the best of our knowledge, has seen only two studies, namely Rodrik (1997) ‘TFPG controversies, institutions, and economic performance in East Asia’ and Campos and Nugent (1999) ‘Development performance and the institutions of governance: Evidence from East Asia and Latin America’ that document the evidence of institutional importance on economic growth, and these studies are however for the period before the AFC.

Keywords: institutions; economic growth; dynamic panel data analysis; generalised methods of moments

Introduction

The East Asian countries for the past three decades have seen arguably the most spectacular economic development ever achievable in the region. Table 1 shows the countries’ economies in the East Asian region which undoubtedly have grown miraculously for the period up to 1996 with the rates of GDP per capita growth ranging between 4% and 7% on average.1 The dramatic performance of the region is arguably the result of several institutional qualities2 that were present in the countries such as strong authoritarian governments implementing numerous pro-growth policies, secure private property rights and bureaucratic efficiency (refer to theoretical analyses by Ahrens (2002) – strong and authoritarian governments and secure property rights; and Gonzalez and Mendoza (2001) – well-functioning public institutions and bureaucracy). Empirically, Rodrik (1997) and Campos and Nugent (1999) show that institutional qualities like secure property rights and efficient bureaucracy significantly determine the region’s economic performance. However, these are arguably the only two empirical studies documenting the institutional importance on
Table 1. Average real GDP per capita growth for selected East Asian countries (1960–2008).

| Year          | 1960–1980 | 1981–1984 | 1985–1988 | 1989–1992 | 1993–1996 | 1997–2000 | 2001–2004 | 2005–2008 | Average 1960–1996 | Average 1997–2008 |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------|-------------------|
| China         | 2.7       | 8.2       | 9.2       | 6.1       | 10.2      | 7.0       | 8.3       | 9.9       | 7.3               | 8.4               |
| Hong Kong     | 6.6       | 5.2       | 6.9       | 3.6       | 1.9       | 1.3       | 2.9       | 4.8       | 4.8               | 3.0               |
| Singapore     | 6.7       | 5.0       | 4.2       | 4.5       | 6.2       | 3.5       | 2.7       | 2.2       | 5.3               | 2.8               |
| South Korea   | 5.1       | 6.3       | 8.4       | 6.5       | 6.4       | 2.9       | 4.0       | 3.7       | 6.5               | 3.5               |
| Malaysia      | 4.1       | 3.9       | 0.8       | 6.0       | 6.8       | 1.0       | 2.5       | 3.6       | 4.3               | 2.4               |
| Thailand      | 4.3       | 3.3       | 6.2       | 8.2       | 6.8       | –1.6      | 3.9       | 3.4       | 5.8               | 1.9               |
| Indonesia     | 3.2       | 4.1       | 3.3       | 6.5       | 6.0       | –2.3      | 3.1       | 4.5       | 4.6               | 1.8               |

Source: Own calculation. The original data are obtained from the world development index (WDI) from the World Bank (2009).
East Asian growth which we are aware of and apparently they are for the period before the Asian financial crises (AFC) in 1997.

As shown in Table 1, the miraculous growth achievement has however declined significantly beginning in 1997 as a consequence of the AFC. With the exception of China, all other countries are unable to achieve the pre-crisis level of economic growth. The World Bank (1998) suggests that institutional failures are among the main causes of the crisis. Lanyi and Lee (1999) and Lingle (2000) argue that the absence of transparency and accountability and too much intervention and politicisation from the autocratic governments are the main factors which have made the countries vulnerable to the crisis.

This study revisits the link between institutions and economic growth in developing countries from East Asia, Africa and Latin American regions for a period of 24 years (1985–2008). Utilising the neoclassical growth model and controlling for the steady state determinants, we find empirical evidence for the significant institutional qualities that matter for growth. Specifically, an institutional variable that reflects the security of property rights, namely Investment Profile, is found to be consistently significant across all models and samples. This finding confirms that of Rodrik (1997). However, we are unable to find conclusive evidence to support the argument that efficient bureaucracy has a positive effect on the East Asian countries’ growth as previously shown by Campos and Nugent (1999) and Gonzalez and Mendoza (2001). Similarly, we do not find supporting evidence of the strong government hypothesis, which according to Ahrens (2002), matters for growth of the East Asian countries. We also show that institutions affect growth via the total factor productivity channel when both investment and institutional variables (particularly Investment Profile variable) are found to be important.

The remainder of this paper is as follows: Section 2 presents the growth framework, methodology, data sources and description. Discussions of the estimation results are presented in Section 3 and Section 4 concludes.

Growth framework, methodology, data sources and description

Growth framework

Based on Dawson (1998), consider the following Cobb–Douglas function which exhibits constant return to scale but diminishing return to individual factors,

\[ Y_{it} = K_{it}^\alpha (A_{it}L_{it})^{1-\alpha} \]

where \( \alpha < 1 \), \( Y \) is the real output, \( K \) is the physical capital and \( L \) is the amount of labour. \( A_{it} \) represents labour-augmenting technology in country \( i \) at time \( t \) and is assumed to grow exogenously at rate \( g \). If we take natural logarithms of both sides, the standard derivation of steady state income per capita function will then be

\[ \ln y_{it} = \ln A_0 + gt + \frac{\alpha}{1-\alpha} \ln s_{it} - \frac{\alpha}{1-\alpha} \ln (n + g + \delta)_{it} \]

where \( s_{it} \) represents physical capital, \( n \) is the rate of population growth, \( g \) is technological progress and \( \delta \) is depreciation rate all of which are constant and exogenous for any period.

The primary motivation for using the Solow framework is particularly due to the fact that it has a shift parameter, \( A \), which according to Mankiw, Romer, and Weil (1992) reflects not only labour-augmenting technology, but also other factors such as resource endowments, climate, institutions and so on (institutions term is added to the list by Campos & Nugent, 1998). Therefore, the notion of institutions affecting total factor
productivity can be explicitly incorporated in the model via a function of $A$, such as

$$A_t = A_0 e^{gt + I_t} \tag{3}$$

Dawson (1998) argues the specification of the $A$ function as above implies that differences in institutions have an explicit impact on the level of productivity across countries. One important assumption in this specification is that institutions are considered to affect growth via the total factor productivity channel and not via investment, $s_{it}$ and therefore measures of both institutions and investment should be statistically significant in growth estimation. Thus, a growth model based on Equation (1) incorporated with Equation (3) and after taking natural logs on both sides can be conveniently derived as follows:

$$\ln y_{it} = \ln A_0 + gt + I_{it} + \frac{\alpha}{1-\alpha} \ln s_{it} - \frac{\alpha}{1-\alpha} \ln (n + g + \delta)_{it} \tag{4}$$

The functional form of Equation (4), with an appropriate error term and country- and time-specific fixed effects and dynamics, is therefore specified as follows:

$$\ln y_{it} - \ln y_{it-1} = \beta_0 + \beta_1 \ln y_{it-1} + \beta_2 I_{it} + \beta_3 \ln s_{it} + \beta_4 \ln (n + g + \delta)_{it} + \eta_i + \gamma_t + \epsilon_{it} \tag{5}$$

where $\beta$‘s are the parameters to be estimated, especially $\beta_2$ and $\beta_3$ that are our parameters of interest. Equation (5) thus presents a heuristic way of testing the institutional effects on growth via its impact on factors’ productivity.

**Methodology**

In this study, we employ the latest dynamic panel data techniques based around the generalised method of moments (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998) to estimate Equation (5). We also employ pooled ordinary least square (OLS) and panel fixed effect methods as robustness tests. System GMM is able to correct unobserved country heterogeneity problems, omitted variable bias, measurement error and potential endogeneity issue that frequently affect growth models when using pooled OLS and fixed effect methods (Bond, Hoeffler, & Temple, 2001). System GMM is also capable of reducing potential bias and imprecision associated with a simple first-difference GMM estimator (Arellano & Bover, 1995; Blundell & Bond, 1998). The general assumptions for the system GMM estimation are as follows: we treat the lagged dependent variable as a predetermined variable and both investment and population growth variables as potentially endogenous. Similarly, we assume all institutional variables are endogenous since reverse causality from growth to institutions is possible. We set the instruments lag to be one to two periods for the predetermined, potentially endogenous and endogenous variables. This assumption is meant to eliminate endogeneity bias. With this assumption, we postulate that, once the steady state determinants are controlled for, the growth effects of institutions would originate from the state of institutions in the past 4–8 years.

Consistency of the GMM estimator depends on the validity of the instruments. As suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), two specification tests are used. First, Sargan or Hansen test of over-identifying restrictions which tests for the overall validity of the instruments and the null hypothesis is that all instruments as a group are exogenous. The second test examines the null hypothesis that the error term of the differenced equation is not serially correlated, particularly at the second order (AR2). One should not reject the null hypothesis of both tests.
Data sources and description

A panel data-set for 69 developing countries in three regions, East Asia, Africa and Latin America for a period of 24 years (1985–2008) is used in this study. The data are converted into 4-year averages, hence, making \( t = 6 \) throughout the sample period. As for the East Asian countries, the 4-year average data fit nicely into the division between the period of high growth (1985–1996, \( t = 1, 2 \) and 3) and the period post-AFC (1997–2008, \( t = 4, 5 \) and 6). The data for real GDP per capita and population growth are obtained from world development indicators (WDI) of the World Bank (2009). We conveniently follow Mankiw et al. (1992), Islam (1995), Caselli, Esquivel, and Lefort (1996) and Hoeffler (2002) to assume exogenous technological change plus depreciation rate \((g + \delta)\) as 0.05. Similarly, we follow them by using investment share of real GDP per capita as a proxy for physical capital and the investment data are obtained from Penn World Table 6.3 (Heston, Summers, & Aten, 2009).

To measure institutional qualities for the countries under study, and following the theoretical institutional analyses on the growth of East Asian region by Ahrens (2002) and Gonzalez and Mendoza (2001), three classes of institutions are introduced, i.e. security of property rights, bureaucratic efficiency and political institutions. Four indicators from International Country Risk Guide (ICRG) data-set provided by the PRS Group (2009) are used: Investment Profile and Law and Order to reflect the security of property rights, and Bureaucracy Quality and Government Stability to reflect bureaucratic efficiency. Whereas an index of Political Rights from Freedom in the World, which is also known as the Gastil index (Gastil, 1978), and Polity2 indicator from Polity IV by Marshall and Jaggers (2009) are used as proxies for political institutions.

The Investment Profile assesses the factors affecting the risk to investment from the aspect of contract viability and expropriation, profit repatriation and payment delays. The Law and Order assesses the strength and impartiality of the legal system and the public observance of the law in a country. The Bureaucracy Quality indicates the strength of a bureaucracy, if it has the strength and expertise to govern without drastic changes in policy or interruption in government services. The Government Stability shows the ability of government to carry out its declared programs and its ability to stay in office based on criteria like government unity, legislative strength and public support. The Political Rights assesses the factors which enable people to participate freely in the political process such as right to vote, compete for public office and elect representatives. Finally, Polity2 measures key qualities in executive recruitment, constraints of executives and political competition, and the variable indicates whether a regime is an institutionalised democracy or an institutionalised autocracy. The Appendix presents more information on the indicators’ conceptual definition, the range of score and meaning of the score and the sources of data.

Estimation results and discussions

The results of the estimation are presented in Tables 2 and 3 below. Table 2 presents results for two samples, the overall developing countries and the East Asian countries. Table 3 shows the results for the East Asian sample for two periods, i.e. the period before and after the AFC. Discussion will focus on the system GMM estimation results since it is the preferred method over pooled OLS and fixed effect methods. The parameters of interest in our estimations are the investment term and the coefficients for institutional variables. To substantiate our earlier assumption that investment and institutions have separate effects on growth, i.e. the latter’s effect is via total factor productivity, at least one of the institutional variables included in the model must be significant and investment
Table 2. Estimations of growth model augmented with institutional variables for whole countries and East Asian samples.

|                        | Whole sample: 69 developing countries | East Asian sample: 14 countries |
|------------------------|--------------------------------------|---------------------------------|
|                        | Pooled OLS  | Fixed effects | System GMM  | Pooled OLS  | Fixed effects | System GMM  |
| Constant               | −0.142 (0.078) | −0.23*** (0.084) | −0.279** (0.126) | −0.102 (0.080) | −0.192** (0.095) | −0.173 (0.143) |
| ln (ynt−1)             | −0.002 (0.002) | −0.001 (0.002) | 0.000 (0.003) | 0.001 (0.003) | −0.001 (0.002) | −0.001 (0.003) |
| ln (snt)               | 0.017*** (0.004) | 0.015* (0.008) | 0.033*** (0.009) | 0.017*** (0.005) | 0.028*** (0.008) | 0.039*** (0.011) |
| ln (n + g + d)         | 0.008 (0.007) | 0.022** (0.011) | 0.019* (0.012) | 0.009 (0.008) | 0.019 (0.012) | 0.013 (0.015) |
| Investment Profile     | 0.003* (0.002) | 0.005*** (0.002) | 0.003* (0.002) | 0.005** (0.003) | 0.006** (0.003) | 0.005* (0.003) |
| Law and Order          | 0.002* (0.001) | 0.002* (0.001) | 0.003 (0.002) | 0.003 (0.002) | 0.003* (0.002) | 0.002 (0.002) |
| Bureaucracy Quality    | 0.000 (0.001) | −0.001 (0.001) | −0.001 (0.001) | −0.001 (0.002) | 0.004** (0.002) | −0.002 (0.003) |
| Government Stability   | 0.004* (0.002) | 0.003 (0.002) | 0.005** (0.002) | −0.001 (0.002) | −0.004** (0.002) | −0.000 (0.003) |
| Political Rights       | 0.002 (0.002) | 0.000 (0.002) | 0.003 (0.003) | −0.004* (0.002) | −0.003 (0.003) | −0.005 (0.003) |
| Polity2                | −0.001 (0.001) | 0.001 (0.002) | −0.001 (0.002) | 0.002 (0.002) | −0.001 (0.002) | 0.003 (0.004) |
| R²                     | 0.250         | 0.493          | −0.001 (0.002) | 0.162         | 0.407          | 0.143         |
| Adjusted R²            | 0.233         | 0.376          |               | 0.143         | 0.270          |               |
| Number of instruments  |              |               | 127            |              |               | 113           |
| AR1 p-value            | 0.032         |               |               | 0.048         |               |
| AR2 p-value            | 0.102         |               |               | 0.166         |               |
| Hansen p-value         | 1.000         |               |               | 1.000         |               |

Note: Dependent variable is log real GDP per capita growth. Robust standard errors are in parentheses. AR(1) and AR(2) are the Arellano–Bond tests for first-order and second-order autocorrelation in the residuals of differenced equation, respectively. Hansen test of over-identification tests for Ho: the instruments as a group are exogenous. ****, ** and * indicate the coefficient is significantly different from zero at 1%, 5% and 10%, respectively.
### Table 3. Estimations of growth model augmented with institutional variables for East Asian samples pre- and post-AFC.

|                                | East Asian countries for the period pre-AFC (1985–1996) | East Asian countries for the period post-AFC (1997–2008) |
|--------------------------------|--------------------------------------------------------|--------------------------------------------------------|
|                                | Pooled OLS | Fixed effects | System GMM | Pooled OLS | Fixed effects | System GMM |
| Constant                        | −0.101 (0.079) | −0.189** (0.093) | −0.188 (0.151) | −0.114 (0.081) | −0.188** (0.094) | −0.251 (0.153) |
| \( \ln (y_{t-1}) \)            | 0.002 (0.002) | −0.000 (0.002) | 0.000 (0.003) | 0.001 (0.003) | −0.001 (0.002) | 0.002 (0.004) |
| \( \ln (s_t) \)                | 0.018*** (0.005) | 0.028*** (0.007) | 0.042*** (0.012) | 0.021*** (0.005) | 0.029*** (0.008) | 0.046*** (0.012) |
| \( \ln (n+g+\delta)_t \)      | 0.008 (0.008) | 0.019 (0.012) | 0.013 (0.015) | 0.009 (0.008) | 0.019 (0.012) | 0.019 (0.016) |
| Investment Profile             | 0.009*** (0.003) | −0.003 (0.005) | 0.008** (0.003) | 0.008** (0.004) | 0.009*** (0.003) | 0.008* (0.004) |
| Law and Order                  | −0.003 (0.003) | −0.001 (0.003) | −0.004 (0.003) | 0.006 (0.005) | −0.000 (0.004) | 0.005 (0.007) |
| Bureaucracy Quality            | 0.003** (0.001) | 0.004* (0.002) | 0.000 (0.002) | −0.012** (0.006) | −0.004 (0.004) | −0.016 (0.010) |
| Government Stability           | 0.003 (0.004) | 0.004 (0.005) | 0.003 (0.004) | 0.000 (0.003) | −0.003 (0.002) | 0.002 (0.003) |
| Political Rights               | −0.013*** (0.002) | −0.002 (0.003) | −0.006* (0.003) | −0.013** (0.007) | −0.011* (0.005) | −0.015 (0.010) |
| Polity2                         | 0.001 (0.002) | −0.002 (0.002) | 0.002 (0.003) | 0.012* (0.007) | 0.009* (0.005) | 0.015 (0.011) |
| \( R^2 \)                     | 0.152        | 0.403          | 0.002 (0.003) | 0.135        | 0.405          | 0.115 (0.268) |
| Adjusted \( R^2 \)             | 0.133        | 0.265          | 0.002 (0.003) | 0.115        | 0.268          | 0.002 (0.003) |
| Number of instruments           | 92           |               |              | 74           |               |              |
| AR1 p-value                    | 0.051        |               |              | 0.032        |               |              |
| AR2 p-value                    | 0.169        |               |              | 0.143        |               |              |
| Hansen p-value                 | 0.974        |               |              | 0.734        |               |              |

Note: Dependent variable is log real GDP per capita growth. Robust standard errors are in parentheses. AR(1) and AR(2) are the Arellano–Bond tests for first-order and second-order autocorrelation in the residuals of differenced equation, respectively. Hansen test of over-identification tests for \( H_0 \): the instruments as a group are exogenous. ***, **, and * indicate the coefficient is significantly different from zero at 1%, 5% and 10%, respectively.
must also be significant. A quick glance on the results in Table 2 clearly shows that the investment variable is consistently statistically significant and positive across all models, and there is always at least one significant institutional variable, Investment Profile.

From Table 2, the security of property rights is shown to be the most important institutional quality that matters for growth. Specifically, the Investment Profile variable is consistently positive and significant in all models for both samples. Bureaucratic efficiency, proxied by the Government Stability variable, is also a significant determinant of growth especially in the overall sample, but it is hardly the case in the East Asian sample. Therefore, these results confirm the finding by Rodrik (1997) on the importance of secure property rights environment to East Asian growth, but yield opposite evidence to that of Campos and Nugent (1999) and Gonzalez and Mendoza (2001) who show a significant effect of bureaucratic efficiency to the region (albeit partially since the quality is an important growth determinant in the overall sample that also includes East Asian countries).

Another interesting finding is the negative coefficient for the Political Rights variable in the East Asian sample, which can be interpreted as autocratic government causing growth in the region. Recall Ahrens’ (2002) theoretical study which argues that the underlying reason behind the East Asian countries’ dramatic economic success was the strong and autocratic government that are able to govern the market and pursue (and enforce) pro-growth policies. Nevertheless, our finding of negative coefficient for the Political Rights variable, albeit supporting Ahren’s strong government hypothesis, must not be taken without caveats. First, the Political Rights variable is significant in pooled OLS estimation only and insignificant in the preferred system GMM estimation, and second, the other variable used to reflect political institutions, Polity2, produces inconclusive sign and is not significant in all estimations.

The estimation results for the East Asian sample between the period of pre- and post-AFC are shown in Table 3. The investment term, again, is consistently and significantly positive across all models and periods, thereby, giving further evidence to our earlier assumption on the channel of institutional effect on growth. For institutional variables, it is fair to say, as far as the period of high growth or pre-AFC is considered, two institutional characteristics, i.e. secure property rights and strong government are the key determinants of growth (as reflected by the positive significant Investment Profile variable, and the negative significant Political Rights variable). We however do not consider the Bureaucracy Quality variable’s significant coefficient in the pooled OLS and fixed effect estimations. These findings therefore corroborate that of Rodrik (1997) on the importance of property rights environment towards growth; and Ahrens (2002) on the positive growth effect of strong government. As for the bureaucratic efficiency quality, although we do not consider the pooled OLS and fixed effect significant estimators as an evidence of its importance on growth, our results are similar to Campos and Nugent’s (1999) obtained via cross-sectional estimation and Gonzalez and Mendoza’s (2001) theoretical analysis on the importance of bureaucratic efficiency.

For the period of post-AFC, with the exception of the Investment Profile variable which continues to be positive significant as expected, the other variables yield conflicting results. For Bureaucracy Quality, it is negative for all models for the post-AFC period, and insignificant in the system GMM method although it is in the pooled OLS. For the political institution characteristics, both Political Rights and Polity2 variables are not significant in the preferred system GMM estimation, despite being significant in the other two methods. Besides, the sign of the coefficients for both variables are wrong, thus we are unable to lend conclusive support for Ahren’s strong government hypothesis.

As far as the empirical performance of system GMM estimation in this study is concerned, it seems reasonably satisfactory and robust. The test for first-order serial correlation
in the residuals AR(1) show that null hypothesis of no first-order serial correlation is rejected in all estimations and samples, which is not unexpected. Meanwhile, the test of second-order serial correlation AR(2) on overall shows that all estimations have no problem of second-order serial correlation since AR(2) test statistics are unable to reject the null of no second-order serial correlation (p-value from 0.102 to 0.169 in all four estimations).

The Hansen test for over-identification meanwhile indicates the null of exogenous instruments is not rejected with p-value from 0.734 to 1.000. Nevertheless, the implausibly good p-value of this range for Hansen test should be interpreted with caution since the test is apparently weakened by a high instrument count. Nevertheless, there are a number of studies employing system GMM that report p-value of 1.000 or close to 1.000 for Hansen test, for example Baltagi, Demetriades, and Law (2009) and Hassan, Wachtel, and Zhou (2009).

Concluding remarks
The East Asian countries have experienced a dramatic economic performance in the past three decades, but an unprecedented financial crisis in 1997–1998 has brought this achievement to an end. Utilising neoclassical Solow growth framework augmented with institutional variables reflecting property rights, bureaucratic efficiency and political institutions, and employing the latest estimation technique and data-set, this study finds some empirical support to the proposition ‘institutions matter’ for economic growth in developing countries and it is able to show that the institutional growth effect essentially runs via the total factor productivity channel.

Specifically, this study finds security of property rights (proxied by the Investment Profile variable) matter significantly for growth in all developing countries under study including the East Asian region and this finding is consistent across different model specifications, country samples and time periods. As for the bureaucratic efficiency quality, the findings of this study is comparable to that of Campos and Nugent (1999) and Gonzalez and Mendoza (2001), but our preferred estimation method yields no significant results for both variables. Finally, this study is unable to find sufficient evidence in support of the strong government hypothesis proposed by Ahrens (2002) who argues that strong and authoritarian governments of the East Asian countries is the reason behind the countries’ miraculous growth. The variables reflecting political institutions namely Political Rights and Polity2 yield conflicting signs and are insignificant in most estimates.

This study contributes to the existing East Asian growth literature as it is arguably the first that uses dynamic panel data analysis to test for institutions growth linkage in developing countries, particularly the East Asian countries for the period when significant growth achievement and severe financial crisis occurred.

Acknowledgements
Stephen Hall acknowledges the support of ESRC-DFID Growth Programme (Award number RS10G0066).

Mahyudin Ahmad is grateful to his PhD advisor, Professor Stephen G. Hall for his continued support in publishing this paper. He kindly thanks the participants at the USM-AUT International Conference 2012 for their supportive remarks. His gratitude extends to Dr Saten Kumar, guest editor of this special issue, Professor Mark J. Holmes, editor-in-chief, New Zealand Economic Papers, and Julia Powys, production editor, and the referees involved in this paper. All remaining errors are his.

Notes
1. The phenomenal economic performance during the period of 1960s to 1990s was once dubbed as ‘the East Asian Miracle’ by the World Bank (1993). There are studies that documented the
underlying factors behind the economic achievement by the region such as Krugman (1994), Collins and Bosworth (1996), Sarel (1997), Senhadji (2000), Nelson and Pack (1999), Easterly and Levine (2002) and Iwata, Khan, and Murao (2002).

2. Influential studies such as Hall and Jones (1999), Acemoglu, Johnson, and Robinson (2001, 2005) and Rodrik, Subramaniam, and Trebbi (2004) have found evidence of institutions’ positive effects on economic growth.

3. If institutions primarily affect investment and therefore indirectly affect growth (via the investment channel), the Solow framework could therefore be extended to include institutions via $s = f(I)$ as a function of institutions, i.e. $s = f(I)$ and $f'(I) > 0$. However, the implication of this specification is that, if it is proven the institutions affect growth via the investment channel only, it will be redundant to include both investment and institutions as regressors in a growth model. Investment (as a proximate growth determinant) should therefore be omitted. On the other hand, if institutions affect growth only partially via the investment channel, omitting investment would not be appropriate as important information would be lost (see Dawson, 1998) for more discussion on the possible channels of institutional effects on growth and the ensuing assumptions that need to be made.

4. The estimation using pooled OLS and fixed effect methods will allow an appropriate comparison to the results of previous institutional studies, such as Rodrik et al. (2004) and Glaeser, La Porta, Lopez-de-Silanes, and Shleifer (2004), which rely on similar methods.

5. These sets of lags are chosen after a series of estimations involving multiple combinations of lags were run using the system GMM regression. The decision to use these sets of lags is because they yield the best results as far as the significance of the steady state determinants and institutional variables as well as the strength of diagnostic tests of the regressions are concerned.

6. We follow Bond et al. (2001) and employ one-step GMM estimators since efficiency gains from two-step GMM estimators is shown by Bond et al. to be small, and two-step estimators normally converge to its asymptotic distribution relatively slowly, and in a finite sample its asymptotic standard errors can be seriously biased downwards, and thus making it unreliable. Despite Windmeijer’s (2005) correction to this problem of achieving robust standard errors in two-step GMM estimation, we have already enforced heteroskedastic and autocorrelation robust standard error in the one-step GMM estimation, therefore, one-step GMM estimation is preferred.

7. By construction, the differenced error term is probably serially correlated at the first order even if the original error is not. While most studies that employ GMM dynamic estimation report the test for first order serial correlation, some do not.

8. Recall that the Solow growth framework shows that savings and population growth are the two key drivers of economic growth. Mankiw et al. (1992), despite basing their study on the Solow growth framework, however use the investment share of real GDP per capita to proxy for savings.

9. See footnote 7.

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### Appendix. Summary of institutional variables’ conceptual definition, range of score and its meaning and sources of data

| Number | Variable name     | Conceptual definition                                                                                                                                                                                                 | Range of score\(^a\) | Measurement of sources of data                                                                 |
|--------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------|
| 1.     | Investment Profile| An assessment of factors affecting the risk to investment from the aspect of contract viability and expropriation, profits repatriation and payment delays. This is a merged version of two ICRG indicators (IRIS data set) namely Repudiation of Contracts by Government, and Risk of Expropriation (Knack & Keefer, 2005) | From ‘0’ to ‘10’      | Security of property rights. International Country Risk Guide (ICRG) – PRS Group (2009)          |
|        |                   |                                                                                                                                                                                                                       | 0 = very high risk    |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | 10 = very low risk     |                                                                                 |
| 2.     | Law and Order     | An assessment of the strength and impartiality of the legal system, and public observance of the law.                                                                                                                                 | From ‘0’ to ‘10’      | Security of property rights. International Country Risk Guide (ICRG) – PRS Group (2009)          |
|        |                   |                                                                                                                                                                                                                       | 0 = very high risk    |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | 10 = very low risk     |                                                                                 |
| 3.     | Bureaucracy Quality| An assessment of possible drastic policy changes when governments change. Strong bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services and it tends to be somewhat autonomous from political pressure and have an established mechanism for recruitment and training. | From ‘0’ to ‘10’      | Bureaucratic efficiency. International Country Risk Guide (ICRG) – PRS Group (2009)            |
|        |                   |                                                                                                                                                                                                                       | 0 = very low quality   |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | 10 = very high quality |                                                                                 |
| 5.     | Government Stability| An assessment of the government’s ability to carry out its declared program(s) and its ability to stay in office based on criteria like government unity, legislative strength and public support. | From ‘0’ to ‘10’      | Bureaucratic efficiency. International Country Risk Guide (ICRG) – PRS Group (2009)            |
|        |                   |                                                                                                                                                                                                                       | 0 = very low stability |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | 10 = very high stability|                                                                                 |
| 6.     | Political Rights  | An indicator that assesses the factors that enable people to participate freely in the political process, including through the right to vote, compete for public office and elect representatives who have a decisive impact on public policies and are accountable to the electorate. | From ‘0’ to ‘10’      | Political institutions. Freedom in the World (also known as Gastil index) – Gastil (1978) |
|        |                   |                                                                                                                                                                                                                       | 0 = very low rights    |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | 10 = very high rights  |                                                                                 |
| 8.     | Polity2           | Measures key qualities in executive recruitment, constraints on executives, and political competition. It gives indication whether a regime is an institutionalised democracy or institutionalised autocracy or anocracies (mixed, or incoherent, authority regimes). | From ‘0’ to ‘10’      | Political institutions. Polity IV – Marshall and Jaggers (2009)                          |
|        |                   |                                                                                                                                                                                                                       | 0 = institutionalised  |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | autocracy             |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | 10 = institutionalised  |                                                                                 |
|        |                   |                                                                                                                                                                                                                       | democracy             |                                                                                 |

\(^a\)The original range of score for each variable is different since the variables are obtained from different sources. We have recalculated the scores and transformed them into a standard range of 0–10, the higher the score indicates the lower the risk. As for the variable Polity2, the higher the score, the more democratic a regime is.