NBER WORKING PAPER SERIES

TFPG CONTROVERSIES, INSTITUTIONS, AND ECONOMIC PERFORMANCE IN EAST ASIA

Dani Rodrik

Working Paper 5914

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 1997

Paper presented at the International Economic Association Round Table Conference on The Institutional Foundation of Economic Development in East Asia, Tokyo, December 16-19, 1996. I am grateful to Masa Aoki, Tain-Jy Chen, Yujiro Hayami, and conference participants for comments, and to Barry Bosworth, Susan Collins, and Bill Easterly for making their data available. This paper is part of NBER's research programs in Economic Fluctuations and Growth and International Trade and Investment. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

TFPG Controversies, Institutions, and Economic Performance in East Asia

Dani Rodrik

NBER Working Paper No. 5914
February 1997
JEL Nos. O30, F43, O47, O53
Economic Fluctuations and Growth
and International Trade and Investment

ABSTRACT

The controversy over the appropriate partitioning of East Asian growth into accumulation versus technical change has overlooked a fundamental indeterminacy in measurement. As a result, we cannot rule out the possibility that East Asia has in fact experienced a tremendous amount of technological progress of the labor-saving kind. Second, an index of institutional quality (drawn from work by Knack and Keefer [1995] and Easterly and Levine [1996]) does exceptionally well in rank-ordering East Asian countries according to their growth performance. A parsimonious specification containing only initial income, initial education, and institutional quality accounts for virtually all of the variation in the growth performance in the region, even when institutional quality is instrumented. Finally, the experience of Hong Kong, which has had a flat investment ratio since the 1960s, is consistent with the idea that making the transition from a low-investment economy to a high-investment economy requires a hands-on government.

Dani Rodrik
John F. Kennedy School of Government
Harvard University
79 JFK Street
Cambridge, MA 02138
and NBER
Dani_Rodrik@ksg.harvard.edu

1. Introduction

Most economists would agree that there are major lessons to be drawn for other countries from East Asia's growth experience. But what these lessons are remains subject to considerable debate. The role of macroeconomic stability and human resources is uncontroversial. The contributions--positive or negative--made by industrial policy, and by government interventions more broadly, are hotly contested. Even there, however, there is some convergence of views on the proposition that, whatever the economic merits of industrial policy, the institutional context in which interventions were carried out in East Asia resulted in fewer by-product distortions than might otherwise have been the case.

Most cross-country analyses tend to compare East Asia as a whole to other regions of the world. As any observer of the region knows, however, the East Asian countries themselves exhibit quite a wide range in terms of policies and performance. In the area of microeconomic policy, for example, South Korea differs more from Hong Kong than it does from, say, Brazil or Turkey. The Philippines' economic performance during the 1980s makes it more of a Latin American country than an East Asian one. One objective of this paper is to emphasize that differences in the quality of governmental agencies are a plausible source of the variation in economic performance in the region.

I make three points in the following pages. First, I will argue that the recent controversy over the appropriate partitioning of East Asian growth into accumulation versus

technical change has overlooked a fundamental indeterminacy in measurement: it is impossible to calculate the technology "residual" without taking a stand on the form of the underlying production function (and its change over time). As a result, we cannot distinguish in practice between two contending explanations for why the capital share in East Asia has remained high despite tremendous capital-deepening; the reason could be a sufficiently high elasticity of substitution between capital and labour (the maintained hypothesis in the literature on TFPG) or a high level of labour-saving technological change. Put differently, we cannot rule out the possibility that East Asia has in fact experienced a tremendous amount of technological progress of the labour-saving kind. While this possibility counteracts the pessimistic conclusions of Krugman (1994), it does not affect the argument by Young (1995) and Rodrik (1995) that capital accumulation is the chief proximate cause of East Asian growth, for reasons that I will explain below.

Second, I will show that an index of institutional quality (drawn from work by Knack and Keefer [1995] and Easterly and Levine [1996]) does exceptionally well in rank-ordering East Asian countries according to their growth performance. A parsimonious specification containing only initial income, initial education, and institutional quality accounts for virtually all of the variation in the growth performance in the region, even when institutional quality is instrumented using plausible exogenous determinants. I will also provide some

evidence that institutional quality in the region is negatively related to aspects of social fragmentation such as ethno-linguistic diversity and income inequality.

Finally, I will briefly compare the case of Hong Kong to the others in the region. Hong Kong is special in that it is the only country to have had an unadulterated laissez-faire attitude to microeconomic policy. It is also the only country in the region which has not experienced a steady, sustained rise in its investment/GDP ratio since 1960. I will suggest that these two facts are not a coincidence. Making the transition from a low-investment economy to a high-investment economy requires a hands-on government.

2. Sources of growth in East Asia: accumulation versus productivity change

Recent research by Young (1995) and Kim and Lau (1994) has generated considerable controversy by suggesting that productivity growth may have accounted for only a small fraction of the growth of the East Asian economies, with capital accumulation being responsible for the bulk of it. Krugman (1994) has taken this work one step further by drawing parallels between East Asia and the Soviet pattern of "extensive" growth, with ominous implications for the future of the region.

I begin by reviewing a new set of estimates of factor productivity growth by Barry Bosworth and Susan Collins (1996). The estimates of Bosworth and Collins (1996), shown in Table 1,

are noteworthy because they cover more than 80 countries over the 1960-94 period. These authors pay considerable attention to data issues and, in particular, to the construction of measures of human capital accumulation. Their results are in line with those of Young: capital deepening accounts for the bulk of the growth in output per worker in East Asia, with total factor productivity growth (TFPG) a distant second. At the same time, as the estimates in Table 1 make clear, East Asia's productivity performance (as measured by TFPG) is quite respectable, and is far superior to that of other regions except possibly South Asia and non-U.S. industrial countries.

There is a wide range of outcomes within East Asia, as the figures in Table 1 also make clear. Korea, Singapore, Thailand, and Taiwan stand out in terms of both overall growth in output per worker and productivity performance (Hong Kong is not included in the sample). The Philippines stands at the other end, with very low growth and negative TFPG. Indonesia and Malaysia exhibit intermediate levels of performance. I will turn later on in this paper to reasons that may account for the divergent experiences.

These results on TFPG are controversial because of their Krugmanesque implications. A key difference between East Asia and the former Soviet Union, however, is that measured rates of productivity growth have not come down in East Asia since the 1960s. If anything the trend seems to be upward (see Bosworth and Collins 1996). In the Soviet Union, by contrast, TFPG fell

over time, and had become negative by the 1980s (see Easterly and Fischer 1995). The fact that East Asian countries have managed to avoid a similar fate may contain an important message about the ability of these economies to generate growth without running out of profitable investment opportunities. Putting it differently, the Soviet comparison, far from detracting from the East Asian success, actually makes it look even more impressive.

2.1 What do the TFPG calculations really show?

While the similarity of findings by Young and Bosworth and Collins may seem comforting at first sight, the evidence we have on the relative significance of accumulation versus productivity growth is actually much less clear cut than is commonly believed. The evidence on investment rates is direct and speaks for itself: with the sole exception of Hong Kong, all East Asian countries have managed to engineer significant increases in their investment rates. But the evidence on TFP is indirect and has to be intrepreted with care. There is in fact a fundamental problem with these estimates of TFPG. It is worth discussing this problem at some length as it has been overlooked in the current literature.

Remember that TFPG is calculated as a residual. One implication is that the calculation depends on the maintained hypothesis about the form of the underlying production function, which itself is of course never directly observed. In fact, there exists a general theorem due to Diamond et al. (1978) which

says that it is impossible to disentangle factor-augmenting technological change from the shape of the production function (and in particular its elasticity of substitution). What this means in our context is that we may be misattributing labour-augmenting technical change in East Asia to an assumed elasticity of substitution that is too high, with the consequence that TFP growth is underestimated.

To see how this might happen, and how serious the implications are, it is useful to carry out a small exercise based on the Bosworth-Collins calculations for rates of factor accumulation. Bosworth and Collins assume that the production functions are of the Cobb-Douglas form, with a capital share (α) of 0.35. They then calculate TFPG as follows:

$$TFPG = (\hat{y}-\hat{l}) - \alpha(\hat{k}-\hat{l}) - (1-\alpha)\hat{h} \qquad (1)$$

where y, l, k, and h denote output, employment, capital, and skills, respectively, and a hat denotes percent changes. The Cobb-Douglas assumption imposes an elasticity of substitution between capital and labour (with the latter defined to be inclusive of skills) of unity. Suppose, for the moment, that technical change is indeed Hicks-neutral, which is what Bosworth and Collins implicitly assume (this assumption will be relaxed below). But now assume that the true elasticity of substitution is below unity. Then capital deepening would result in the factor-share of capital (α) to fall over time, rather than remain constant at 0.35. For given rates of capital deepening and

output growth, the residual (attributed to TFP growth) would correspondingly increase. This effect would be particularly strong in the East Asian countries, as they are the ones that have experienced the most capital deepening. Consequently, the downward bias in estimating TFPG would be largest for the East Asian countries.

Table 2 shows the quantitative magnitudes involved. Bosworth and Collins calculate an annual TFP growth rate of slightly over 1% for East Asia on average. This is shown in the first row of the table. The remaining rows display what the imputed TFP growth rates would have been under different assumptions about the elasticity of substitution. For example, with an elasticity of substitution of 0.5, the imputed TFP growth would rise to 1.93% in ten years, 2.53% in twenty years, and 2.89% in thirty years. Clearly, the lower one's priors about the elasticity of substitution, the higher one must presume TFP growth rates to have been in East Asia.

One defense of the unitary elasticity of substitution is that we do not actually observe the reductions in the capital share that would be implied by low elasticities of substitution (and displayed in Table 2).[1] But this is misleading because of the indeterminacy noted above. This indeterminacy has to do with the fact that a reduction in the marginal productivity of capital can be cushioned <u>either</u> by a high elasticity of substitution <u>or</u> by <u>labour-saving</u> technical change. My calculations assumed that TFP growth was Hicks-neutral. Suppose instead that technical

change was labour-saving, i.e. that it favored the marginal productivity of capital. In that case, we would not have observed any significant decline in the capital share.[2]

More generally, the rate of change of the capital share over time can be expressed as:

$$\dot{\alpha} = \frac{1-\sigma}{\sigma}(1-\alpha)\,[(\hat{a}_L - \hat{a}_K) - (\hat{k}-\hat{l})] \qquad (2)$$

where σ is the elasticity of substitution, and a_L and a_K are the labour- and capital-augmentation coefficients respectively. As the equation shows, the observed capital share can remain constant over time for either of two reasons: (i) σ is close to unity, which is the Cobb-Douglas case; or (ii) there is fast enough labour-augmenting technical change ($\hat{a}_L$) buttressing the marginal productivity of capital, which would otherwise be falling in view of capital deepening. There is an observational equivalence between these two cases. We simply cannot disentangle empirically which is the real culprit.[3] Therefore we would have to place very strong priors on the likelihood that $\sigma = 1$, or on the Hicks-neutrality of technical change, in order to be able to rule out a significant amount of labour-saving technical change.

The problem is most severe when the production function is assumed to be of the Cobb-Douglas type, but it exists even when this assumption is not made. This is because discrete-time formulations of TFPG must rely on end-period factor shares, which

depend both on the form of the production function and on the intervening technical change.

This can be illustrated using the approach taken by Young (1995). Young uses a translogarithmic production function, which does not constrain the elasticity of substitution to be unity, to motivate his empirical analysis. First-differencing the logarithm of this production function, he expresses TFPG between time t-1 and t as follows:

$$TFPG_{t-1,t} = \ln(\frac{y_t}{y_{t-1}}) - \bar{\alpha} \ln(\frac{k_t}{k_{t-1}}) - (1-\bar{\alpha}) \ln(\frac{l_t}{l_{t-1}}) \quad (3)$$

where

$$\bar{\alpha} = \frac{\alpha_t + \alpha_{t-1}}{2} \quad (4)$$

(This is a rearrangement of equation 3 in Young 1995.) Hence, factor-shares at the beginning and end of the period are averaged to calculate the contributions of capital and employment growth. This creates a problem with the interpretation of the residual, for reasons explained above. The capital share can remain high despite capital deepening between t-1 and t either because there is sufficient substitutability between capital and labour, or because technical change is labour-saving. In the latter case, too much of growth would be attributed to capital accumulation, and too little to the residual (i.e. TFPG).

2.2 A closer look at the potential bias

A heuristic derivation of the likely downward bias in TFPG measurement when technical change is labour-saving and the elasticity of substitution is below unity is instructive. For this purpose, let us write the production function as $y_t = a_t f(a_{kt}k_t, a_{lt}l_t)$, with a_t, a_{kt}, and a_{lt} denoting technical coefficients. Assume the production function exhibits constant returns to scale. Using Young's (1995) approach, we can express output growth as:

$$\hat{y} = [\hat{a} + \bar{\alpha}\hat{a}_k + (1-\bar{\alpha})\hat{a}_l] + \bar{\alpha}(\hat{k}-\hat{l}) + \hat{l} \qquad (5)$$

where a hat denotes first differences in logs ($\hat{x} = \ln x_t - \ln x_{t-1}$), and $\bar{\alpha}$ is the average capital share in output (between t and t-1) as before. We calculate TFPG as the difference between actual output growth ($\hat{y}_c$) and the output growth that would have resulted in the absence of technical change ($\hat{y}_{nc}$):

$$TFPG = \hat{y}_c - \hat{y}_{nc} \qquad (6)$$

Since $\bar{\alpha}$ can be approximated by $\alpha_{t-1}[1 + (\hat{\alpha}/2)]$, it follows from (5) and (2), and from noting that $\hat{a} = \hat{a}_l = \hat{a}_k = 0$ under the scenario of no technical change, that

$$\begin{aligned} \hat{y}_{nc} &= \bar{\alpha}(\hat{k}-\hat{l}) + \hat{l} \\ &= \hat{l} + \alpha_{t-1}(\hat{k}-\hat{l}) - \frac{1}{2}\alpha_{t-1}\left(\frac{1-\sigma}{\sigma}\right)(1-\alpha_{t-1})(\hat{k}-\hat{l})^2 \end{aligned} \qquad (7)$$

Note the interpretation of the third term: as long as σ is less

than unity, capital deepening results in a fall in the capital share, and, in the absence of technical change, this reduces growth from what it would otherwise have been with an unchanged capital share of α_{t-1}.

Actual growth (inclusive of technical change) is in turn given by:

$$\hat{y}_c = [\hat{a} + \bar{\alpha}\hat{a}_k + (1-\bar{\alpha})\hat{a}_l] + \bar{\alpha}(\hat{k}-\hat{l}) + \hat{l}$$

$$= [\hat{a} + \bar{\alpha}\hat{a}_k + (1-\bar{\alpha})\hat{a}_l] + \hat{l} + \alpha_{t-1}(\hat{k}-\hat{l}) + \frac{1}{2}\alpha_{t-1}(\frac{1-\sigma}{\sigma})(1-\alpha_{t-1})(\hat{k}-\hat{l})[(\hat{a}_l-\hat{a}_k) - (\hat{k}-\hat{l})] \quad \textbf{(8)}$$

This follows from the same logic as previously, without imposing $\hat{a} = \hat{a}_l = \hat{a}_k = 0$. Taking the difference we calculate "true" TFPG as follows:

$$TFPG = [\hat{a} + \bar{\alpha}\hat{a}_k + (1-\bar{\alpha})\hat{a}_l] + \frac{1}{2}\alpha_{t-1}(\frac{1-\sigma}{\sigma})(1-\alpha_{t-1})(\hat{k}-\hat{l})(\hat{a}_l-\hat{a}_k) \quad \textbf{(9)}$$

The conventional measurement of TFPG, on the other hand, is based on the following equation (using Young's formula above):

$$T\tilde{F}PG = \hat{y}_c - \hat{l} - \bar{\alpha}(\hat{k}-\hat{l})$$

$$= [\hat{a} + \bar{\alpha}\hat{a}_k + (1-\bar{\alpha})\hat{a}_l]$$

The bias in measurement is therefore:

$$Bias = TFPG - T\tilde{F}PG = \frac{1}{2}\alpha_{t-1}(\frac{1-\sigma}{\sigma})(1-\alpha_{t-1})(\hat{k}-\hat{l})(\hat{a}_l-\hat{a}_k) \quad \textbf{(11)}$$

We note several things about this expression for the bias. First note that it disappears when either $\sigma = 1$ or $\hat{a}_l = \hat{a}_k$. That is, when the true production function is Cobb-Douglas or technical change is of the Hicks-neutral type there exists no bias, as noted above. Second, assuming $\sigma < 1$, the downward bias is always positive as long as technical change is geared towards "saving" the factor that is becoming relatively scarce (which is plausible). In particular, when capital deepening is accompanied by labour-saving technical change ($\hat{a}_l > \hat{a}_k$), conventional estimates of TFPG will be necessarily biased downwards (on the assumption, again, that $\sigma < 1$). Third, the bias is proportional to the magnitude of capital deepening on the assumptions just stated, so that the productivity performance of high-investment countries (such as those in East Asia) will be systematically underestimated relative to other countries. Fourth, the bias is cumulative in a way that equation (11) does not entirely make clear: labour-saving technical change this period raises the factor share of capital in the next period (relative to what it would have been), thereby increasing the apparent contribution to growth of <u>next period's</u> capital deepening. Accordingly, the cumulative bias over a period of decades will be much larger than that indicated by equation (11), if this equation were to be applied period by period.

These considerations have a rather depressing implication for our ability to discern the relative contributions of accumulation and technical change in East Asian growth. In

principle, any rate of labour-saving technical change is compatible with the observed outcomes provided we make the appropriate assumptions on the form of the underlying production function. However, in my view, neither nihilism nor downplaying the importance of capital accumulation is the right response to this. Capital accumulation itself is relatively well measured, and there is a tight relationship between it and economic growth, as shown in Figure 1. Leaving command economies out, the best single predictor of the growth of an economy remains its investment rate. Hence, focussing on the determinants of investment as the proximate source of growth seems to me to be the right approach. This is consistent with both the East Asian and the broader, cross-country experience.

Furthermore, equation (11) suggests an additional reason why focusing on accumulation is the right way to go. Even if we underestimate the contribution of technical change to growth, the previous discussion indicates that the magnitude of the downward bias is likely to be proportional to capital deepening. Intuitively, labour-saving technical change is most likely to take place when there is significant amounts of capital deepening. Consequently, this line of argument returns us to our starting point: capital accumulation is the proximate source of growth.

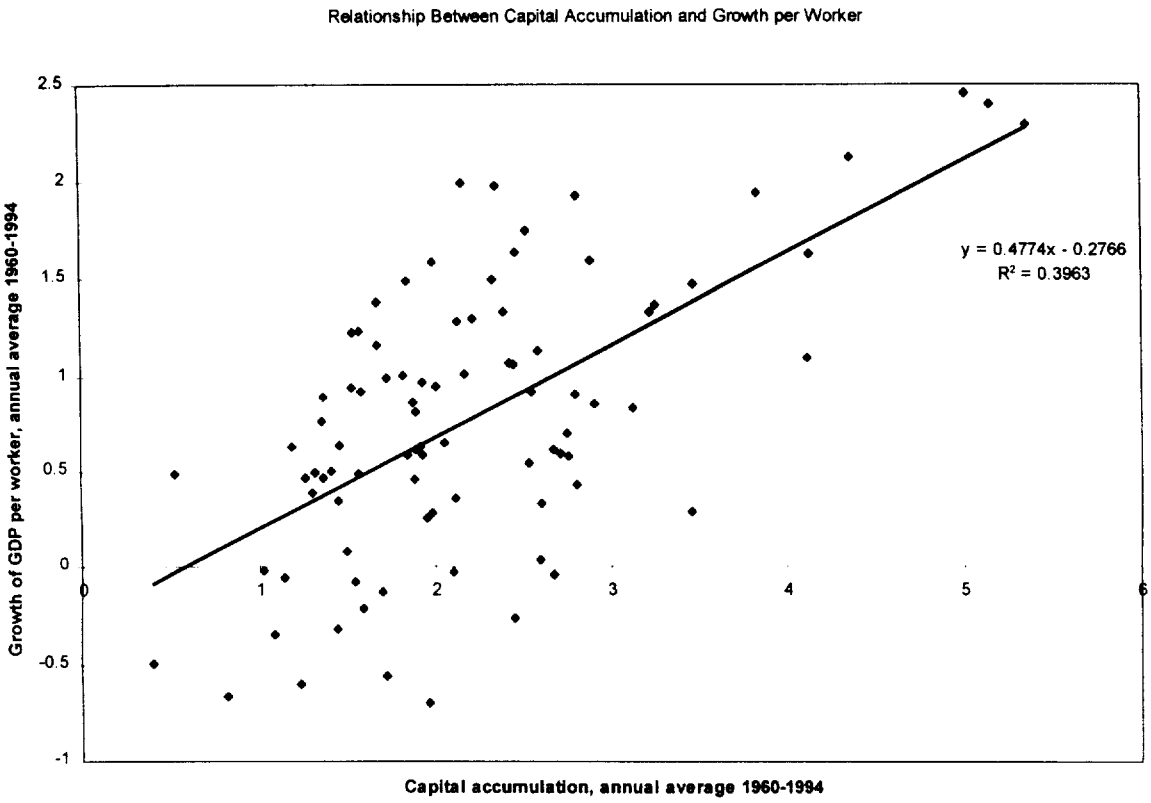

Figure 1

Source: Data from Bosworth and Collins (1996).

3. Explaining differentials in economic performance within East Asia

Much ink has been spilt explaining why East Asia has done so much better than other regions of the world. There is consensus on a number of issues, in particular on the importance of conservative fiscal policies, sound exchange-rate management (both critical inputs into macroeconomic stability), low or non-existent anti-export bias (at least in aggregate), and educational policies. Two areas remain controversial: the relative significance of trade policy versus investment incentives, and the contribution of targeted industrial policies (World Bank 1993, Page 1994, Rodrik 1995).

There is less work on explaining the differentials in performance <u>across</u> the East Asian countries themselves. Such differentials are not insignificant, as the numbers in Table 1 make clear. The Philippines' experience--with a growth rate per worker of 1.2 percent compared to the East Asia average of 4.2 percent--has been decidedly inferior to the other economies'. But even if one leaves this country out (as the World Bank did in its East Asia study), we still have the Indonesian and Malaysian cases These two countries experienced annual average growth rates per worker of 3.4 and 3.8 percent, respectively, over the entire 1960-94 period. While this looks quite good when the reference group is all developing countries taken together, it is still about 2 percentage points below the growth experienced by Korea and Taiwan.

It is clear that the East Asian countries differed from each other in terms of initial conditions, the institutional context, and government policies. These differences have led many to argue that there is no single East Asian recipe for success (see for example World Bank 1993 and Page 1994). It is plausible that many of these differences account for the variation in economic performance in the region as well. In line with the general theme of this conference, a question of particular importance is the degre to which institutions have mattered. Of course, it is well recognized that institutions have played a key role in East Asia's success. But do institutional differences also explain why some countries in East Asia have done better than others?

Table 3 displays an index of institutional quality for eight East Asian countries--Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Thailand, and Taiwan--along with some other basic data on initial conditions. This index is one that has been constructed by Easterly and Levine (1996) using data from Knack and Keefer (1995), who in turn base it on surveys compiled by the International Country Risk Guide. It is based on responses to questions relating to the following aspects of governance:

- quality of the bureaucracy, with high scores indicating autonomy from political pressure, expertise and efficiency in the provision of government services, and superior modes of recruitment and training;
- rule of law, with high scores indicating sound political

institutions, strong courts, and orderly succession of political power;

- risk of expropriation, with low scores indicating possibility of confiscation and forced nationalizations;
- repudiation of contracts by government, with low scores indicating risk of modification in contracts such as repudiation, postponement, or scaling down due to budget cutbacks, changes in government priorities, etc. (see Knack and Keefer 1995).

Easterly and Levine (1996) have combined these indices and converted them to a scale from 1 to 10, with high values indicating good institutions. I use their measure here, as it is strongly correlated with other measures of institutional quality such as indices of government corruption. One problem with this index, however, is that it is based on surveys compiled during the 1980s, that is towards the end of the 1960-94 period. If strong institutions are a by-product of economic development (as well as its cause), we might mistakenly attribute too much significance to institutional quality as a causal factor for growth when using this index. I will deal with this problem below by using an instrumental variable approach.

The raw figures tell an interesting story. There is tremendous variation across the East Asian countries in the ranking of their institutions. Japan, Singapore and Taiwan receive very high grades (above 8), while the Philippines scores particularly low (below 3). In fact, the Philippines' score of

2.97 puts it only slightly above a country like Bangladesh (with a score of 2.74). Indonesia scores low as well (below 4), at about the same level as Burma (3.78), Congo (3.69), and Ghana (3.69). The remaining countries (Korea, Malaysia, and Thailand) score between 6 and 7 (comparable to the level of Cote d'Ivoire which has a score of 6.70).

These rankings are in line with conventional wisdom on the quality of public institutions across the region. The Philippines is well known for its "crony capitalism" and weak bureaucracy, and Indonesia for its high-level corruption. Hence it would be plausible to attribute the relatively poor performance of these two economies to their weak institutions, subject to the endogeneity issue mentioned above. At the same time, we are left with the puzzle that Malaysia, whose growth performance was only slightly better than Indonesia has a much higher score on institutional quality.

Some of the initial conditions displayed in Table 3 may help account for this and other anomalies, such as the faster growth of Korea compared to Japan, despite poorer institutions. These eight countries differed greatly among themselves in their income and educational levels in the early 1960s. Differences in educational levels and in convergence effects must have played a role, along with institutions, in determining their respective growth paths. Korea, for example, was the second poorest country in our sample in the early 1960s (after Indonesia) but also had the second highest level of education (after Japan). This may

help account for its outstanding performance relative to others in the region.

In fact, these three variables--institutional quality, initial income, and initial education--do a surprisingly good job of explaining the growth performance of the countries in the region. A cross-country growth regression with these three explanatory variables results in an adjusted R^2 of 0.99! With only eight countries in the sample, a regression of this type is not particularly meaningful for purposes of inference--and indeed the same three variables yield an R^2 of 0.34 on the full sample of countries. Nonetheless, the fact that we can almost perfectly account for the differences in the growth experience of the East Asian countries with a parsimonius set of determinants is useful information. It indicates that we do not have to construct elaborate stories or hypotheses about what went right or wrong in each country. An economically meaningful set of variables tells us all that we need to know.

Before I elaborate further on this evidence, I return to the question of the endogeneity of our index of institutional quality. Since this index is measured during the 1980s, using it as an independent determinant of economic performance over the post-1960 period is problematic. It is certainly plausible that high-growth countries will enjoy superior institutions partly as a consequence of becoming richer. Hence the use of this measure in cross-country regressions as those in Easterly and Levine (1996) or Keefer and Knack (1995) raises interpretational

problems. I try to overcome this problem by instrumenting for institutional quality using pre-determined variables.

Hence in the first-stage I regress the institutional quality index on three indicators for the early 1960s: income, education, and ethno-linguistic fragmentation (ELF). ELF measures the probability that any two individuals drawn randomly from the population will not belong to the same ethnic or linguistic grouping. The values of this index for the eight countries of the region are shown in Table 3. There is great variation among the countries, with ELF ranging from virtually zero in Korea and Japan to more than 0.7 in Malaysia, Philippines, and Indonesia. Note that ELF does not enter significantly in the growth regression for East Asia when institutional quality is also included, so it makes for a good instrument in this context. The first-stage regression yields:

$$\underset{\text{institutional quality}}{} = \underset{(3.09)}{2.63} + \underset{(1.43)}{4.82}\ \log(Y60) - \underset{(0.62)}{1.39}(\text{education}) - \underset{(2.26)}{6.23}\ (\text{ELF})$$

Adj. $R^2 = 0.73$ $\quad n = 8$ $\quad$ (standard errors in parentheses)

The results are generally sensible, indicating that institutional quality increases with income and decreases with ethno-linguistic fragmentation. (However, controlling for income and ELF, education is negatively correlated with institutional quality, which is harder to explain.)

The finding with respect to ELF can be interpreted as saying that ethnically-fragmented polities have a harder time

maintaining high-quality institutions. This could be due to the higher intensity of distributional conflicts in such polities. The experience of Malaysia, Indonesia and the Philippines--the three economies with the highest values of ELF--is certainly consistent with this view. In all three economies, the position of minority Chinese businesses has been controversial, resulting in efforts--sustained or periodic--to redistribute income to the indigenous majority groups. As K.S. Jomo (1996) puts it, "much state intervention in South East Asia has mainly been for redistributive ends, mainly at the behest of politically influential business interests and inter-ethnic reditribution, primarily in Malaysia, but also in Indonesia" (p. 5). Since independence, the regimes in Malaysia and Indonesia "have often been preoccupied with constraining Chinese wealth expansion and enhancing accumulation by politically influential (non-Chinese) 'indigenous' rentiers" (Jomo 1996, p. 12).

In the growth regressions to be discussed below I will use ELF (along with initial income and education) as an instrument for institutional quality. An alternative first-stage specification would be to use income distribution, rather than ethno-linguistic fragmentation, as the instrument. Using the Gini coefficient measured around 1960 (shown in Table 3), the results are as follows:

$$\underset{}{\text{institutional quality}} = \underset{(3.89)}{4.63} + \underset{(1.62)}{5.49}\ \log(Y60) - \underset{(0.48)}{0.41}(\text{education}) - \underset{(10.85)}{26.96}\ \text{Gini60}$$

Adj. $R^2 = 0.69$ n = 8 (standard errors in parentheses)

The result has the same flavor, with initial income inequality associated negatively with institutional quality. (The correlation coefficient between ELF and Gini60 is 0.30--positive but not very large.) Hence the results are suggestive: social fragmentation, as measured by ethno-linguistic differences or income inequalities--makes it more difficult to establish and maintain high-quality public institutions.

Table 4 shows the results of regressing measures of economic performance on our three independent variables, with institutional quality instrumented in the fashion just described. The three performance measures are growth of output per worker, capital accumulation, and TFP growth. Since these regressions are run on only eight East Asian countries (with correpsondingly only four degrees of freedom), this exercise should not be taken as representing a serious test of any particular theory. The regressions are to be regarded more as the presentation of systematic evidence along the lines of case studies. The question is how well three determinants--initial income, initial education, and the exogenous component of institutional quality--do in discriminating between the star and average performers in the region.

The answer is, very well indeed. An instrumental-variables regression of growth on these three variables yields a remarkably close fit, with an adjusted R^2 larger than 0.99! All three variables are highly significant in statistical terms. The

coefficient on initial income suggests a very strong convergence effect within the region. The coefficient on institutional quality indicates 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. The strikingly high R^2 indicates that our three variables taken together account for virtually all of the variation in the growth performance in the region.[4] The "unexplained" component of growth is typically only a tiny fraction of each country's performance.

Table 4 also displays the results of regressions where the dependent variables are rates of capital accumulation and TFPG. We note that the predictive power of initial conditions and institutional quality for these two determinants of growth is not as spectacular--although still high, with R^2's of 0.72 and 0.80 for investment and TFPG respectively. This is perhaps not very surprising in light of the discussion in the previous section: there is an inherent ambiguity in the "measurement" of TFPG and in how we partition growth between accumulation and technical change. Growth itself is better measured than either of its determinants, and it is reassuring that our basic regression does best for growth overall.

Table 5 displays the deviation of each country's growth from the regional average. Taiwan, Korea, Japan, and Singapore are the star performers, while the Philippines (and to a lesser extent) Indonesia and Malaysia are the laggards. Thailand is somewhere above the average. The table shows the quantitative

contribution of our explanatory variables to this pattern of outcomes. The results can be summarized as follows:

- In three of the four star perfomers--Japan, Taiwan, and Singapore--quality of institutions accounts for the bulk of the performance. In fact, the convergence effects were negative (subtracting from growth) in Japan and Singapore, these being the region's two richest economies in 1960. In the absence of superior institutions Japan and Singapore would have been predicted to grow at rates below the regional average.
- In the Philippines and Indonesia, it is poor institutions that were primarily responsible for lackluster performance. The convergence effect in Indonesia was stronlgly positive, but cancelled by poor institutions.
- Initial education levels played an important positive role in Japan, and a negative role in Indonesia.
- It is primarily the convergence effect that accounts for Korea's good performance. Education appears to have played a positive role as well, while below-average institutions were a negative force.

The "unexplained" part of the deviation from the regional average is shown for each country in the last column of Table 5. It reaches a maximum of 0.12 percentage points (in the case of Singapore).

These results confirm the importance of institutional variation in accounting for differential growth performance in

the region. A graphic perspective on this is provided by Figure 2, which is based on the regression results from above. The figure displays the relationship between the index of institutional quality and growth per worker, after controlling for initial income and education. The association between institutions and growth is remarkably close, with a (partial) correlation coefficient above 0.99 and a rank correlation of unity. Three clusters of countries are evident from the picture. Taiwan, Japan, and Singapore have the best institutions and the highest growth rates; the Philippines and Indonesia have the worst institutions and the lowest growth rates; and Thailand, Korea, and Malaysia are intermediate.

One must of course not read too much into regressions with such few observations and degrees of freedom. At the very least, however, these results are interesting in providing a descriptive taxonomy of the region's experience with economic growth.

4. What role for investment policies?

So far I have said little about specific policies. Governments in each of our eight countries intervened heavily in markets. Some countries made systemic use of industrial policies (Japan, Korea, Taiwan). In others intervention was less systemic and more ad hoc (e.g., Thailand, Malaysia). In the Philippines and Indonesia, microeconomic interventions were typically redistributive, and rent-creating/shifting policies were perhaps the norm rather than the exceptions. One interpretation of the

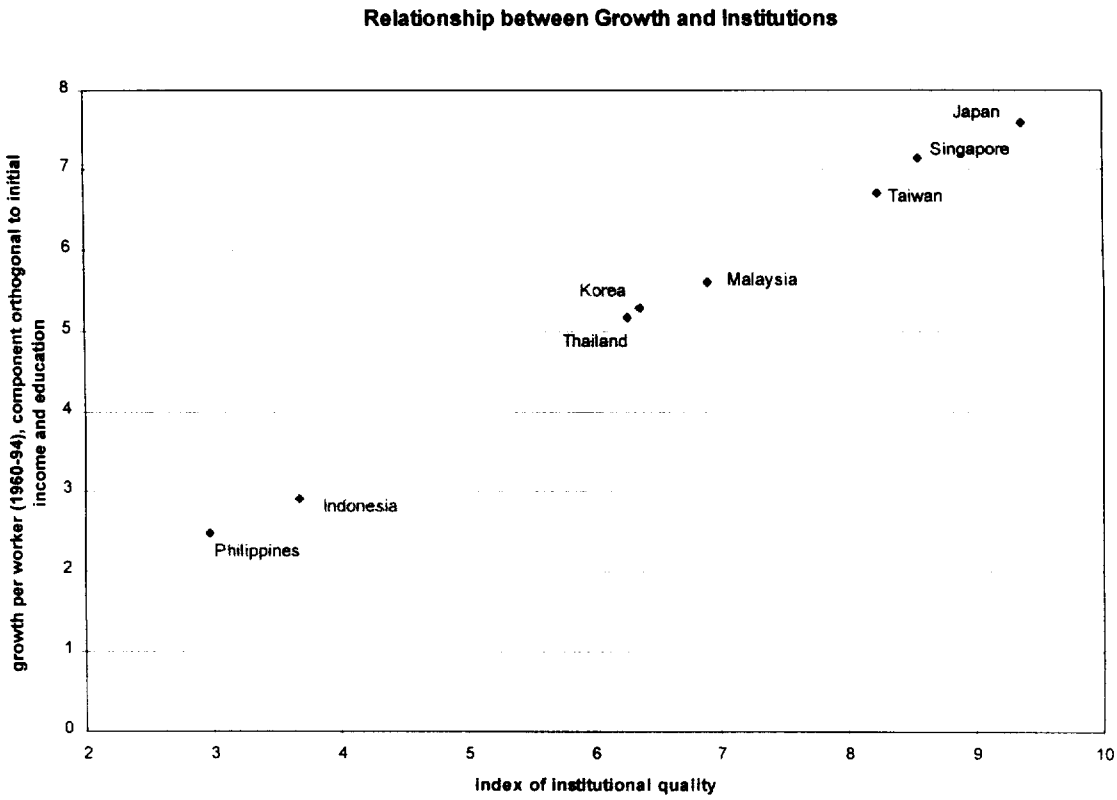

Figure 2

Source: See text.

results in the previous section would be that policy interventions do not make much of a difference, as long as the fundamentals (i.e., education and good institutions) are in place. In particular, one might be tempted to conclude that the "fundamentals" alone are what matters for growth.

However, that would be a wrong inference to draw from the empirical exercise above for a couple of reasons. First, the quality of institutions as captured by the index used here is at least partly revealed through the implementation of specific government programs. Governments that carried out efficient and effective industrial policies are more likely to have been rated by respondents as possessing good bureaucracies and obeying the rule of law (see the criteria for rankings above). In other words, good institutions matter for growth whether governments are interventionist or not. Second, all of the included countries had policy regimes specifically designed to increase domestic accumulation. Consequently, the empirical evidence cannot discriminate well between cases where governments were less active and more active.

On the second issue, we luckily have one interesting case to compare: Hong Kong. This country was not included in our sample (because the Bosworth-Collins data set does not provide data on growth per worker for this country for the 1960-94 period). Hong Kong presents a clear case of a non-interventionist policy regime--in fact as clear-cut a case as one can find anywhere in the world. At first blush, Hong-Kong's experience would appear

to confirm that it is primarily (if not exclusively) the fundamentals that matter, with industrial policy playing no role. Plugging values for Hong Kong in the estimated regression coefficients from above, we get a predicted growth rate per worker for Hong Kong of around 4.3 percent per annum.[5] This is not too far off from the actual record for Japan, Thailand, or Singapore, suggesting that Hong Kong would not have been an outlier had it been included in the regression.

On the other hand, Hong Kong's experience is distinctive in one respect that bears emphasis. It is the only country in the region that has not experienced steady and sustained increases in investment (as a share of GDP) since the early 1960s. Figure 3 displays the experience of four South East Asian countries. Malaysia, Indonesia, and Thailand have all managed to raise their investment ratios rather dramatically in the span of a relatively short period of time. Even the Philippines (also shown in Figure 3) was able raise its investment by about 10 percentage points of GDP in the two decades prior to the debt crisis of the early 1980s--and its post-debt-crisis investment level stands well above the level prevailing in the late 1950s.

Hong Kong's investment level, however, has remained remarkably stable since 1960. Figure 4 compares Hong Kong's experience with Singapore's. In 1960, Singapore's investment effort was half of Hong Kong's--around 10 percent versus 20 percent. Throughout the 1960s and much of the 1970s, Singapore's investment rose, while Hong Kong's remained constant. By the

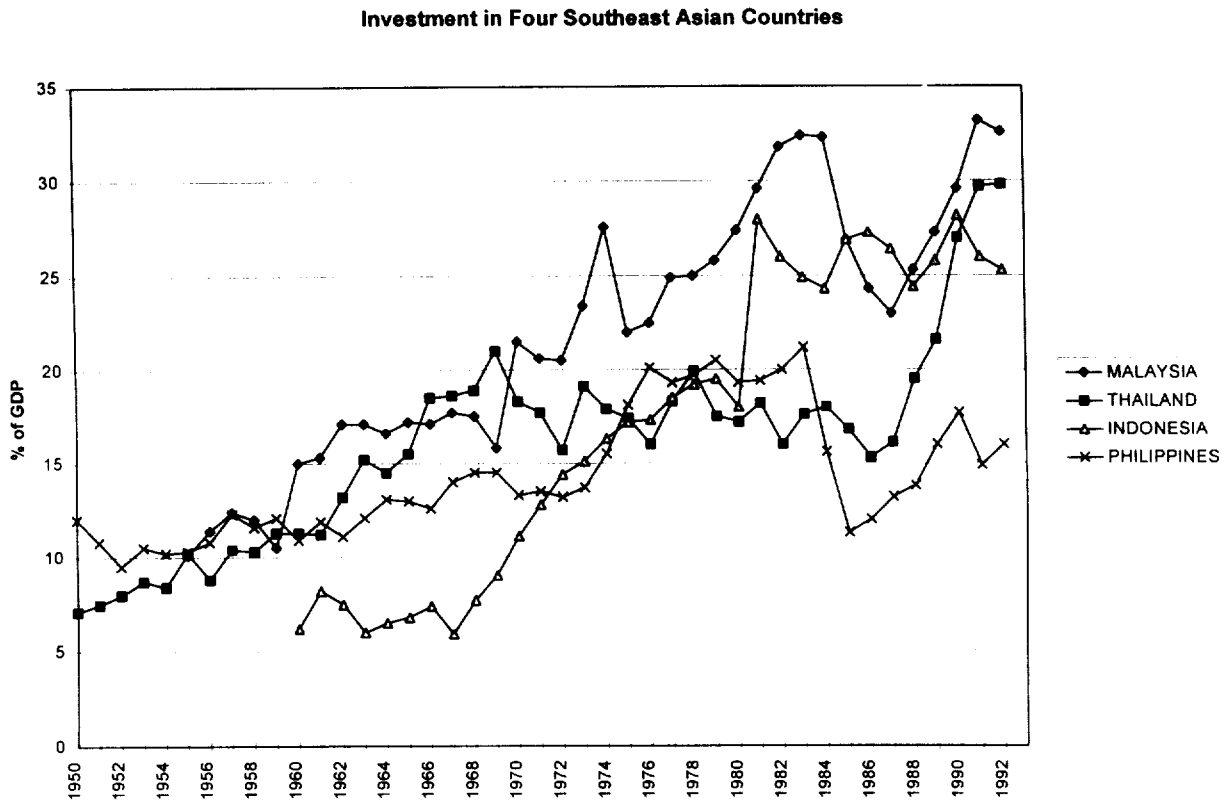

Figure 3

Source: Penn World Tables 5.6

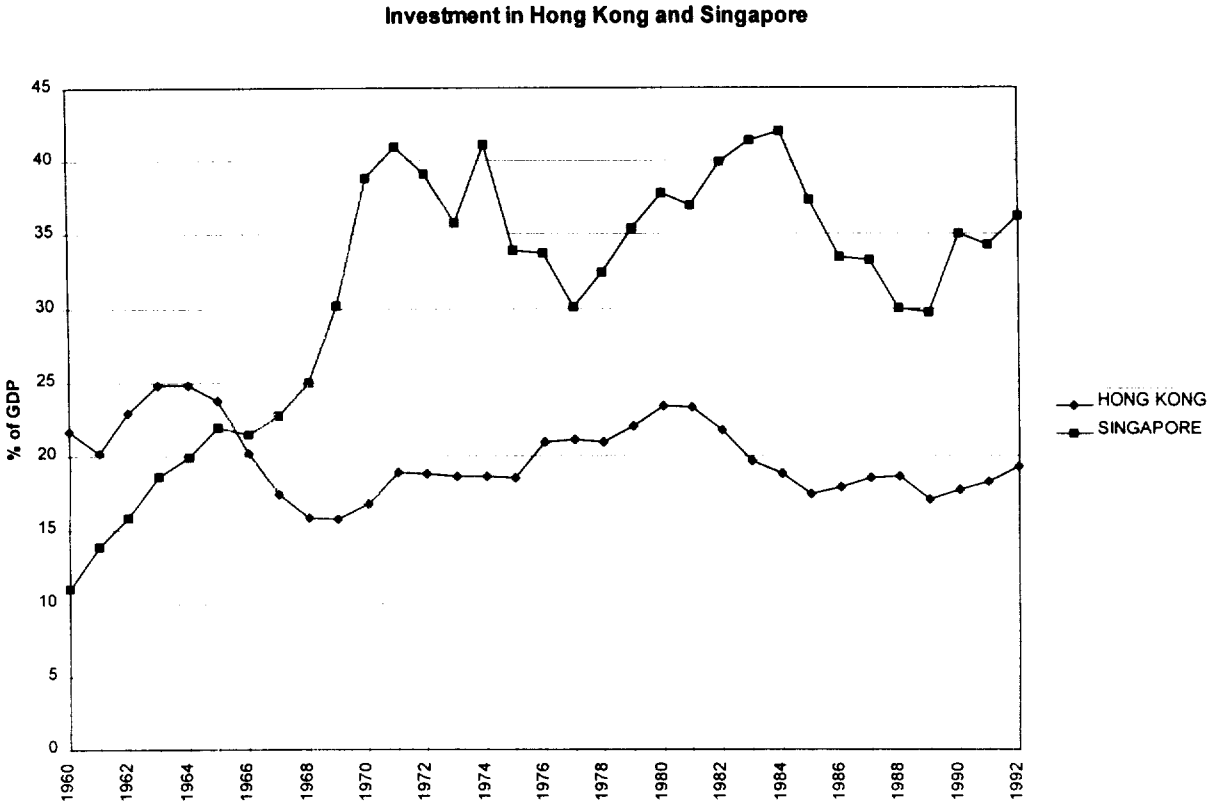

Figure 4

Source: Penn World Tables 5.6

early 1990s, Singapore was investing roughly twice the amount (in relation to GDP) that Hong Kong did.

One interpretation of this divergent experience is to claim success for the strategy of laissez-faire. After all, Hong Kong grew at a high rate (comparable to Singapore) in spite of flat investment. Industrial policy in Singapore appears to have eked out substantially less output payoff from accumulation. That is essentially the interpretation of Young (1992). However, there is an alternative interpretation, one that is kinder to industrial policy. For historical reasons having to do with its entrepot role in international trade, Hong Kong was already a relatively rich country in 1960, with a per capita income of 2,222 in 1985 dollars, a level which South Korea and Taiwan would not reach for at least another decade. Hong Kong's transition to high investment appears to have taken place largely during the 1950s, when the country was a haven of economic and political stability in the region. There were major inflows of capital from China and elsewhere. Hong Kong's investment rate exceeded 20 percent of GDP in 1960, far above that in other East and South East Asian countrie (save for Japan). Note from Figure 3 that South East Asian countries did not reach such investment levels until the second half of the 1970s.

Hence, one can argue that Hong Kong did not face the central challenge of economic development--how to transform a low-saving, low-invesment economy into a high-saving, high-investment one--in quite the same way that the other economies did. Its

government's non-interventionist stance was reflected in a flat investment ratio. But this was not costly insofar as the Hong Kong economy had already reached a certain degree of maturity. The other countries of the region (again save for Japan) started from considerably lower levels, and needed their governments to give accumulation a push.

To conclude, high-quality institutions contribute to growth irrespective of a government's stance on policy interventions. Hong Kong's experience suggests that a hands-off attitude to industrial policy can succeed when investment is already comparatively high and the appropriate bureaucratic institutions are in place. At the same time, far from suggesting the irrelevance of interventionist policies, Hong Kong's experience indicates that a sustained rise in the domestic investment effort is unlikely to be achieved in the absence of government policies directed towards that aim.

5. Concluding remarks

Noone who studies economic development will be surprised to learn that the quality of governmental institutions matters for growth. What is perhaps more surprising is the finding that a single, necessarily imperfect index of institutional quality performs so well in predicting the rank-ordering of growth among East Asian countries.

The implication for countries in other regions of the world is direct, yet full of challenges to economists. Despite a

growing body of research on institutions--both empirical and theoretical--there is very little serious work which aims to provide operational guidance to policy makers on how to improve bureaucratic institutions. The usual recommendations--e.g., transparency and uniformity in incentives, merit-based bureaucratic recruitment--tend to be either obvious or ad hoc and based on casual reasoning.[6] Moreover, as emphasized by Hayami (1996, p. 2), "[r]elative to production technology, institutions are more difficult to borrow from outside, as they are strongly constrained by the unique cultural heritage and historical development path of the technology borrower." What we need is better integration of the theoretical and empirical work, with an eye towards developing a set of recommendations that is historically informed and grounded in rigorous analysis.

REFERENCES

Alesina, Alberto, and Dani Rodrik, "Distributive Politics and Economic Growth," Quarterly Journal of Economics, May 1994.

Diamond, Peter, Daniel McFadden, and Miguel Rodriguez, "Measurement of the Elasticity of Factor Substitution and Bias of Technical Change," in Melvyn Fuss and Daniel McFadden, eds., Production Economics: A Dual Approach to Theory and Applications, vol. 2, North-Holland, Amsterdam, 1978, 125-147.

Easterly, William, and Stanley Fischer, "The Soviet Economic Decline," The World Bank Economic Review 9(3), September 1995, 341-372.

Easterly, William, and Levine, Ross, "Africa's Growth Tragedy: Policies and Ethnic Divisions," May 1996.

Hayami, Yujiro, "Towards an East Asian Model of Development," paper prepared for IEA Roundtable Conference, Tokyo, December 1996.

Jomo, K.S., "Lessons from Growth and Structural Change in the Second-Tier South East Asian Newly Industrializing Countries," United Nations Conference on Trade and Development, Geneva, 1996.

Kim, J.-I., and L.J. Lau, "The Sources of Economic Growth of the East Asian Newly Industrialized Countries," Journal of the Japanese and International Economies, 8, September 1994, 235-271.

Knack, Stephen, and Keefer, Philip, "Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures," Economics & Politics 7(3), 1995, 207-227.

Krugman, Paul, "The Myth of Asia's Miracle," Foreign Affairs, 73:6, 1994, 62-78.

Nelson, Richard, and Howard Pack, "The Asian Growth Miracle and Modern Growth Theory," unpublished paper, September 1995.

Page, John, "The East Asian Miracle: Four Lessons for Development Policy," in S. Fischer and J. Rotemberg, eds., NBER Macroeconomics Annual, Cambridge, MA, 1994.

Rodrik, Dani, "Getting Interventions Right: How South Korea and Taiwan Grew Rich," Economic Policy 20, April 1995.

Rodrik, Dani, "The Paradoxes of the Successful State," Alfred Marshall Lecture, European Economic Association, Istanbul, August 1996 (forthcoming, European Economic Review).

Singh, Ajit, "Savings, Investment and the Corporation in the East Asian Miracle," UNCTAD, Geneva, March 1996.

Young, Alwyn, "A Tale of Two Cities: Factor Accumulation and Technical Change in Hong Kong and Singapore," in O.J. Blanchard and S. Fischer, eds., NBER Macroeconomics Annual 1992, MIT Press, Cambridge, MA 1992.

Young, Alwyn, "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience," Quarterly Journal of Economics CX(3), August 1995, 641-680.

World Bank, The East Asian Miracle, Washington, DC 1993.

Table 1: Sources of Growth in East Asia and Other Regions, 1960-1994 (annual percentage rate)

Country/ Region	output per worker	contribution of:		
		physical capital	education	factor productivity
Indonesia	3.4	2.1	0.5	0.8
Korea	5.7	3.3	0.8	1.5
Malaysia	3.8	2.3	0.5	0.9
Philippines	1.2	1.2	0.5	-0.4
Singapore	5.4	3.4	0.4	1.5
Thailand	5.0	2.7	0.4	1.8
Taiwan	5.8	3.1	0.6	2.0
East Asia	4.2	2.5	0.6	1.1
South Asia	2.3	1.1	0.3	0.8
Africa	0.3	0.8	0.2	-0.6
Middle East	1.6	1.5	0.5	-0.3
Latin America	1.5	0.9	0.4	0.2
U.S.	1.1	0.4	0.4	0.4
Other industrial countries	2.9	1.5	0.4	1.1

Source: Bosworth and Collins (1996)

Table 2: TFPG Rates for East Asia Implied by Different Assumptions about Factor Substitution

elasticity of substitution	implied TFPG after:			implied factor share of capital after:		
	10 years	20 years	30 years	10 years	20 years	30 years
1	1.03	1.03	1.03	0.35	0.35	0.35
0.8	1.28	1.51	1.73	0.31	0.28	0.24
0.5	1.93	2.53	2.89	0.21	0.12	0.06
0.3	2.68	3.17	3.27	0.10	0.02	0.00

Note: These calculations assume an initial factor share of capital of 0.35, and are based on the Bosworth-Collins results for factor accumulation.

Source: See text.

Table 3: Basic data

	growth of output per worker, 1960-94	log of income, 1960	average years of education, 1965	quality of institutions	ethno-linguistic fragmentation, 1960	Gini coeff. c. 1960
Indonesia	2.91	1.76	1.60	3.67	0.76	0.33
Japan	4.50	3.41	6.88	9.37	0.01	0.40
Korea	5.10	2.16	4.43	6.36	0.00	0.34
Malaysia	3.15	2.71	2.82	6.90	0.72	0.42
Philippines	1.37	2.44	4.22	2.97	0.74	0.45
Singapore	4.54	2.81	3.25	8.56	0.42	0.40
Thailand	4.24	2.26	3.24	6.26	0.66	0.41
Taiwan	5.22	2.51	3.81	8.24	0.42	0.31

Note: The figures for growth of output per worker in this table are expressed as log differences (rather than as percentage changes) and hence differ from those in Table 1.

Sources: Bosworth and Collins (1996 for growth rates, income and education;
Knack and Keefer (1995) for institutions; and
Easterly and Levine (1996) for ethno-linguistic fragmentation;
Alesina and Rodrik (1994) for Gini coefficients.

Table 4: Regression Results for East Asian Countries

	Dependent variable:		
	growth of output per worker	capital accumulation	TFPG
constant	4.85 (0.25)	5.07 (1.12)	1.28 (0.67)
log of income, 1960	-3.11 (0.18)	-2.02 (0.83)	-1.26 (0.49)
years of education, 1965	0.38 (0.04)	-0.01 (0.19)	0.22 (0.11)
institutional quality	0.83 (0.03)	0.65 (0.15)	0.32 (0.09)
n	8	8	8
adj. R^2	0.99	0.72	0.80

Note: Estimated using instrumental variables, with log of income in 1960, years of education in 1965, and ethno-linguistic fragmentation in 1960 serving as instruments for institutional quality. Standard errors in parentheses.

Table 5: Explaining Diversity in Growth Performance

	growth of output per worker, 1960-94	deviation from average	contribution of: convergence	education	institutions	total	unexplained
Indonesia	2.91	-0.96	2.34	-0.82	-2.38	-0.87	-0.10
Japan	4.50	0.62	-2.81	1.17	2.34	0.70	-0.08
Korea	5.10	1.22	1.07	0.24	-0.15	1.17	0.05
Malaysia	3.15	-0.73	-0.62	-0.36	0.30	-0.69	-0.04
Philippine	1.37	-2.51	0.20	0.16	-2.96	-2.59	0.09
Singapore	4.54	0.66	-0.94	-0.20	1.67	0.54	0.12
Thailand	4.24	0.36	0.77	-0.20	-0.23	0.33	0.03
Taiwan	5.22	1.34	-0.01	0.01	1.41	1.41	-0.08

Note: Same as in Table 3.

Source: See text.

NOTES

1.The evidence on this is not so clearcut either. It appears that profit rates and profit shares in Korean manufacturing have fallen quite a bit since the 1970s. Singh (1996, Table 15) reports that the gross profit share in Korean manufacturing went down from 46% in 1975 to 33% in 1990.

2.Harrod-neutral technical change is one form of labour-saving technical change. Hicks-neutral and Harrod-neutral technical change are equivalent when the production function is Cobb-Douglass. But when the elasticity of subsitution differs from unity, as in my calculations, they will yield different implications for the evolution of factor shares.

3.See also Nelson and Pack (1995) who argue in the East Asian context that the strong diminsihing returns to capital that would have otherwise set in was offset by technical advance.

4.Using income distribution as an instrument for institutions instead of ELF makes virtually no difference to these results. The adjusted R^2 remains above 0.99, and the estimated coefficients are affected only slightly.

5.Hong Kong had a per capita income of $2,222 in 1960 (in 1985 dollars), an average schooling of 4.90 in 1965, and an index of institutional quality of 8.02.

6.The preference for uniformity in incentives, for example, is flatly contradicted by actual evidence. See Rodrik (forthcoming) for a discussion.