

LSE ASIA FORUM
KNOWLEDGE: THE DRIVER OF ECONOMIC GROWTH

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1 INTRODUCTION

A calamitous financial crisis recently caused economies and markets to collapse. Easy credit and a lack of financial system transparency had led to excessive borrowing at low interest rates. This last had fuelled a boom in housing, property, and asset markets across tightly-coupled economies.

The economy at the centre of this maelstrom had its current account deficit balloon to a record 8% of GDP.

Investors realised all this was unsustainable and took corrective action. A catastrophic crisis ensued: Asset values plunged by up to 70%; real incomes plummeted in different countries by 11% to as much as 35%; millions of people lost their jobs.

What I have just related, however, is not the 2007 US subprime mortgage-sparked credit crunch, although the latter still might emerge to be that. The 8%-current account deficit country is not the US, but instead Thailand. The date on those events was 1997-1998, not 2007-2008. The 'tightly-coupled economies' were not the US and Western Europe but instead the collection of Thailand, the East Asian Tiger economies, and the rest of emerging Asia.

Those were the economies that, a decade ago, were viewed to be the catastrophes of corporate and political misgovernance, financial excess, and wasteful over-investment. Yet, before 1997, those same countries had been held up as the growth miracles and poster children of a then-emerging consensus on managed economic development.

The year 1997 was a watershed. Ideas about successful economic development changed. Confidence in and on East Asia was shaken. Countries such as Singapore experienced for the first time in the modern era unemployment and stagnation. The names of Paul Krugman and my LSE colleague Alwyn Young grew identified with the idea that East Asia had come so far, so quickly through "mere sweat"—i.e., nothing miraculous in productivity but simply hard work and high savings—a growth strategy that ultimately must be unsustainable.

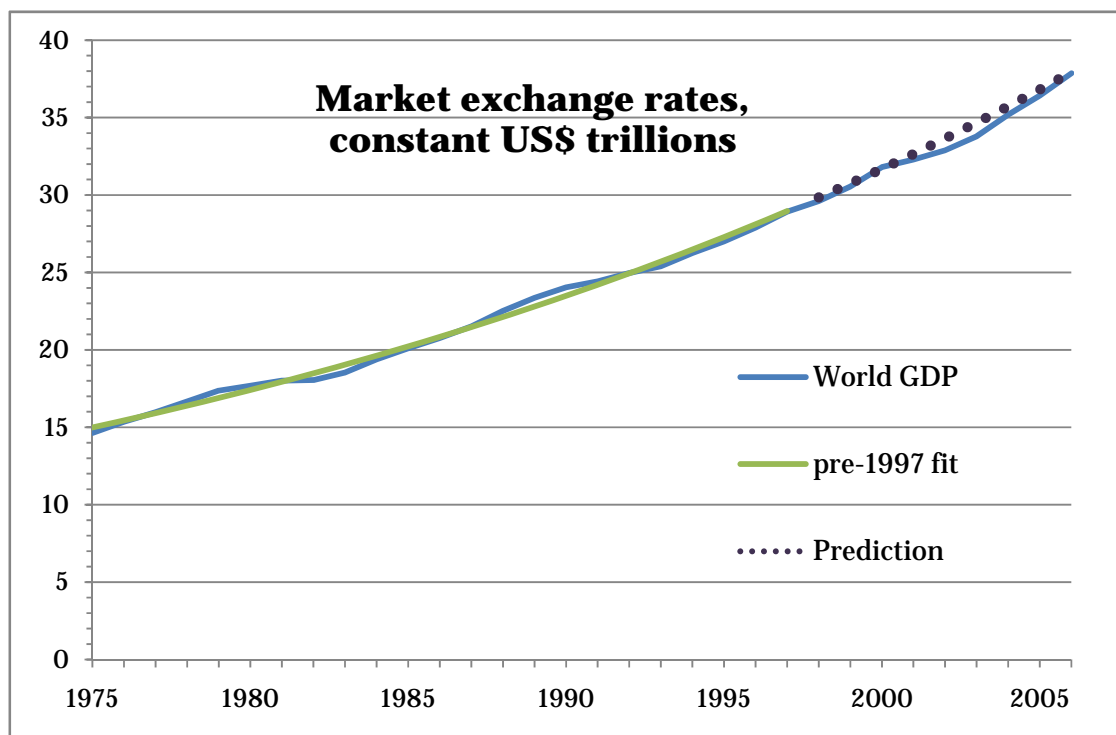
I want to show in this talk how, a decade after those tumultuous events, once again emerging Asia has surprised. The post-1997 Asian reality has turned out to be a success, mostly, and very different from expectation a decade ago. Perhaps important lessons

were learnt very quickly, and key repairs immediately put in place. Perhaps, for instance, the Economic Review Committee formed in December 2001 in Singapore under the Ministry of Trade and Industry had successfully done its job.

Or perhaps 1997 was really just a blip, and fundamentals in emerging Asia have always been strong.

I don't think enough evidence has accumulated yet for us to be confident on the underlying causes. But we should try to be clear at least on the facts. In my view, two facts are central: First, the strength of emerging Asia has shifted eastwards the global balance of economic activity. Second, that shifting balance has profoundly lifted human welfare worldwide, more than perhaps anything else has done in the last 100 years.

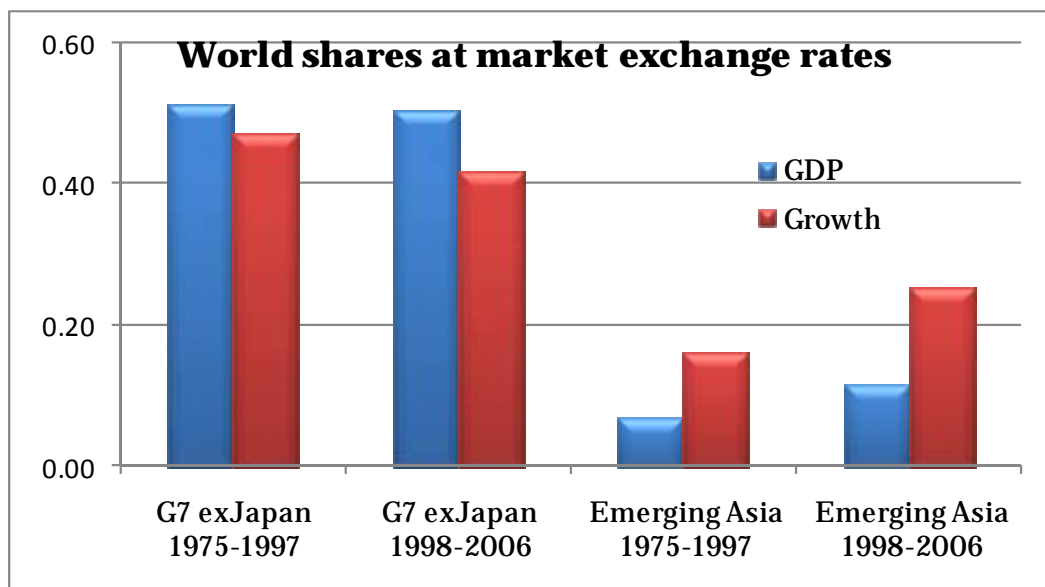
Figure 2.1 The world economy after 1997 has under-performed by about 10% relative to trend. A log-linear trend fitted to world GDP 1975–1997 over-predicts the out-turn every year between 1998 and 2005 except for the single year 2000. The accumulated over-prediction amounts to US\$3.3 trillion, or 9.7% of trend.



2 FACTS

If there has been economic under-performance since 1997, the entire world has shown it (Figure 2.1). Global GDP has in the last decade come in at an accumulated shortfall of 10% relative to the best (smoothed) guess based on information up through 1997.

Figure 2.2 Emerging Asia held things together.



What Emerging Asia has done in the global economy is hold things together and keep world economic growth going. Figure 2.2 shows what happened before and after 1997,

the G7 (excluding Japan) on the left; Emerging Asia on the right.¹ The share of world GDP at market exchange rates is in blue; the share of world growth is in red.

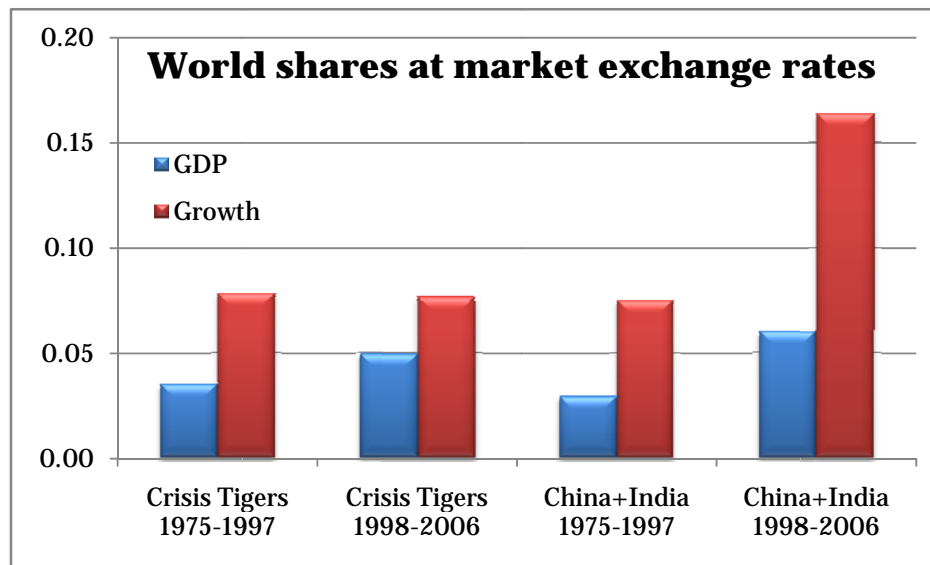
I have excluded Japan from the G7 bloc but the point I want to make would simply be strengthened if I put it back in.

Figure 2.2 shows that the G7 share of world GDP remains high. However, both before and after 1997, growth across the G7 has come in lower than shares there. This means two things: first, G7 growth has been lower than growth in the rest of the world; and second, the G7 share of world GDP is shrinking through time.

By contrast, Emerging Asia has its growth much larger than its share, both before *and* after 1997. If anything, growth has simply gotten even stronger and accelerated after 1997.

¹ The G7 economies, excluding Japan, are Canada, France, Germany, Italy, the UK, and the US. By Emerging Asia I mean Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, and Vietnam.

Figure 2.3 Crisis or otherwise, Emerging Asia continues to pull east the world's centre of gravity. In Crisis Tigers, I include those economies that had suffered the most from the 1997 currency crisis and those previously called the East Asian Tigers, i.e., Hong Kong, Taiwan, Singapore, and South Korea. See also Figure 2.4.

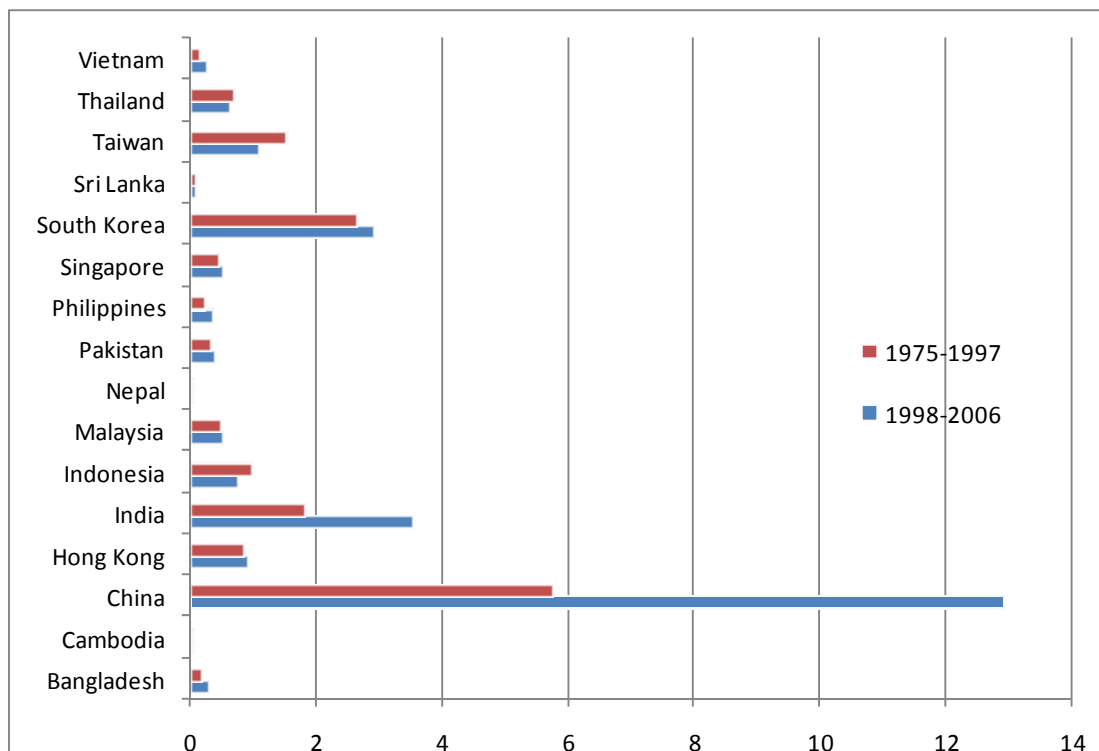


It is as if 1997 was just an irrelevance.

This strengthened growth has occurred throughout Emerging Asia, whether one looks at those economies that had suffered the worst ravages of the Asian financial crisis, those East Asian Tigers thought to have over-saved and over-invested, or the billion-people economies China and India. Except for Indonesia, Taiwan, and Thailand, every economy in emerging Asia has contributed to world growth more after 1997 than before (Figure 2.4).

Crisis or not, Emerging Asia pulls east the world's centre of gravity.

Figure 2.4 Except for Indonesia, Taiwan, and Thailand, every economy in Emerging Asia has contributed to world growth more after 1997 than before. The bars indicate percentage share of world economic growth.



Even at market exchange rates, rather than only at PPP, China and India together already contribute as much as does the US to world economic growth (Table 2.1).

Table 2.1 Fraction of world Gross National Income and absolute growth, 2005–2006, at market exchange rates

	2005 Fraction of World GNI	2006 Growth, billions US\$
US	28.6%	533.1
China	5.0%	371.8
India	1.8%	102.5
China + India	6.8%	474.3

3 ASIDE: LSE AND EMERGING ASIA

Sometimes, when I'm sitting in my office at LSE and mulling over these numbers, I think I see the answer. Literally. I don't mean I see the answer in some mathematical formula in my mind's eye, I mean I see the answer literally.

Figures 3.1 and 3.2 show the composition of the LSE student population, broken down across the G7 (excluding the UK) and Emerging Asia. These two blocs have for a while now provided about an equal number of LSE students, with the G7 typically slightly more. In 2006/07, however, emerging Asia forged ahead, providing 2153 students at the LSE compared to the G7's 2001.

China until recently provided the LSE fewer students than the US; in 2006/07 that configuration switched. India is snapping at the heels of China's lead and will seek to catch up.

Well, OK, perhaps LSE's changing student body simply reflects the changing balance of world income, rather than guides it. But there is always the possibility that the students we have trained at LSE do go out and, as we tell them to do, change the world. Do good in the world by doing well for oneself (and, of course, LSE's investment bankers do, generally, do very well for themselves).

Figure 3.1 Does the LSE student body composition foreshadow even more of an eastwards shift?

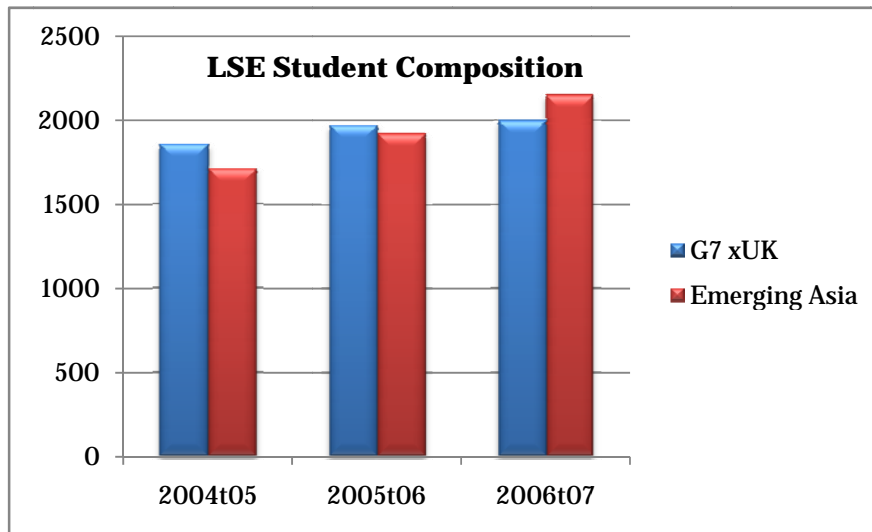
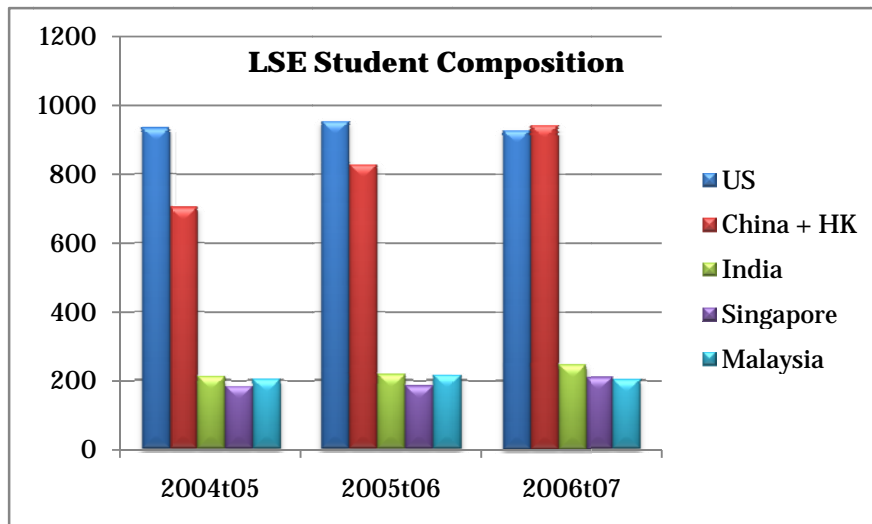


Figure 3.2 The similarities are uncanny



4 WORLD POVERTY

Whichever the right view might be, economic strength in Emerging Asia both before and after 1997 has not just shifted eastwards the global centre of gravity and significantly supported world economic growth. It has done more.

Over the last quarter century Emerging Asia has lifted out of extreme poverty hundreds of millions of people. Indeed in that time China alone has done that for half a billion of its citizens. Five hundred million turns out also to be exactly the same number of people lifted out of poverty across the entire world in this time (Table 4.1).

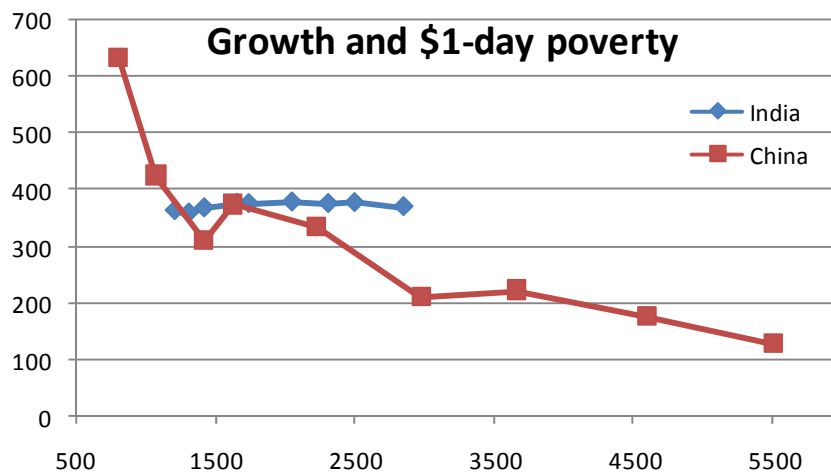
Table 4.1 Poor denotes people living on less than 1 Intl2000\$ a day. These numbers are calculated from Chen and Ravallion (2007) and World Bank (2007).

	1981	1990	1999	2004
World GDP 10¹² PPP\$	24	33	43	52
GDP per capita PPP\$	5408	6292	7231	8198
World's poor 10⁶	1470	1247	1109	969
China's poor 10⁶	634	374	223	128
Remainder 10⁶	836	873	886	841

Outside China, the number of the world's poor has remained flat, reflecting the interplay among economic growth in general, changing inequalities, and a rising population. However, the result, put mischievously and inaccurately but vividly, is that everyone lifted out of poverty in the world in the last quarter century ... has been Chinese.

Obviously not every Asian country confronted with the same external global economy has taken the same growth path. The difference between China and India is striking (Figure 4.1).

Figure 4.1 China and India have differed dramatically in their alleviation of poverty. The horizontal axis shows per capita GDP in PPP; the vertical axis, millions of people living on less than \$1 a day. These numbers are calculated from Chen and Ravallion (2007) and World Bank (2007). They are shown for 3-yearly intervals from 1981 through 2002, and then 2004.



While in China the number of people living on less than \$1 a day fell from 634 million in 1981 to 128 million in 2004, that same figure in India has barely budged, actually rising from 364 million to 371 million in this time. Overall growth in China raised per capita GDP from \$804 to \$5493 (measured at PPP) but that in India only from to \$1212 to \$2851. It is true that in India the fraction of the \$1/day poor in the entire population fell from 52% to 34%, but in China that fraction plummeted precipitously from 64% to 10%.

So, growth and poverty experiences have differed. The end result, however, remains that Emerging Asian economic growth, overall, has lifted hundreds of millions of people out of extreme poverty, a striking achievement seen nowhere else in the world in the last quarter of a century.

5 SOURCES OF GROWTH

How did all this come about?

Different ways are available to break down economic growth into its driving forces. Here it is useful to do the following.

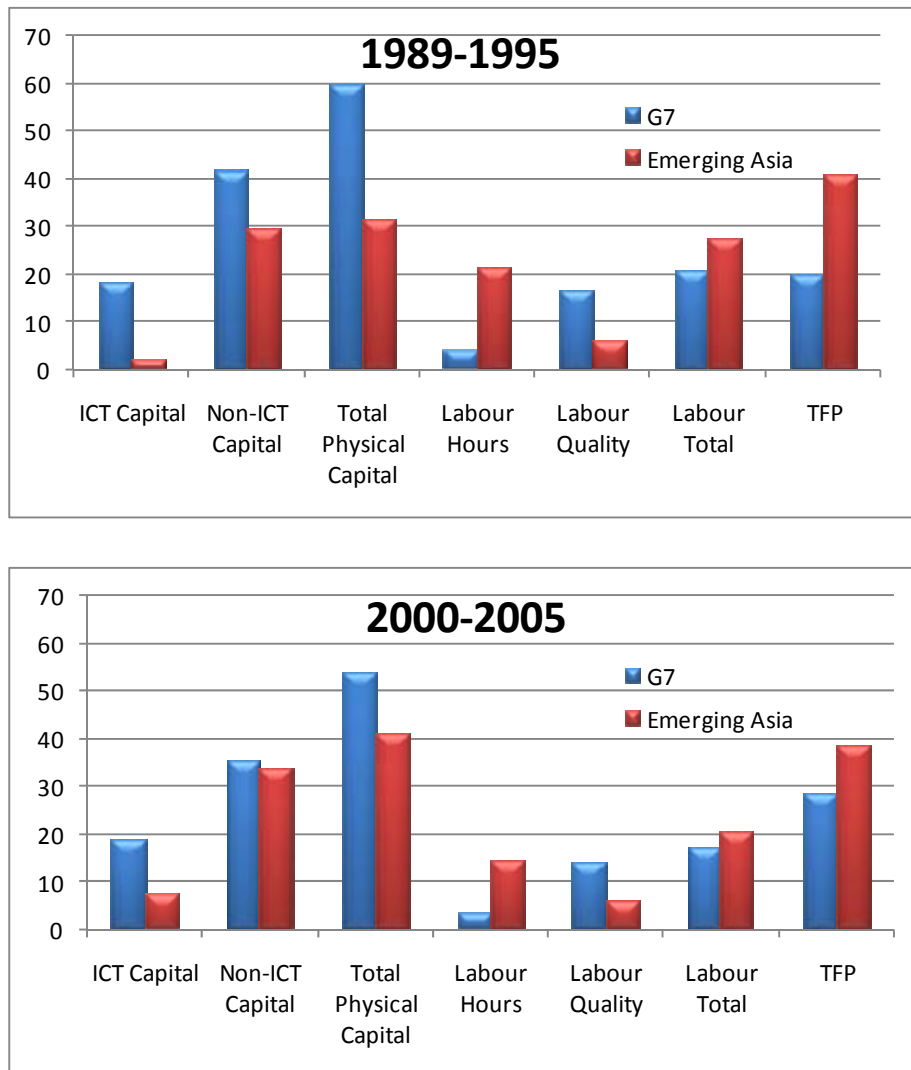
Decompose growth into contributions due to physical capital, labour input, and (total factor) productivity or TFP. **Physical capital** includes two components: first, *information and communications technology (ICT)*—computers, Internet infrastructure, and so on—and second, *non-ICT capital*—among other things, machines, buildings, factories, and transport infrastructure. **Labour input** includes two components: first, *labour quantity*, i.e., hours employed; and second, *labour quality* or human capital, i.e., person-specific skills from accumulated schooling. Call **TFP** what's left over that remains unaccounted for after physical capital and labour input: This might include improvements in the general state of science and engineering or of governance and management practice. For short, think of all these as describing technology and knowledge, generally.

The justification for the preceding growth accounting decomposition is that it describes a production function for the aggregate economy. The decomposition derives, therefore, from consideration of the supply side of the economy: the identification of TFP with technology and knowledge is then particularly apt.

Figure 5.1 shows this production-function growth-accounting decomposition of economic growth over two periods, 1985–1995 and 2000–2005, across the G7 economies (including Japan) on the one hand, and Emerging Asia on the other. The evidence shows that even in the earlier period TFP contributed significantly to growth in Emerging Asia, indeed by more than twice the rate it did in the G7.² However, in the earlier period “mere sweat” certainly did account for a large part of growth in Emerging Asia: labour hours alone contributed 21.3%, while labour quality only 6.2%—the total contributed by labour input came to 27.5%. By contrast, in the later period, labour input's total contribution came to only 20%, with TFP's hardly changed but physical capital—and especially ICT capital—surging to take the lead.

² These numbers are from Jorgensen and Vu (2006). Although those authors used quantities data rather than prices in these calculations, the way I read their findings their results have ended up aligned more in spirit with those of Hsieh (2002) than of Young (1995). Details differ, however, and the greater aggregation levels of concern both here and in Jorgensen and Vu (2006) are not well-compared with the very detailed methodologies of either Hsieh (2002) or Young (1995).

Figure 5.1 Before 1995, emerging Asia did grow through TFP, even more than did the G7. But labour hours mattered much more than labour quality. After 2000, physical capital's contribution surged ahead, while TFP's held firm. These numbers are from Jorgensen and Vu (2006).



Emerging Asia transformed from relying overly on labour for growth, to drawing instead on contributions from information and communications technology, while at the same time maintaining high rates of TFP growth.

Just as with poverty reduction, however, this depiction of Emerging Asia comes with important differences across economies. Figure 5.2 shows that for both China and India TFP contribution has remained high throughout 1989–2005. Both China and India, again, drew heavily on labour hours for growth through the mid-1990s. Since then, though, Chinese growth has shifted significantly towards greater reliance on physical capital and drawn much less on the contribution from labour hours. India's profile, however, has remained almost invariant, continuing to rely heavily on labour hours, so that by 2000–2005, India was drawing from both labour hours and total labour input twice the contributions that China did. Contrary to the impression of high-tech India given in writings such as Friedman (2006), it is actually India rather than China that has continued to draw growth from intensive use of labour. Just as striking, China has in a relatively short time shifted its engine of growth from labour to capital without compromising TFP's continued contribution.

Figure 5.3 compares the growth experiences of the original East Asian Tigers before and after 1997. Of the four, Taiwan has notably lagged in boosting TFP contribution to economic growth. A similar but muted pattern appears for South Korea. However, both Hong Kong and Singapore have sharply raised their TFP growth contributions to above 40%, a third higher than that in the G7 economies. A further striking feature of Singapore's growth is how sharply the economy has reduced its reliance on labour hours, replacing that with continued steady contribution from TFP as well as increased contributions from both ICT and ordinary physical capital.

Figure 5.2 Both China and India drew heavily on labour hours for growth through the mid-1990s. Since then Chinese growth has shifted significantly towards greater reliance on physical capital and much less on labour hours. India's profile, however, has remained almost invariant, relying heavily still on labour hours. TFP contribution has remained high throughout.

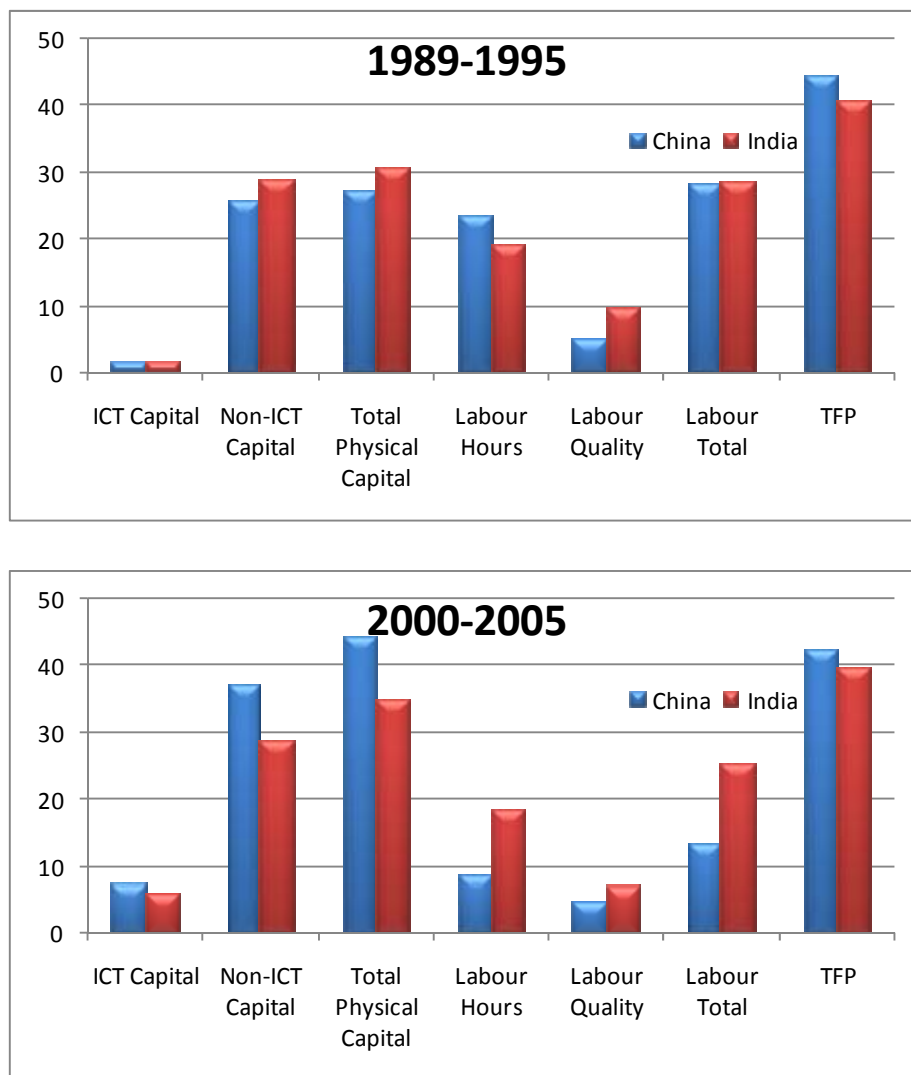
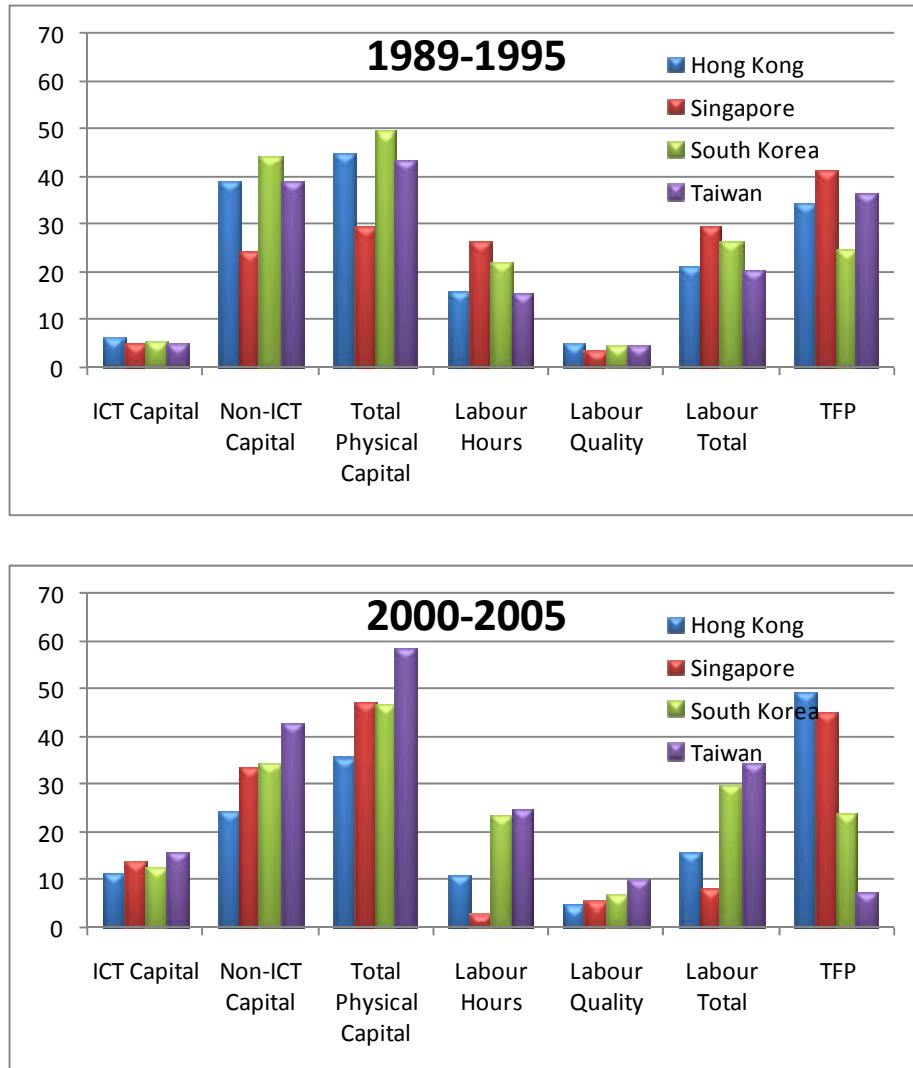


Figure 5.3 Except for Taiwan, the East Asian Tigers have maintained strong growth in TFP throughout. All four have significantly boosted their ICT contribution. Singapore has dramatically reduced its reliance on labour hours.



6 KNOWLEDGE AND SCHOOLING

TFP incorporates many different possible drivers—in empirical analysis, TFP’s contribution to growth is simply what is left over after taking into account labour and capital. Even in its identification as knowledge and technology, the logical distinction of TFP from, say, ICT capital or labour quality is not always obvious.

Despite these difficulties, however, the argument is a compelling one that improvements in the state of technology matter critically for sustained growth. And the direction of effects described in the earlier sections is clear.

This section provides related evidence on knowledge—not directly tied to 1997-related developments—but on the output from school systems across economies. Figure 6.1 through Figure 6.3 show results from the OECD’s triennial PISA surveys of 15-year-old school children (OECD 2004, 2007). These surveys assess between 4,500 and 10,000 students in each economy, focusing not only on ability to master school curricula but also on useful adult-life mathematical, reading, scientific literacy, and problem-solving skills and knowledge. Although by 2006 the PISA survey covered 57 countries (up from 41 in 2003 and 43 in 2000) it nonetheless omitted some of the economies of interest in this paper.³ PISA achievement scores range, in effect, from 400 to 600, with the highest countrywide-mean scores typically 560–580. The precise subject focus and scores distributions reported vary through time, thereby restricting some of the description that follows.

Figure 6.1 shows 2003 PISA achievement scores for problem-solving skills, across 15 year-old boys and girls in different economies. The OECD average for boys is 499; that for girls, 501. Hong Kong-China achieved an overall average score of 548, the highest in the survey, but with South Korea, Japan, and Macau-China close behind. Of non East Asian economies, only Finland, 548; New Zealand, 533 (neither shown); and Canada, 530, achieved average scores 530 or higher.

³ In 2009, 67 countries, including Singapore, plan to participate in the PISA survey.

Figure 6.1 PISA 2003—Problem solving skills in 15-year-olds. Boys' scores appear on the vertical axis; girls' scores on the horizontal. The OECD average for boys is 499; that for girls, 501. The highest average score across all economies in the survey is 548 from Hong Kong-China. Data are from OECD (2004).

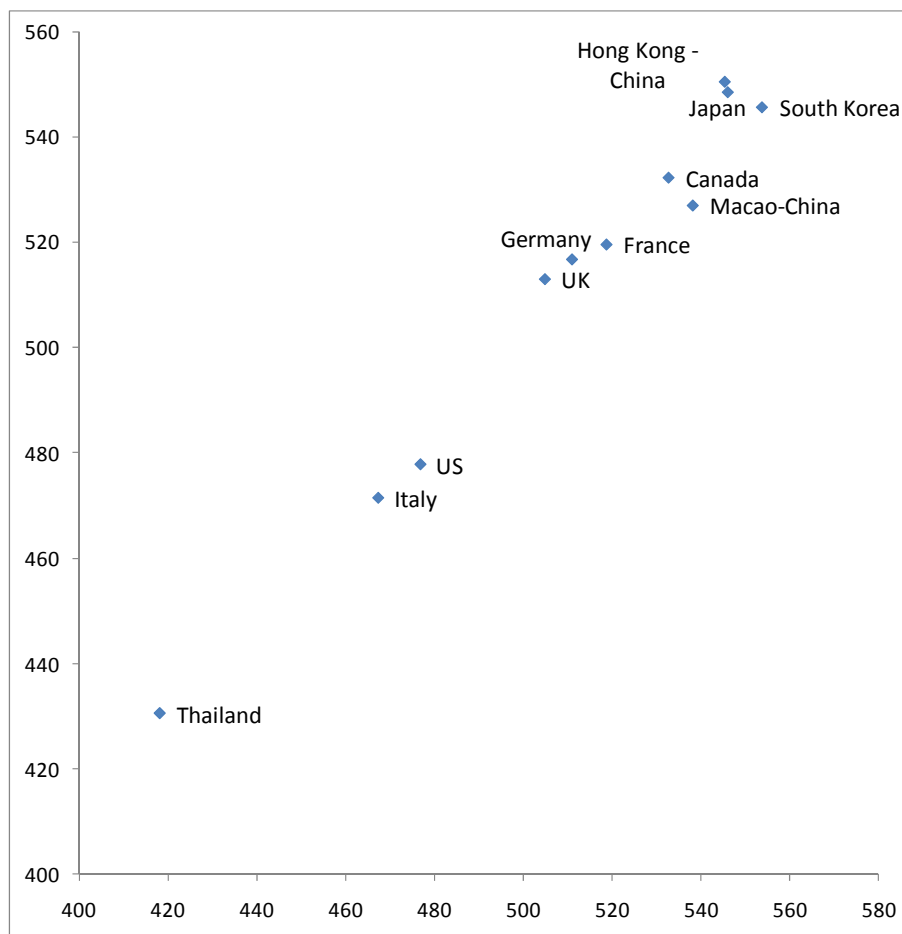


Figure 6.2 PISA 2006—Science scores for 15 year olds. The economy mean appears on the vertical axis; the percentage reaching the top two proficiency levels, on the horizontal. For the OECD overall, the mean is 489 and 9% reach the top two achievement proficiency levels. The highest mean score was Finland 563 (not shown). Data are from OECD (2007).

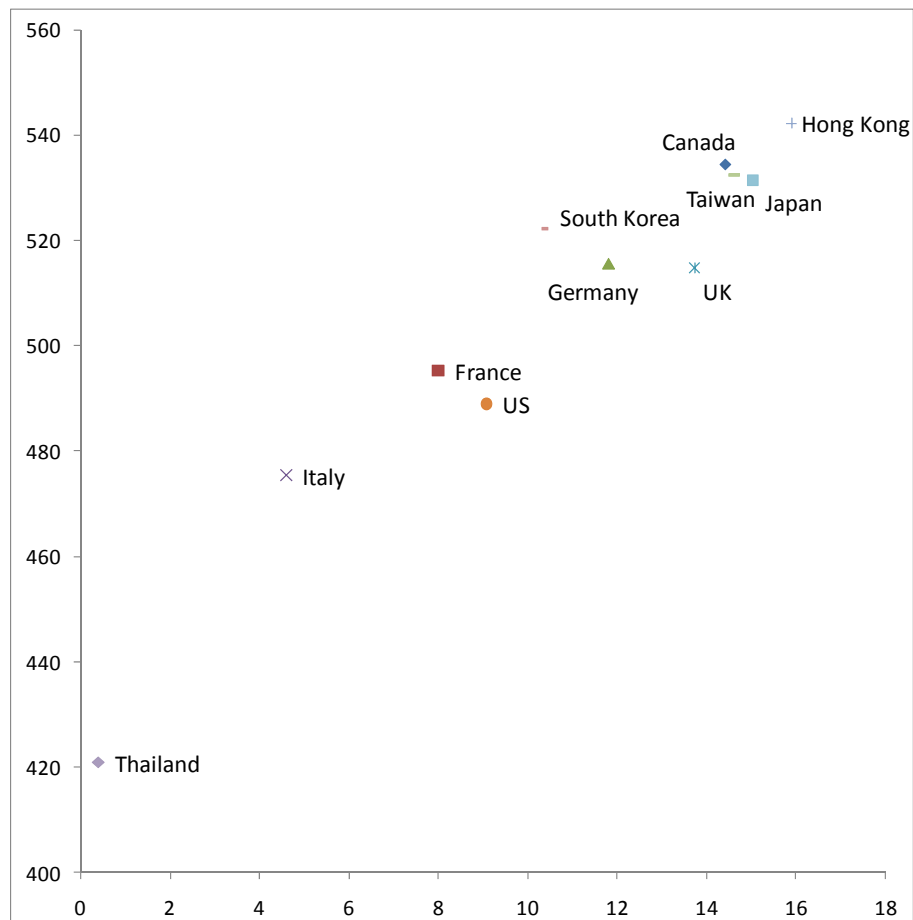


Figure 6.3 PISA 2006—Mathematics scores for 15 year olds. The economy mean appears on the vertical axis; the percentage achieving the top two proficiency levels, on the horizontal. For the OECD overall, the mean is 484 and 11% reach the top two achievement proficiency levels. The highest mean score was Taiwan at 549. Data are from OECD (2007).

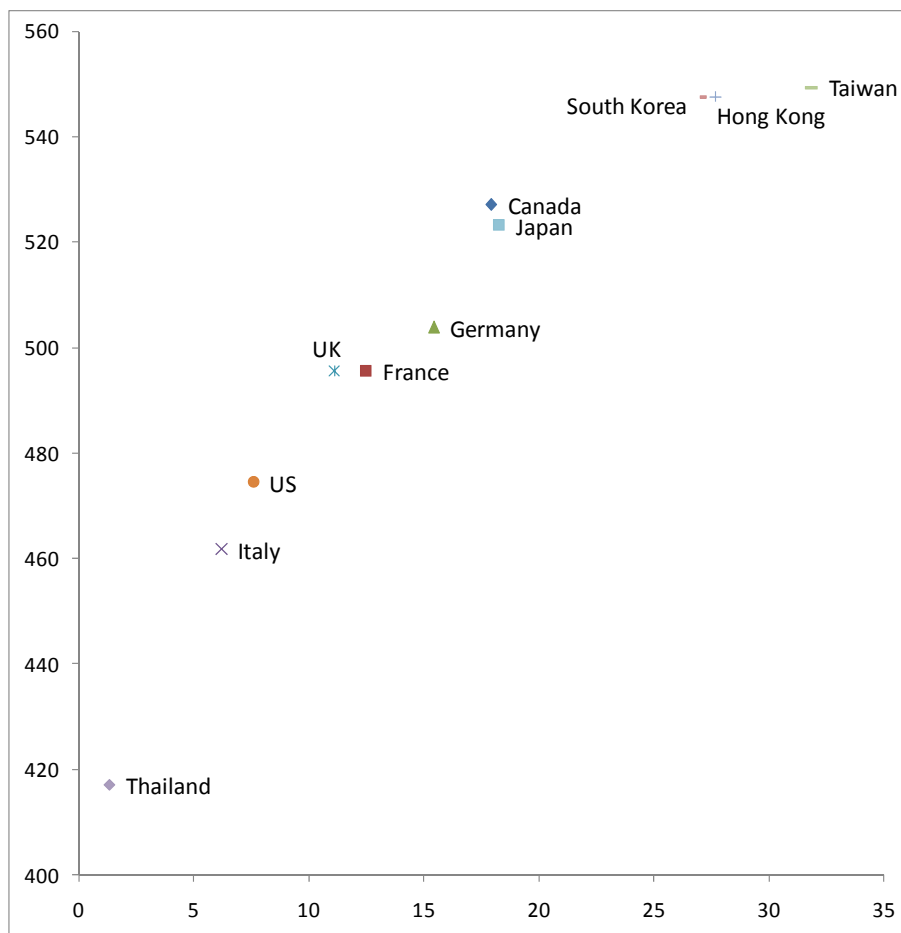


Figure 6.2 and Figure 6.3 show results on economy-wide average and highest within-economy achievement from the 2006 PISA surveys, for science and mathematics across a range of economies.

In Figure 6.2 reporting science achievement, for the OECD overall, the mean is 489 and 9% reach the top two achievement proficiency levels.⁴ The highest mean score was Finland 563 (not shown). The four East Asian economies that appear in the sample—Hong Kong, 542; Taiwan, 532; Japan, 531; and South Korea, 522, all rank at the top of the cross-country distribution. Outside of East Asia and Finland, only Canada, 534; Estonia, 531; and New Zealand, 530 (not shown) have mean achievement scores exceeding 530.

In Figure 6.3 reporting mathematics achievement for the OECD overall, the mean is 484 and 11% reach the top two achievement proficiency levels. The highest mean score was Taiwan at 549, with Hong Kong-China and Korea close behind at 547. Of economies not in East Asia, only Finland, 548, and the Netherlands, 531, (neither shown) achieved average scores exceeding 530.

The horizontal axes in both these Figures map the percentage of the sample attaining the two highest proficiency levels. The correlation with the mean is strongly positive: The evidence thus shows that the East Asian economies perform well, not just on average, but also have high fractions of top-achievers.

7 CONCLUSION

A decade ago the East Asian economies were viewed to be catastrophes of financial excess, corporate and political misgovernance, and diminishing returns to over-investment, just as before the 1997 financial crises those same economies were the growth miracles and poster children of managed economic development.

This paper has presented evidence on how Emerging Asia is freshly restored as the world's economic powerhouse. Its recent success is striking: Poverty alleviation in China alone has accounted for 100% of that on the entire earth. And even if still relatively small in size, Emerging Asia's contribution to world economic growth already matches that of economies many times larger. Along multiple dimensions the world's economic centre of gravity continues to shift east.

⁴ At the highest level, the student “can consistently identify, explain, and apply scientific knowledge in a range of complex life situations”.

What has brought this about? The fundamentals for sustained economic growth include, not just good governance and openness to trade, but also creativity and innovation in economic processes: Knowledge and technology. On these latter fronts, the Emerging Asian economies, especially the ones in East Asia, have achieved the highest standards of performance. Some of Emerging Asia does lag but where improvement in schooling and education is needed is also apparent.

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