AN ESRC & HEFCE INVESTMENT

CENTRE FOR GLOBAL HIGHER EDUCATION

ASAIHL Conference 2016, National Taiwan University, 18-19 May

# Higher education and regional engagement: Taiwan and Southeast Asia

Simon Marginson
ESRC/HEFCE Centre for Global Higher Education, University College London, UK

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We meet at a dynamic time in higher education, especially in East and Southeast Asia. Across the world, in all middle-income and high-income nations, both elite higher education and mass higher education are moving to a more central role. Since the late 1990s, worldwide participation in universities and colleges has grown at an accelerating rate. Mass higher education now extends also to low income countries—in one quarter of all nations with a GDP per person of less than $5000 US dollars, the rate of enrolment now exceeds 15 per cent. Meanwhile, science and university research, and World-Class Universities, are also spreading. The table lists countries in which scientific output is growing very rapidly on an annual basis, more quickly than in any university system in the past, including the United States. In these systems, enrolments at tertiary level are also growing rapidly. Four of these countries are in East and Southeast Asia, Singapore, Malaysia, Thailand and China. The fastest growth of research is in Iran, which is represented in ASAIHL.

Across the world international student mobility is growing at twice the rate of student enrolments. In East and Southeast Asia it has become an important medium for building cross-border regional integration, within ASEAN and especially between the ASEAN nations and East Asia. Taiwan, like Korea, Japan and the PRC, have placed priority on recruiting students from Southeast Asia, which parallels the pattern of East Asian investment in Southeast Asia. For East Asia, Southeast Asia is a new economic frontier, a customer and a source of lower priced

labour, and perhaps a demographic source to supplement ageing populations. For East Asian higher education, there are public goods as well as private goods to be developed through transactions and cooperation. There is growing staff and student exchange with ASEAN, research partnerships. In part of Southeast Asia there are opportunities to contribute to capacity building in higher education. Aid and trade, knowledge and people flows are combined.

But this continues the long pattern of flows in the East Asian corridor, running between Indonesia and Japan. Southeast Asia has always been shaped by its geography between South Asia and East Asia. Hindu-Buddhism fed the cultures of the maritime empire of Srivijaya and the awesome hydraulic regime in Angkor; Indian influence dominated over Chinese influences in Indochina up to the border between Champa and North Vietnam; and Islam came to Indonesia, the Malay peninsula and the Philippines from West Asia and South Asia. At the same time, during the Song, Yuan and later the Ming dynasties, the route to China, Korea and Japan through South China Sea, the Nan Hai, was becoming increasingly important. East Asian merchants became distributed across the region. Trade in the East Asian corridor climaxed between 1770 and 1850 when it was growing by 4 per cent a year. Western military intervention and colonisation disrupted the regional flows. We are now seeing a reversion to the historic pattern of regional relations in East Asia. This meeting and your ongoing cooperation is part of that historic pattern. Within the global setting, partly as a response to globalisation, trade and cultural exchange is maximized in regional blocs, formal or informal. Whereas in the past the East Asian corridor was populated by tributary and private trade, now it is also sustained by flows of learning and ideas. And it continues to be a zone of cultural mixing between states and beyond states, in which new ways of life are developed. We can hope it will generate new solutions to the problems of the human condition. The East Asian corridor is one of the world's creative zones.

Today, I will provide an overview of higher education and research in East Asia and Southeast Asia in global context.

**Economy and population in East and Southeast Asia**

First, a quick sketch economy and population. National size and economic wealth are very uneven and this is central in all regional relations.

Singapore's achievement in all areas is extraordinary. It is hard to find a university anywhere in the world with a more effective global strategy

and developmental trajectory than NUS, except perhaps Nanyang! Malaysia is now as wealthy as Portugal and Russia in per capita income terms and after long periods of prosperity Thailand and Indonesia are now entrenched as middle income countries. In the next generation the world will talk about Indonesia, the world's fourth largest nation, the way it now talks about Brazil. For all the remarkable qualities of their people, the nations of Indochina, which bore the brunt of Western intervention, remain poor but are moving forward.

Turning now to Northeast Asia, this region has become as wealthy and powerful than Western Europe and UK, or more so. Combined R&D investment now exceeds North America. Taiwan has almost exactly the same population and GDP as Australia, though it has less land, less kangaroos and more rain. On the Purchasing Power Parity measure of GDP China's economy has reached that of the United States. We all know of the dynamism of modern South Korea because its economic, cultural and educational influence not only permeates East and Southeast Asia but the world. I have included Iran both because it is part of ASAIHL, and because it is not always realized at world level that Iran, a large nation with a long civilizational tradition, has made very considerable progress in the last two decades in higher education and science.

**Growth of participation in tertiary education**

Let's look more closely at recent growth in educational participation. Up till about the mid 1990s worldwide participation in 'tertiary education', the UNESCO and OECD definition of higher education that refers to programs of at least two-years full-time or more, grew at the same rate that world GDP grew in real terms. Then something changed.

The growth of tertiary education shot above GDP. Higher education became qualitatively more important, and more costly. It became a higher priority in the economy, policy and society. In many countries, the pace of growth accelerated at much the same time, in the second half of the 1990s and after. Rapid growth has extended to all regions except Central Asia. Even in Sub-Saharan Africa, Pakistan and Bangladesh, with participation remains low, it is increasing quickly from its low base. At world level the Gross Tertiary Enrolment Ratio is now increasing at 1 per cent a year. One third of the school leaver age group now enrols. One per cent a year is 20 per cent in 20 years. In another generation half of all people will enter tertiary education and a third will gain a degree. Less than 15 years ago, only half of all people had mobile

phones. Will higher education become as commonplace as mobile phones?

In the East Asia and Pacific zone participation has now caught up to the world rate. Essentially this is because China, with its demographic weight, has almost caught up. As you know China's GDP per person began increasingly rapidly since the early 1980s, but it was only in 2000, when policy changed, that participation in higher education took off, zooming past GDP per head. Middle class demand is now so strong that the growth pattern is irreversible. The official target of 40 per cent by 2020 will be reached.

Taiwan moved earlier to expand tertiary education and at 84 to 85 per cent now has one of the highest participation rates in the world. The quality of its diverse academic and technical-vocational institutions is crucial to that.

This graph compares Gross Tertiary Enrolment Ratios, GTERS, across the ASEAN nations plus East Asia, Australia and New Zealand, India and the other comparator and ASAIHL countries I am using in these slides. You can see here that the systems in societies in the Chinese civilizational tradition—the PRC, Hong Kong SAR, Taiwan and also Korea and Japan—have exceptional levels of tertiary education. At 97 per cent the GTER in Korea is second in the world. Singapore, where we don't have data, is at a similar level to Hong Kong. A majority of the school leaver age cohort enters tertiary education in Thailand at 51 per cent, though Malaysia is disappointing at 39 per cent, not far ahead of Philippines and Indonesia with their lower GDP per head. In Lao PDR, Cambodia and Myanmar not enough students reach the end of school. It should be noted that these are aggregate participation figures only and do not tell us about the quality of mass education, which is highly variable.

There is a good fit between the pattern of participation in tertiary education in an Asia-Pacific society, and the level of Internet penetration. It's not the one causes the other, both are signs of the level of resources and modernization, but no doubt Internet connectivity facilitates advanced education. Note that in Malaysia, Vietnam, Japan and China Internet use is higher than educational level, while the opposite is true in Thailand and Indonesia where education is ahead of networking. Internet use is very low in Cambodia and Myanmar. There is also a good fit between the level of participation in tertiary education and

the proportion of the population living in cities. The urban share is mostly higher than the GTER but tertiary education is catching up.

Statistically three developments go together: growth of the middle class, the growth of cities, and growth of higher education. The required scale of provision of higher education means that HEIs concentrate in cities. Cities also concentrate the middle class families that lead social demand for higher education. This builds a critical mass of upper secondary students, concentrates political pressure for expanded HEI provision and enables economies of scale. In turn the growing higher education infrastructure funnels and magnifies aspirations. The example here is Indonesia. You can see how the rural share of labour, in grey, is falling, urbanization, the dotted line, is rising, and the GTER, the bars, is also rising.

This is not to say all people living in cities are middle class or educational aspirations are confined to them. Higher education in cities comes within viewing distance of the whole urban population, accumulating demand and placing greater pressure on government and markets to provide access. With the continuing mobility of large numbers of people between countryside and cities, especially in China, India and Indonesia, you can be sure that the demand for higher education and level of enrolment will keep going up.

**Growth of science and research**

Let's turn now to the growth of science and research. In the 1990s the Internet and the globalization of English-language science created a one world research system. Most new knowledge comes from this system, not nation-bound systems. If they can, national economies, governments and universities need to connect to that global knowledge system to draw innovation benefits and deal with foreign corporations, governments and universities. In turn this, together with the movement for World-Class Universities, has stimulated the growth of national science systems, including home PhD training, in many more countries.

There has been a surge of investment in research and development in East Asia. Korea has the highest level of investment in the world, 4.29 per cent of GDP. China's investment is rising by 0.1 per cent of GDP a year and in five years will pass the United States. Most resources go to the large state enterprises but enough reaches the universities to drive rapid growth in scientific outputs.

We don't have data for all ASEAN countries. But what stands out in the graph is the relatively low level of investment in R&D in four of the countries, especially Indonesia which has not yet started to build a modern research system. Malaysia is spending, and there is growing research activity in Thai universities.

There are 50 countries around the world with the broad capacity to produce their own science. Most though not all have GDP per head at $20,000 US and more. In Vietnam, Indonesia and the Philippines the outputs in the graph are largely by overseas trained doctoral students working with their PhD advisers.

The main story is the enormous output of published science coming out of China. When the world's largest nation grows its research at the rate of 15 per cent a year for almost 20 years, it is mathematically certain that in future a large part of human knowledge will come from that country.

In just one decade the total output of published science in East Asia has moved well past the United States, which is the background tone in the graph. China is moving into second place in research after the United States. In quantity terms it will move past the US in the next five years. In quality terms the United States, and also Europe as a bloc, are still well ahead of China. The US produces a third of the world's leading science, the high citation papers, the top 10 per cent and top 1 per cent papers. However, in the Physical Sciences and Engineering in China—Engineering, Computing, Chemistry, Physics and to a lesser extent Mathematics—China's research quality is improving at a remarkable rate. In the year 2000 it produced 0.6 per cent of the world's top papers in Chemistry. By 2012 that world share of top papers had risen to 16.3 per cent. China's research in Medicine and the life Sciences is weaker. Research in East Asia and Singapore as a whole is strongest in the Physical Sciences and Engineering, the fields that relate to urbanization, construction, transport, communications, energy and also the environmental implications of development. That's where the R&D investment has gone.

**World-class universities**

Finally, let's turn to the emergence and strengthening of research-intensive universities in East and Southeast Asia. World-Class Universities, WCUs, are universities that figure in global ranking and that normally means research universities. Research drives the whole of the Shanghai ARWU ranking. Research and research-related reputation

drives more than two thirds of the Times Higher ranking and half of the QS ranking.

At world level the list is dominated by the United States and Oxford and Cambridge in the UK. Toronto in Canada is very large. Note that the number of top 10 per cent papers from Harvard is more than twice that of number two. As yet Asian universities, are not strongly represented in the top 30 of the major research rankings. One reason is that Americans in the large American research system tend to cite Americans. In addition, there are time lags between investment in research, increased scientific output, its recognition in citations, and the pick-up of citation performance in rankings. So the most recent investment in Asia is not showing yet.

However, the protracted investments are now bearing fruit. Between 2004 and 2015 the number of universities in the PRC in the world top 500 jumped from eight to 32. Taiwan saw an increase from just three in 2004 to seven in 2015. Hong Kong has the same five but this is a strong research university system with excellent citation rates. Some Hong Kong universities would be higher placed except that the Hong Kong University Grants Commission maintains all universities at a modest size and keeps an effective balance between them.

This table lists the regional universities in the ARWU world top 500. The right hand column names those in the top 200. Note that Iran now has two top 500 universities, as does Malaysia, UM and USM. It is a little surprising that Korea only has one top 200 university, Seoul National. That will change. China now has four in the top 150, Tsinghua, Beida, Shanghai Jiao Tong and Zhejiang. In Singapore NUS would be in the top 50 if it was not for the Nobel Prize factor in ARWU, which affects 30 per cent of the index used for ranking.

The data here are taken from the Leiden University ranking which was released at 4 pm yesterday. This is the best ranking of research universities—sound in terms of technical validity, and the most user friendly. It provides data in five discipline clusters as well as overall. However, the Leiden ranking includes only the leading 842 universities, that produced 1000 papers or more in 2012-15. It does not provide much information on emerging systems. What stands out here is the rapid rate of improvement in quality in some regional universities, as measured by the growth of high citation scientific papers—for example Nanyang, Fudan, Beida and Zhejiang. Note also that NUS in Singapore now produces almost two thirds as many high citation papers as the

University of Cambridge in the UK. At Nanyang 14.8 per cent of all papers are high citation papers, compared to 12.9 per cent at NUS. The number of high citation papers, the quantity of quality in science, is a good measure of total research firepower.

In Taiwan the acknowledged leader of research is confirmed in the measures. That is our host National Taiwan University. Interesting to see the University of Malaya would be number two if it was located in Taiwan. But Taiwan has depth—it has 19 universities in the Leiden ranking. Note that UKM and UPM in Malaysia are not far from UTM on these measures. Thailand is a bit further back but has five research universities in the world top 800.

Every nation now needs its own capacity in research, and the provision of that capacity has become part of the responsibility of modern governments, like roads, clean water and a viable banking system. As you know, building research capacity and performance requires focus, time and resources; it means being self-critical and benchmarking against stronger systems, it means researchers have to be paid sufficiently well to keep enough of them from being poached by the established systems, and it benefits from cross-border help. The WCUs already established in the East Asian corridor countries will keep rising. What is less certain is whether, or when and how research capacity will be built in the emerging higher education systems in the ASEAN region. But it is certain that collaboration with international partners will be crucial. International collaboration helps build a research system over time.