

Asian Voices :
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*From Manufacturing to Knowledge-based
Industries: Development Strategies for East
Asian NIEs in the next Decade*

by

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Poh Kam Wong: First of all, I would like to thank Sasakawa Peace Foundation, Professor Ikenberry and Iwatake-san for inviting me to come to Washington. Hopefully I can try to provide a feeling, kind of a sense of why they are having these concerns. So, my original intent was to sort of give a very brief overview of how the four Asian NIEs (Newly Industrializing Economies) have achieved very rapid economic growth, which is a familiar story. But, quickly to lead on to why this passed to a successful strategy based on manufacturing, real industry development, the government cannot sustain the growth in the future, and why they need to sort of have major restructuring and change in the policies in particular highlighting three aspects.

First is to cover the so-called global digital economy, where the division of ICT (Information and Communication Technology) became increasingly important. Secondly, increasing competition based on technological innovations. And third, the need to promote more entrepreneurship but to gain technology.

Success of the Four Newly Industrialized Economies

I don't have to belabor the point about why the four Asian NIEs have been so successful in the past that they have really, in a word. I don't know whether this is big enough for you, but if you can see that clearly that over the four decades the four NIEs are really distinguished in terms of their ability to sustain very rapid growth over such a long period.

Now, of course a lot of people talk about the East Asian miracles and so on but really I think it is a mistake to lump all the East Asian high global economies together, because the four Asian NIEs are really quite different from

the rest. And you can see from this year, for example, that the ASEAN four, Malaysia, Thailand, Indonesia and so on really have distinctly lower levels of growth than has been achieved by the four Asian NIEs.

And if you look on the, I think purchasing price, parity assessment terms relative to the U.S. GDP per capita, for example, you can see that a repeat of over 30 years in this case, the Asian NIEs have really moved from less than 1/5 of the level of the United States to almost 3/4. In contrast, the Australians were able to move from 1/10 to about 1/5 of that of the U.S. So a very remarkable growth record, but much of it, of course, has been driven by their success in manufacturing exports.

And you can see that for example, of the four Asian NIEs, that manufacturing has been a very major share of their economy. In the case of Korea for example about 30%, Taiwan 30%, and Singapore about 25% in 1998. This is in comparison for a share of about 20%, 24% of all developing countries, and decreasing amount in the advanced countries.

Rise in Manufacturing Growth Key to Success of East Asian NIEs

So, this rapid growth of manufacturing as you can see from here, also the very rapid rise in manufacturing productivity as well has been really the key to the success of the East Asian NIEs. Because much of the growth of the economy was then driven by the multiplier effect of this strong manufacturing growth. Part of the research that I did when I was having this project with Sasakawa Peace Foundation was of course to look at the role of the state.

And the important thing is to recognize is that there is not one common role of the state, and

again this is where the East Asian miracle is sort of over generalized.

Because, if you look carefully at what happened in the four Asian NIEs, even though manufacturing had been an important source of their growth, that the part of all the manufacturing development staging has been quite different. And if you really look at the interaction of the role of the state with that, you can see that really with the perspective of trying to understand how these policies affect the behavior of the firm, you can see that they seem to affect their incentive to innovate or to adopt new technology to increase their technologic capability, and also, affect their capacity to do so. Right, both incentive and capability.

Generic Learning Strategies

Very quickly, you can see that the key to really this rapid catch up and rapid improvement in manufacturing productivity was really improvement in their technological capability. And this capability had to be developed through a process or learning. And what I've done in that book, as far as illustrate, is to highlight the number of what I call the generic learning strategies of these firms. I will go through this very quickly in the interest of time.

But, basically the idea is that a firm that is a late-comer firm that is, you know, just trying to join the world competitive market, they need to improve both their product and process of technological capability. And, of course, they can do so in a number of generic ways. One way, of course, is to just focus on improving the manufacturing process, technology, be very good at manufacturing, but not try to learn how to develop new products. So you don't focus as much on product, technological capability.

One is, of course, to do what I call the reverse sort of a product life cycle strategy. This is where the Korean and the Japanese have done in the earlier stage, would be to first

manufacture the low-end mature products. Then when you become good at it, you move on to a more advanced product until you are able to reach the most current technology frontier in terms of the product life cycle that you are making increasingly complex products.

So, the Koreans, for example, started making very low end semi-conductor memory chips but very quickly they can move on to make a more and more advanced chip until they are at the technological frontier. So this is what is called the reverse product life cycle strategy. Start from the mature end to the really sort of a most recent end of the product life cycle.

The other generic strategy is what is called the reverse value change strategy. This is where you actually start from the manufacturing site, learn to be good at manufacturing, then later move on to learn a bit about design. So you move from what is called OEM contract manufacturing to ODM or original design manufacturing, where you begin to do part of the design as well. And then from then on, you then move on to creating your own product yourself. Right?

So this is moving from, this is called reverse value change because you move from the manufacturing to design to R&D and new product creations. And, of course, some companies do combinations. And the key point here is that, if you look at the four different Asian NIEs, they have very different sorts of models and that is partly because of this interaction of policies that lead to the behavior of the firms.

So, very quickly, for example the Koreans I know have evolved what they call the *chaebol* model in which common policy has the effect of promoting the growth of indigenous high tech firms. You know, there are a number of policies; they have been well discussed in the literature, including the contact base, bank, credit, financing, which really we want the financing to those groups that can grow fast, and therefore, fit them to grow faster.

So, this has the effect of pushing for increasingly concentration of production by large firms. Also, some degree of production of the domestic market, which is important. This is coupled by the firms response, which is a very aggressive investment in technological learning and strategy.

The purpose is largely that, or what I call the reverse life cycle model. Look at Samsung, other companies, they all start by from day one making more end products but under their own brand, they develop their own marketing channels. They do not mix for others in a sense of contract manufacturers like the Taiwanese. Many Taiwanese firms only manufacture for others. They don't have their own brand. They don't have their own distributions. So, the Koreans are able to do this because this approach requires a very high investment, and investments to some extent are supported by this government, finance, assortment of allocations, policies. And, of course, to some extent you could say that the returnees, that Koreans had overseas helped contribute to this very rapid technological learning.

Another thing that is somewhat overplayed, I believe, is that the government plays an important role in transferring the technology and helping the company to develop technological capabilities. My own research panel shows that in fact, although the government played an important role in the early years, by and large the government largely has not been a very important factor since the 1980s. And it is these large firms that really get the work.

Taiwanese Pursue a Reverse Value Change Strategy

The Taiwanese in contrast have a strategy that is more on pursuing the reverse value change strategy. Concentrate on manufacturing them, become good at design, then move to product sort of innovations. And this is true the policy that had the effect of encouraging the growth

of small or medium-sized firms. Part of this had to do with the political economy of Taiwan. I don't have time to get into this. But the result is that we have very rapid manufacturing growth on a very different model, and here the government policy role is very different. It is in the form of really providing the anchor for developing consortiums because medium enterprises don't have the resources to invest much in R&D, unlike the big Korean companies. So the government they set up, these public research institutes that essentially adapt the assimilated technology and then diffuse and transfer them to the many SMEs (small and medium-sized enterprises), all going through a consortium kind of approach. And so you can see that in this case the manufacturing success was based on a very different model.

Singapore Strategy Based on Leveraging Foreign Investments

In the case of Singapore it is again quite different, because unlike Korea and Taiwan, which have largely promoted indigenous firms, in the case of Singapore, it is entirely, until recently, based on the leveraging of foreign investments. So the government policy here is to make Singapore a conducive environment for foreign firms, the big global electronics and other manufacturing firms to set up their production in Singapore. And to some extent, there is technology transfer by the multi-national company from the headquarters to the subsidiary, and then some of these are then transferred out to the colony through engineers that will leave this big Hewlett Packard and so on to start up a company and so on, so a very different strategy but nonetheless also successful.

Hong Kong: Gateway to China

Hong Kong's model is more a strong contrast in a sense that instead of investing in developing technological capabilities, it has largely been leveraging it's role as a gateway to China, both in terms of access to cheap

labor and other resources. So, also in terms as a gateway to access the huge market in China. So, rather than focusing on developing their technological capability, Hong Kong manufacturers in fact outsource a lot of the manufacturing to low-labor cost locations in China and elsewhere. And they focus on being the marketing intermediary, having good knowledge of the customer requirements and having good knowledge of where the suppliers are. And they focus on managing this sort of supply chain between the sellers and buyers.

So, again a very different approach, nonetheless also successful. But in this case, arguably it's a less replicable model for many other countries because it is difficult to imagine another location. They have kind of a special relationship with a big market like China. So, that is the past.

Past Industrial Development Strategy Cannot Continue

So looking forward to the future we can see the question then is, can the past sort of industrial development strategy be sustained in the foreseeable future? And the answer is that it cannot because of a number of factors. First, of course, China itself has become a major manufacturing powerhouse, and Mexico, Ireland and other transitional economies have also become very good at manufacturing. So there is increase in competition for the kind of things that these NIEs used to be able to do well in the past.

Also, there is increasing migration of varied creations and competitive capture to knowledge based activities. Increasingly you look at the end-value being created of a product, where does the value creation reside? A lot of it is no longer on the manufacturing site, but more on intellectual property creations; it is in product design and development, it is in marketing, brand distributions, and in ICT enabled transactions, E-commerce and others sort of a major sort of a digital economy role.

So, the question then is that how can the East Asian NIEs sort of adapt to that kind of change? There are just some statistics to show you, for example, if you look at the change from over the last decade, for example, you can see that except for China and Mexico on this chart, really, everybody else among the East Asian NIEs are really not being able to expand their share in the global export market. And if you look at the growth of the manufacturing industry, for example, it was very fast in the 1970s, it was still quite high in the 1980s, but by the 1990s growth potential has been limited. You can't continue to grow fast based on manufacturing alone. In fact, in the case of Hong Kong you can see that they have actually de-industrialization.

Now, these are figures in actual, in real terms, if it was in constant price, the change would be even more remarkable. In Hong Kong you would see a contraction of about 20%, 30% of the manufacturing sectors. And this is in a context that for the developing countries the whole manufacturing is still sort of growing significantly. So, this kind of shows the limitation on continuing a strategy of manufacturing growth.

And now I may want to highlight another aspect, which is the last problem of this manufacturing growth was also predicated on manufacturing of electronics goods, basically electronics goods going to the U.S. market. Here, for example, it shows that among the East Asian NIEs, their share of the world electronics in this case ICT, information communication technology goods, you can see that they are major exporters of these goods.

In fact, by the mid 1990s the four Asian NIEs share of the global electronics export market has exceeded that of Japan. Japan has gone from a 20% share of the world's electronics export to just over 10% in that period, and the East Asian NIEs are basically now exporting a lot more than Japan itself. And if you look at the share of electronics, ICT exports in the manufacturing export of East Asia, you can

see that it has become highly dependent. In the case of Singapore more than half of the manufacturing export is based on electronics goods. In the case of Korea it is 30%, and Taiwan 40%. And you can understand why, for example, when recently you had a sort of slow down in the IT sector the number of these economies have gone into recession. Singapore has gone into recession because the large part of the growth is based on exporting to the U.S.

Okay, and this is just to show the climbing share of Singapore and other Asian NIEs in exporting electronics to the U.S. The only one that is increasing as rapidly is Mexico and China, everybody else is losing. Even in the EU, for example, again that is China that is picking up. And in the case of Japan, Taiwan and China are also expanding. Now, let me skip that.

Okay, so currently in order for the East Asian NIEs to continue to be able to sustain high growth, they need to be able to move into other value adding activities and I wanted to highlight three aspects here. First is, of course, on the intellectual property creation site. But you need to go into, you know, creating technologies, have patented sort of the know-how that you can then extract value from.

NIEs Behind in Intellectual Property

Competing on the intellectual property creation site, as you can see that I will show you very quickly that on the whole range of what is what I call innovation indicators, that the East Asian NIEs have made significant progress, but on the whole we are still plenty behind those of the advanced countries. If you look at national expenditure on R&D as a percentage of GDP, Korea is already exceeding the average of the OECD. But for Taiwan and Singapore, they are still slightly below. Singapore is about 1.9% and Taiwan is about the same, whereas, Hong Kong is really way behind.

As I mentioned Hong Kong has really not been able to invest in technological capabilities, partly because of the policy environment that they were in. So you can see that only 3% yes, well this is about 2.6% for the U.S. Same thing, you look at the number of R&D personnel per capita, we are significantly behind the advanced countries. In case of U.S. patents granted per 10,000 population, which is another measure of intellectual property creations, here you can see that, you know, in the U.S. it is about 3.5 patents granted per 10,000 population in the year 2000.

You know in the East Asian NIEs we are significantly behind those numbers. In fact, if you look more carefully at the, this is a business chart that shows the patents granted per 10,000 population, this is U.S. patents, this is to all U.S. patents you can see that there has been a significant increase for all the Asian NIEs, but still compared to, you look at the absolute level, say, in the year 2000, we are still behind the rate that you can see in the U.S., Switzerland, Israel, Finland, and so on.

Now on this chart you may find for example, Hong Kong is actually not doing as badly as compared to Korea and Singapore in terms of patents granted per 10,000. But, if you look at the next chart, it actually shows more clearly what is happening.

This next chart shows that patents that are granted to private companies rather than to just universities or to individuals. And you can see here that on this chart that the reason Hong Kong is really way down, 1.23 lower than that of Singapore and all the others. And the point is that a lot of the technology commercialization actually are patents that are granted to companies. Whereas a patent granted to universities still has not much been diffused into a productive use. So in this goal, you can see that on intellectual property production the performance of the NIEs while increasing rapidly is still significantly behind those of the advanced countries.

This chart does sort of indicate to you that the growth rate is very high. For example, in Singapore the growth rate in patents granted is an average of 31% per year, but that is from a very low base. So, in some sense that if the trend were to continue, then there is hope that these countries may be able to catch up to the levels of the advanced countries, the way that, for example, Israel has been doing, and the way that a number of Scandinavian countries have done in the earlier periods.

Now, of course, in order to be able to sustain high level intellectual property productions, we need to also increase the human capital intensity and this chart here kind of shows that we still have some way to go compared to that of the United States in terms of the quality of human capital.

And this table, it's also kind of interesting to show that Singapore still scores relatively low on human capital in terms of the number of years of education. And in fact, if you show the change over the years, you can see that Hong Kong started off at a much higher rate. And this is one of the reasons that you can explain why Hong Kong has really, at the time of political independence in 1949, Hong Kong received a big influx of highly educated technical professional and industrialists from China and that really had been a very major source. But this has not been sustained with a policy to actually encourage these human talents to actually invest in technological innovations.

And so to some extent, it is not being carried in the direction that results in higher innovations. And in this Singapore started off with an adult population, many of them are not well educated. But the effect of new investment in education takes time and it takes generations to change. And that's why you can see a rapid, really, in one decade it has changed from 5.5 to 8.2, which is basically you have an old generation of workers retiring and replaced by a new generation of workers coming to the work force, which are highly

educated. And so within another 10 or 20 years, you see that Singapore will have rates that are much higher than that for Hong Kong.

Comparison of NIEs and Advanced Countries on Intellectual Production Indicators

I just want to sort of show some of these indicators, kind of tell you where the Asian NIEs are compared to the advanced countries, which are increasing rapidly but still behind them in terms of the level that they achieve. And you bear in mind that very often intellectual property production is not just a result of production, but that you also benefit from cumulated intellectual property production that you had in the past. So it's not just catching up to the current rate, but also to overcome the latecomer disadvantages against countries that have started much earlier and therefore had a higher accumulated stock.

Let's look briefly at how the East Asian NIEs are trying to compete on, trying to promote some of the ICT diffusions. We all know that increasingly the global economy is dominated by the digital economy so-called, right. You have increasing amount of the use of IT, in all sectors, also the production of ICT related goods; it's coming, increasing a large part of the economy. Now, in this read-out you can see that in brief the Asian NIEs have also maintained progress in trying to catch up with the advanced countries, but they still trail behind the advanced countries in the number of areas. For example, they trail behind the U.S. in PC diffusions, software and E-commerce applications, especially in the corporate business sector. And they also trail behind the Scandinavian countries and the Japanese in wireless infrastructure deployment, and also in consumer wireless applications. Just to highlight two aspects.

So, for example, again another business chart to kind of show you some indicator benchmark to show you where these countries are at. Basically, what you have is that maybe

in the area of cellular, mobile communications is one area where Asia and the East Asian NIEs in particular have met even higher penetration than that of the U.S. But otherwise, in terms of computer diffusions, we are still significantly behind that of the U.S.

And if you look at the Internet for example, this is a whole set of indicators to look at the Internet diffusions in terms of especially E-commerce transactions. You can see that the levels that we have in the East Asian NIEs are still significantly behind those of the U.S. particularly. And if you look at B2B transactions, for example, right, in the U.S. we are talking about 1,600 per hits on average, which is about four or five times the level that it is being seen and achieved in the East Asian NIEs. So these are just the rankings of the Asian NIEs and I won't go into some of the detail patterns.

The Gazelle Phenomenon

Last, I want to highlight the aspect about technology entrepreneurship. I think the important thing is to recognize that it is not just entrepreneurship in general that is the key to continuing success in the future, but the sort of entrepreneurship of the kind that perhaps may have powered the Silicon Valley phenomenon. And here the jargon is the Gazelle Phenomenon. Because the key to the rapid growth is that you must not just have many start-ups but that you have start-ups that are in technological opportunities that have tremendous upside growth.

So, we all know that in new venture creations, a lot of firms fail. So in general to generate lots of growth, you might have a small number of firms that can grow spectacularly fast that create most of the jobs and these are called the Gazelle Phenomenon. The Gazelle Phenomenon are firms that can grow very fast and they are the ones that become the Cisco of the future. So the challenge is, how do you promote that kind of growth? Not just small

or medium enterprises, not just, you know, more people I saw opening up corner stores and other laundry mats and so on. So to do so clearly changes the existing business environment and corporate government and structure needed to be put in place.

Rules and Institutions Facilitate Technology Entrepreneurship

And just as a brief note on this for example, if you look at what some of the institutions and rules that facilitate technology entrepreneurship in the U.S. and Silicon Valley are, I just list here some of the examples of rules and regulations. For example, you have more liberal listing requirements for IPO. Until recently the financial markets of the East Asian NIEs were highly regulated. You need to have five years profitability track record before you can get listed. And so the exit market is not there for technology entrepreneurs.

You have more lenient bankruptcy laws to allow failures to start over. In the large part of Asia if you are bankrupt it is impossible for you to start over. You have, for example, innovation in taxation policy. They allow, for example, to defer taxation or stock options. You have rules allowing pension funds to invest in business partnerships and also limiting the liabilities of the limited partners. This is really one sector that fuels the rapid growth of venture capital industry in the United States. And of course, we have the Bi-dual Act that actually allows universities to own intellectual property created using federal grants.

Again, another major policy innovation of the U.S. in the 1980s is that they had contributed to a major expansion of university technology patenting and technology transfer and licensing. Now, many of these are not in place in the East Asian environment.

And, also besides the creating of these rules and institutions, you also need the creation of

specialized resources. And some of the specialized resources that, of course, have been important to facilities to the start up environment in the U.S. and Silicon Valley are you have venture capitalist firms, not just the venture capital money, the experience, the so-called smart money, the pull of this expertise. In the case of the U.S., for example, the government from the FDIC actually in the early years helped actually train a whole group of people who are leaders, many of them became the pioneers of venture capitalists. And again that had to be created, that infrastructure. Of course, we know about the venture lawyers, the venture recruitment specialists and the accountants and bankers for underwriting, IPO, and so on.

So these whole new service industries don't exist in a large part of East Asia. So when you want to encourage technology and developing you have to have policies to try to encourage the growth of these. Until recently, for example, you can look at many East Asian countries in terms of policy incentives. They have policy incentives to encourage investment in the new manufacturing industry but they don't have incentive for investing in services industries. In fact, so that is the challenge. If you look at here, I have a number of entrepreneurship indicators that show again that the East Asian NIEs are really significantly lower on the entrepreneurship compared to the U.S.

Differences among the East Asian NIEs

Now, of course, as I highlighted it, is not just entrepreneurship in general but the kind that is important for technology entrepreneurship. And here I want to sort of highlight a number of sort of differences between the East Asian NIEs. First, I want to say the context here is that we have to see that because we come from very different diplomatic backgrounds. The path they need to think of to move to this new knowledge base, intellectual property base, innovation base, technology entrepreneurship base economy will be different. And I will go

into some of them, each of the countries briefly.

But first, I want to highlight that the nexus of innovation and entrepreneurship may be very different. Like, for example you have an economy like Hong Kong, which is certainly very entrepreneurial, right? But yet it has very low level of innovation. Most of the entrepreneurship is not related to technology, it is not related to technological innovations. And you have, for example, a country like Japan and Korea until recently with relatively high innovations. They invest a lot in R&D, they have very high production of patents and so on, but they are relatively low on technology entrepreneurs. So entrepreneurship is low.

Singapore and Ireland, two countries that have grown very fast in adopting similar policies of growth through attracting foreign multinational corporation investments. So they have a reasonable amount of innovations, both through the multi-national, it's through some indigenous spin off, but they are not that high in entrepreneurship, because they have become too dependent on multi-nationals during the sort of technology transfer innovations. Israel and Taiwan are the ones that perhaps seem to have the right mix of promoting both innovation and entrepreneurship. And, of course, you can say that Silicon Valley is a typical example of where both innovation and entrepreneurship combine together to fill the kind of high growth based on innovations and entrepreneurship together.

Sources of Technological Innovation

I mentioned before also about the sources of innovations of technology which is also a very different amount for Asian NIEs. For example, you have a country like Korea, which essentially has very little use of foreign investments but relies a lot on indigenous technical capability and also on a big return flow of returnees. They have the Korean engineers work in the Bell Labs and Hewlett Packard and so on and will go back. You have

in the case of Israel and Taiwan, again, which have a very high rate of sort of technology transfer, again true combination of returnees, indigenous and some degree of foreign investment. Then you have the case like Singapore and Ireland where essentially most of the technology transfer is primarily through indirect investments and very little in terms of returnees. Not as much in terms of an indigenous sort of firm than innovating.

So this is the backdrop from which these countries have to evolve towards. And to some extent you could see that these are the two, within the context of what I call a reconfiguration of the regional economy of Asia, and the biggest thing really is that you have in recent years and expecting over the next ten years, the shift of the growth dynamics from essentially from Southeast Asia to East Asia.

Until the financial analysis, for example, Southeast Asia kept a very sizeable share of the foreign American investment of manufacturing. But not anymore, most of it is going into East Asia, and the reason is mainly because China has emerged in such a big, sort of enormous market and a manufacturing powerhouse and with their entering the WTO.

Of course, the other factor is the political instabilities in Southeast Asia and the continuing fragmentation of the South Asian markets. So the situation changes investor perceptions about the potential of Southeast Asia. So a major shift.

And also, you can see here as a result of this that, as a group the East Asian NIEs will have to start to acquire a different role to play. They cannot do the thing that China has become good at doing now. And so they have to start to really invest more out of their own economies, at the same time, there will have to be more outward direct investment. At the same time they also have to open up to let in more foreign direct investment into their

economy, particularly in the services sector, which in the past they have not been strong in, and also because they have been largely protected. And they do not have the kind of innovations that you know that have been happening in the manufacturing sector.

This is one chart, a couple of charts to show you it's a trend in direct investment flow. The first row is inflow, the second row is outflow. As you can see that over time that there has been an increase in flow, both outflows, inflows and outflows. And this trend, I would argue, is going to have to accelerate a lot more in order for the East Asian NIEs to really stay very good.

And this is another picture of it by looking at it as a percentage of the gross fix capital formations. As you can see that in the case of Taiwan, for example, you can see that the outflow is very significant and, of course, a lot of it is going to China. So, very quickly looking at the four countries, I highlight some of the changes, the policy challenges that they are facing in moving in that direction.

Policy Challenges of NIEs

Clearly, the thing the Taiwanese have done is to internationalize, so it's to intensify the public R&D and basic research. And I believe that Taiwan has probably done the best among the four Asian NIEs in doing so by coupling this with by closing in on Silicon Valley. This has resulted in a visible increase in the new venture creation and the innovation rate of Taiwan. So this is something that they have done right. They, of course, now have the initiative to promote Taiwan as a regional transshipment hop and also to liberalize the service sector, but so far this has made almost no progress.

The bureaucracy, to try to liberalize the services sector is still slow. You may, I sort of ironically say that because the Taiwanese financial sector was so regulated for example that's why they did suffer the financial crisis. And there are Taiwanese economists who

argue that we will see that they continue to regulate the services sector because they cannot afford to be completely liberalized. So it shows that, you know, in one aspect they are doing well, but on the liberalization or service sector, they are not doing that well.

On the promotion of ICT or E-commerce diffusions the progress has been primarily in updating the manufacturing and supply chain management. And this is where, I think the government has done a lot here to really encourage many of the SMEs to go to use the Internet primarily for managing their supply chains.

The big challenge for Taiwan is managing the relationship with mainland China. There is a significant move by Taiwanese firms to tap China as an offshore production base, even R&D base. But there is constant worrying about they are being too rapid, sort of hollowing out, which as a result, you know this is a big policy debate in Taiwan now about what is the best way to manage this cross-strait relationship.

Korea, of course, after the financial crisis, they have been moving fairly quickly to open up the economy to foreign competition and DFI (direct foreign investment) and also allow more room for them to enter the services sector, but it's focus is still not as fast as I think they need to have. And so this is going to continue to be a drag on the Korean ability to really compete in the knowledge base services. Because many of the thriving Internet services are still not completely open.

Korea has remarkably, you know, created a very rapid deployment of broadband and wireless infrastructure, in fact they are probably one of the most wired and most sort of advanced in terms of wireless applications. But, of course, here the danger is that the danger of locking into CDMA, which ironically was a technology that the government itself pushed. And this highlights one of the

dangers of a government policy trying to pick winners because it might lock the country into a technology platform which may not be the one that is diffusing worldwide, which is GSM and in the future to the WCDMA and not the CDMA 2000 that they are being locked into now.

Big efforts are trying to move to curb the oligolistic power of the big *chaebols* because unless this big concentration of power is reduced, they will stifle innovations. I was in Korea as recently as July and August and they were concerned by many start-ups that the big *chaebols* are really suppressing them.

The other challenges that are promoting new venture in the venture capital industry, in this the Koreans have sort of in fact done a lot and I was chatting with someone just now. That in fact, for example, in Korea you can get exemptions, deferment to your military service if you actually start a company of the type that is approved, either venture capital, investment, or R&D. So this is one example to illustrate the extent to which they are prepared to try to promote this.

And, of course, this is one of Kim Dae Jung, President Kim Dae Jung's pet ideas. Because he also wants to wean the economy away from the dominance of the *chaebols* so he is pushing that. But the problem now is that as a result of domestic melt down many of the start-ups have grown enormously over the last, three, two years and are now having difficulty finding further investment and many of them are dying now. And so this is a critical stage where the policy encourages a big increase in entrepreneurial activities among technical professionals.

I know with Samsung very high-level engineer managers, they all left to start companies, now they are caught in this crunch. The promotion of knowledge based and service industries is something that they are being talked at. I'm involved in a World Bank set of studies for Korea on this and again the

level of obstacles that they need to overcome to try to change the policies.

In Singapore the major move has been to try to liberalize the financial services sector and to get the local banks to consolidate. Because they see the importance of having a really globally competitive financial sector, because to finance innovation and to finance entrepreneurship you really need to have a more flexible financial services sector. Of course, there is a big sort of government policy push about promoting technology. This was a launch in the early 1990s; many major changes have been made.

You know, there are people who still say that Singapore is quite regulated. I think if you visit Singapore now you see that things have actually become much more flexible. But of course, the problem is a lot of this would take a lot of time to have the effect to actually show. So, therefore, we do not expect that things will change overnight. There is very significant increase in government investment in R&D, especially life sciences, particularly after the genome mapping was completed. That this is, the Singaporeans probably have invested a lot more into promoting life sciences than any other of the Asian NIEs. And again, the emphasis is to attract foreign talent because this is where they want to get the innovations, to get entrepreneurship is to import foreign talents.

The other efforts are not really that successful partly because of the unfavorable environment that Singapore finds itself in Southeast Asia. Hong Kong is another sort of mixed case, where the government policy they have been trying to focus primarily on emphasizing where Hong Kong had been strong in the past. But, really for example, it's really as a hop, which they have been doing well in the past. But then because of the U.S. dollar backed policy, this is hurting them, because of the high cost, and many MNCs (multi-national corporations) actually are moving their headquarters away from Hong Kong.

And, of course, the other big problem is that China itself is expanding and the growing importance of Shanghai is going to make Hong Kong less relevant and of course with the improving relationship with Taiwan and China, many of the flow that used to go through Hong Kong is no longer going through Hong Kong, but are going to go through directly between Taiwan and China.

And Hong Kong, although they had a big policy announcement about the need to increase public R&D, to increase support for S&T infrastructure and so on, the reality is that nothing much really had been done. And so this is a boring picture. Another incident for example there was a big to do about how to liberalize the entry from technical professionals from China to enable Hong Kong to have access with more of these talents. But, again, there has been very little progress on this.

So, in conclusion then, I will say that in the new landscape of the 21st Century for Asia, the key factor to take into account is of course you have China emerging as a powerhouse for manufacturing. You have increasing global competition based on innovations and you have the growing importance of the digital economy. So, the four Asian NIEs are trying to face up to this challenge and perhaps coming from very different directions. They have mixed progress but clearly a lot more policy changes need to be made and I've just highlighted some of the policy challenges that they are facing. I'd be happy to take any questions from anybody.

G. John Ikenberry: We have two discussants here who will kick things off, and then we will open it up to the audience. I'm not sure who wants to go first, George do you want to?

George Shambaugh: I want to say the talk that Dr. Wong gave was quite detailed, I think very informative, and painted a very interesting and I think provocative picture about the transfer from manufacturing to high

technology. You've given us a lot to chew on, and I don't want to kind of take over that role but what I would like to do is push you in two directions.

I don't know maybe if it means opening conversation and raising really two issues. One is that there is a shift right now from manufacturing towards high technology; I think that's right. But within the high technology sector there are really two dynamics going on, one is sort of the production of PC software, hard drives, other PC hardware capabilities. And the other is development of software and E-commerce and web business, et cetera.

Computer Related Technologies

And the first part of the high-tech realm, particularly the production of computer related technologies of some countries in Southeast Asia, like Singapore in particular, have been remarkably good at developing a real solid basis and real solid footing in those industries. To the extent that Singapore is a real fundamental base of production of hard drives and maintains that position in the production of computer hardware even as wages have gone up, even as other factors that would traditionally drive those businesses out of that region, have made things more complicated.

And the question is, can the factors that kind of drove the production of computer technology in Singapore and elsewhere in Southeast Asia kind of drive it to those regions to begin with and maintain it despite increasing wages and increasing land costs et cetera? Can those same factors be applied when it comes to web technology or software development, which I think is sort of the next phase? And I'm going to suggest some ways to spin that but I'd be curious about the comments on that regard.

Relationship between Entrepreneurs and Government

The second is the relationship between the entrepreneur and the government. And here I

want to play on the analogy that Dr. Wong mentioned, which is that of Silicon Valley. And the interesting issue with Silicon Valley and the parallel with Silicon Valley and entrepreneurship and the relationship between entrepreneurs and the government is that if you talk to people out in Silicon Valley, and you talk about the role of the government, they get very queasy. There is a real antithesis about government involvement.

Instead of the government, you talk about who is key, are venture capitalists. But venture capitalists tend to be again, as Dr. Wong said, are not just sources of money but also sources of inspiration, sources of nurturing, they really kind of play more than a role of providing finance, they provide a role of guidance and sort of selection of potential entrepreneurs and potential firms that are really going to take off. And the question is, okay we've got these days where you've had active government intervention and the economy has been very successful in certain realms, in different ways.

As Dr. Wong pointed out, can the government intervene in a way that creates the type of entrepreneurship or inspires parallel to venture capital development and the role that venture capitalists play in Silicon Valley? And that to me is a bigger issue that I'd like to push him in that direction a little bit.

So, back to the first one, just a few points to think about and the question would be okay, Singapore and some other countries in Southeast Asia were extremely good at developing industries in the production of computer technology hard drives and other things like that. And the question is really, why was that the case, and why was that the case even when you had, why was that maintained even when you had wages going up, even when you had other costs going up that would tend to say you should move those businesses elsewhere.

Creation of Conglomeration Economies

Well, one of the explanations has to do with

sort of the creation of conglomeration economies. That is something that attracted other firms; once original firms were investing in those countries something attracted others to them. And the conglomeration economies had to do with kind of a pulling of skills and a pulling of infrastructure, and a pulling of skills, I think, is interesting. And this comes out of something that I think Dr. Wong wrote about in an earlier piece, which is the idea that, well, what is it about pulling these resources and skills that made Singapore and other countries so attractive to hard disk developers.

And the answer is that you needed something, some sort of set of skills, precision engineering, other technological development that were industry specific but not firm specific. That created something where everybody in a particular sector could benefit and it acted as a magnet and pulled people in. But those skills needed to be sticky. That is you wanted managers and entrepreneurs and there are a couple key entrepreneurs in the industry that played a major role in various, in the sector, but worked in various companies. You would need those entrepreneurs to be able to shift company to company with relative ease and to be able to share those skills, but you don't want those entrepreneurs to leave, so you need it to be somewhat sticky. You need the kind of, you need to create kind of sector specific benefits but things that don't transfer across borders very easily.

And the interesting, the other side of bringing all of the firms together is development of infrastructure, which a lot of these countries, Taiwan particularly, Singapore are doing. Hong Kong is a bit behind the scenes. But the infrastructure, physical infrastructure is developing. The real interesting question to me that I would pose to Dr. Wong is, looking back at the skill set, with the development of computer technology, the thing that really made Singapore attractive was, you had the engineers that had sort of sector specific skills that spilled over into other firms in that sector and really created this sort of a cluster that

created basically a critical mass to attract others into the business. But they stayed in that country.

When you shift from production to web-based IT or E-commerce the question is can you create a comparative advantage or a cluster that is going to have that same sort of dynamic effect? That is, that it is going to inspire people to pull together in a sense that creates a cluster but that cluster that is beneficial to, it is not firm specific, it is sector specific, but that is sticky, that is the people won't leave from.

And the answer is a bit of a puzzle, because if you look at E-commerce or web development the glory of the web is that it has not been in a location, that it can go basically everywhere, anywhere. But there are some web-based and E-business based functions, like dealing with distribution networks or different aspects of supply chains where there really are regional comparative advantages.

And the question is to me, what can governments do to basically play up those regional comparative advantages if they have a country like Hong Kong, which really is behind in terms of wiring in its society. But really like Taiwan, may have some real advantages in terms of logistical knowledge, logistical skills that it could use on an E-commerce basis to sort of inspire entrepreneurs and to bring in business that could localize in Hong Kong. So, really the broad question is, do the same things that worked in high-tech hardware work in high-tech software? And how does the relationship between entrepreneurs and government change in that regard?

Scott Shane: Let me start off by first saying that as I listened to the presentation, I actually found it extremely interesting, and I was looking actually for the point at which I could come up with a very broad disagreement. And I can't actually for the most part as I agree with what Dr. Wong had said. However, saying that I also saw that he had given us a lot

of information and actually from a factual point of view, this is very rich. What I thought though was that maybe we could make some of this a little bit more parsimonious.

So I would like to address three different kinds of questions. The first is how, what is it that I would agree with in a brief summary of the presentation. The second is, how could I boil down this to a couple of key points to summarize it to make it really parsimonious? And then third, to turn a proactive spin on this, what would you do then if you were going to make policy off of this information? What actions would you take, given that you pretty much couldn't do everything? Right, I mean that's the problem, if you could do everything this stuff would be easy.

So let me start with the following summary of kind of what I agree with here. The first thing here is that the old ways of gaining wealth in Asian countries are outdated. Right, this manufacturing based system is coming to an end, and the data seems to show that that's not going to continue.

The second thing is that catch-up is different than being at the technology frontier and developing a new economy as a different thing.

The third is that the countries are coming from very different points and they are going to have very different models, but then, what's common across that that you could do something with? And I think that a focus on technology entrepreneurship and the creation of new knowledge-based opportunities is central to this process. And then secondarily, generating people, giving people the right incentives to make sure that they do that are going to be crucial. And then this gets to these ideas of the role of government, and so forth.

Importance of Human Capital

The final kind of big piece I think that I agree with, and I want to reinforce, I think is very important in this talk, is the idea about human

capital. And this goes to the notion of the kinds of opportunities that get created in a country.

One of the things that we really know that's actually a very robust fact is that people create new businesses to exploit things in areas that they already know about. That is, biologists are the people who create biotechnology firms, software engineers are the people who create software firms, people who work as construction workers create construction firms, and people who work as bus boys at restaurants at best can create restaurants.

The reason that that's important is that at the heart of part of this puzzle is what Dr. Wong is talking about, of creating the kind of human capital that's necessary in these countries, which is if you want to have a lot of the cutting edge biotechnology based businesses getting started, you need a lot of biologists and chemical engineers and so forth. So if you take kind of what one could agree with in this whole talk I would summarize this as there being three key components to this, the process that I believe that Dr. Wong was talking about.

Components to Creating Human Capital

The first is having a set of entrepreneurs, that is a set of people who have the requisite skills it takes to create companies in these countries, the requisite motivation. Okay, willingness to take risks, being enough driven by greed for self advocacy to have confidence in themselves when everybody else tells them their ideas aren't good, which they will, because when it's new, it's not going to be generally perceived. If it's generally perceived it's not very valuable because everybody else is doing it.

The second is that there is some set of opportunities out there and this is the heart of the idea of technology. In addition to the whole issue of software, perhaps the next revolution is actually in biologically based activities and where are the opportunities?

What's going to be these set of ideas that are going to be huge at a forefront cutting edge development out there? And what we know historically is, it's almost always in technology of some kind. So, what's the technology in there?

And then the third are what are the supporting institutions? That is, how do you make this work? What's the role of government and what is it that government is not supposed to do? Or are they supposed to stay away? What are the roles of universities in the system? What are the roles of other institutions like investors and a financing system? So I think if I kind of pull out of this the kinds of policy things that one might say could be needed from this talk in these countries.

University Technology System Important

The first is, what seems to be lacking is the university technology system that seems to exist elsewhere. This is what I think is alluded to by the notion of the discussion of the Bi-dual Act in giving universities the right to intellectual property. What we have in places like the United States and Sweden and many other countries is a set of universities that drive the creation of very new technology.

And I would challenge every one of you to come up with a major technology in the past 50 years for which universities did not play a major role in development and that becomes important. And if I want to make this very specific in the start up activity in the U.S., one can trace particular companies and particular industries to singular inventions in universities. For example, Cirrus Logic, a billion dollar semi-conductor company, a single semi-conductor gate-aide patent at MIT, Lycos, a single Internet search engine patent at Carnegie Mellon, and INTEC, the initial biotechnology patent was at Stanford and San Francisco State University.

One of the things that's lacking in these countries is the system that creates this

technology out at universities that people then spin off and use in these companies. A second thing that seems to be lacking that needs to be jump started in the system that came across in the presentation is a venture capital based system. That is a system that draws capital in from investors, like pension funds, like government agencies, like private investors, pull that capital and puts it in young technology companies. And then at the other end an exit strategy a market like NASDAQ or a system where companies can get listed at a young age. And what Dr. Wong talked about is at both ends of the spectrum that kind of is missing in many of these countries.

Difficulty of Picking Winners

The third thing is an idea that goes back to kind of what governments can do and what they can't do, and it goes back to an old idea of high acts about why it is that governments are so lousy at picking winners. And the reason that governments are lousy at picking winners is that everyone is lousy at picking winners. That is, that nobody out there can see all of the uses of new technology and all manifestations.

And if I had more time I would give you an example that I always give of a single MIT invention, where people from wildly different industries all saw different applications. And most people don't foresee all of these things. The problem with government is picking winners and why government needs to stay out of this because what you want is everybody to see a use in the new technology and then figure out which ones worked. If you try to pick winners you're just going to pick wrong because you're not picking everything.

And the point about that is that information diffusion and that is where I think a lot of these countries have a lot of problems, is that everybody doesn't have widespread access to information, information doesn't diffuse easily and everybody can't choose what they do, and governments often try to pick winners.

The fourth thing that's needed is capabilities. This system is based on a set of skills like every activity and I think one of the things that came across in this presentation is the skills of exporting or the skills of working in other countries' multi-national corporations aren't the same skills that people need to have to build companies and finance new companies, and that there needs to be somewhere in the system a set of policies that help to develop those skills. So if there is a role for governments in the system it's probably not picking winners, but it's going out and doing things like figuring out ways to support the development of understanding of these topics among people.

System Should Allow for Failure

And then the last point that I think comes across very clearly in at least one of the slides was the ideas of rules of the game. And this is that if you look at the Silicon Valley model, or you look at the model that's in Cambridge in the UK one of the things that you see is that the rules of the game are actually very different than the rules of the game in many Asian countries.

The bankruptcy law example that Professor Wong gave is a good one. What you want to make the system work is that you let people fail.

Now, in Silicon Valley the idea is a person who failed starting a company is better than a person who didn't try at all. Okay, that's the opposite of a law that says if you were bankrupt you're barred from starting a new company for five years. That's a very different view. Similar things have to do with non-competes and here the idea is if people move from one company to another, if they can quit a company when they have a good idea that is going to benefit the system and those are the kinds of laws that have developed and came across in this presentation, and systems that tend to work well for this technology entrepreneurial activity.

So in sum I would say this is a very interesting presentation with a lot of good information. I think that if I made a contribution here at all, I think it's to try to boil this down and make a very good presentation just a little bit more precise for an audience.

Q & A

Ikenberry: Thank you very much. I think we've got a full plate here and I think what we'll do is open it up and let you pose questions or make comments and then we'll let Dr. Wong and our discussants react and weave in the reactions to each other as we go forward. Does anybody want to start off the discussion?

Questioner: Thank you very much, that was a nice presentation and comments, I have a question, actually two questions. For example, it is said that the Japanese have not so much entrepreneurship. I am Japanese and we understand that. My question is related to Dr. Shane's question. By changing institutions is it possible for say a Japanese or Asian people to improve the entrepreneurship, that's my first question.

And the second question, I think Japan had the most serious problem in education and education system is good at catching up the technology. What kind of education system is good for Japan, for other Asian countries? Maybe it's a very difficult to answer?

Shane: I'll take a stab at that. I think one of the things, the questions about institutions needing attitudinal change. Actually if you look at the U.S. as an example, this is true. If you were actually to go back for example and look at attitudes among college graduates and we have data on this that look, going back to the 1960s, people will tell you. You know, you go back into the data in the 1960s, nobody wanted to start their own companies, this was not an interesting activity, a very small percentage of students would be interested in this.

And then you see this over time, and I have a colleague who shows this data. You see a lag of the attitudes by the institutions as venture capital grows up, as NASDAQ develops, as all of these activities develop a few years later you start seeing attitudes among people saying, moving in that direction. And I think the institutions lead that direction. You don't need everybody; what you need to do is you need to move some portion of the population at the margin, and I think that's, I think it's possible for the institutions to effect attitudes.

Changing Attitudes Key to Entrepreneurship

On the dimension of this solution in the educational system, I think the key is, well what are the attitudes that one wants to impart and have people believe? Now the colleague at Yale University that decided that the major activity that he wants to invest in in entrepreneurial education is actually at the grade school level by running entrepreneurial camps for Japanese kids. Because his argument is that if the attitudes aren't changed at that level there is not much that you can do. Right? And the argument though is to essentially change at a low level attitudes towards thinking about entrepreneurship, thinking differently about self-employment, et cetera, and building that into the system. And I think it's possible.

Now I'm not an expert on the Japanese educational system, so I can't speak on the specifics but I do know of anecdotal evidence of ways that one can go about doing that.

Questioner: One comment about changes and ideas. It could come from the institution but it can also come from elsewhere. One of the interesting things that struck me about Korea in this regard was the willingness of young people to work in foreign companies, which if you go back one generation really did not exist. It was a real stigma against working for foreign companies for social, for historical

reasons, but it was very very strong. And now it's reversed, now it's a badge of honor rather than a kind of shame because you're not working for one of the *chaebols*.

So it's really, it can be institutionally driven but in this case I think actually it wasn't. I think it was driven partly by the success of the dot coms, partly by disenchantment with the *chaebols*, partly by increased exposure to other things. So I think that dynamic can come from multiple sources. But it can happen very quickly. People often talk about generational change, but this was in a matter of, it's a matter of five years difference. So it can be very quick.

Ikenberry: Dr. Wong?

Wong: Yes, I think the effect of institutions is not just on attitudes but on also the opportunities that are available, and also the opportunity cost. So you know it, some of these changes therefore can take effect much faster. Other changes in attitude, you know, at least other kinds of attitudes may take longer.

So the question I'm thinking in the case of Japan, you know you have a very rigid labor market, internal labor market. The opportunity cost for someone who is in the system, you know working for one of the you know, the NEC or Fujitsu or whatever, to leave and start a company is enormous because you know there is no way for the person to get back into the system if he fails. And that has been a system that has been evolved over the years, the institutions.

And so, if there is a change in that venue, if the opportunity costs can be significantly reduced and therefore it will, you know, make it much easier for people to access those to take the risks. Secondly, also in terms of technological opportunities, if you have an environment which is much more open, for example, open to foreign competition, then people with new ideas can actually start up, or people who get ideas can actually start up companies.

This is competition policy and that's why I think this researching of the *chaebol* is so important. Because if the *chaebols* are so strong that anybody with a start up company, it's almost like a case of trying to fight against Bill Gates and Microsoft. Right, you start out a company and then Microsoft will crush you. And so again, then that is a question of competition policies. If you have a competent policy in place that makes the playing field a bit more level, then you make it easier for start ups to be able to grow. So therefore, I think we have to separate between, you know, different types of institutions.

Creativity in Educational System Conducive to Development

On the question of the educational system, I agree that certainly there has to be a lot more sort of a, being introduced into the even younger ages and the idea to make people more creative and the need for people to be more innovative. I think that is a problem of the educational system, too much rote learning effect, and so on.

So I certainly agree that there is a need to change that, not just in Japan but also in all other Asian NIEs. But I also wanted to recognize that very often it is the opportunity that actually prevents people from doing that rather than just the educational system. You hear the example that you can say that the Singapore education system is also very like the Japanese system, very stifling. But interestingly that has not stopped many Singaporeans to start companies in Silicon Valley.

So the question then is that, that these individuals who came up on the same system, they are classmates, joined the MNC, joined the government in Singapore, but they chose to start a company but they couldn't start any in Singapore because the environment, the opportunities — it's just not suitable and encouraging to start a company. So, if they want to start a company they have to go to a place where it is supported and they end up

starting a company. So, that's what you say about the educational system, they went through the same educational system, you know.

Questioner: I am with the Korea Economic Institute. In looking at a new strategy for countries around China, whether it's Korea, Taiwan, Hong Kong, Singapore, Southeast Asia, to what extent could they focus on services and leave things to China? For example, could these countries become centers of excellence in transportation, communication, accounting, medical care, all these sort of things that are very labor intensive, that require excellence, that allow differentiation between customers according to wealth, and to make it very hard for big countries to provide whether in the case of Indonesia, Singapore, China, Hong Kong, et cetera. Can you do that? Or do they also have to incorporate in their development strategy the ability to innovate products as well?

Shambaugh: My response begins with the thought that the contrast you're making is too stark. I don't think it's a question of one or the other. Indeed, one of the things that I find interesting about most of these countries is that, as they move up the ladder, things don't really open up behind, the manufacturing doesn't disappear entirely. And I think there is a stage for the manufacturing to, kind of high-tech manufacturing to software, to medical, to you name it. But I don't think you're going to... You're not seeing a disappearance of the previous things.

I think Singapore, for example, is going to maintain a comparative advantage in producing some types of computer hardware, particularly because of the kind of synergies and effects that have been produced in that region. I think you can see some expansion outwards up and into other sectors. But I think then, it's really going to be a question of whether or not they can create the comparative advantage in that sector sufficiently so that there is some regional locational benefit that is

inherent within each of these countries rather than elsewhere.

Wong: Well, I think by and large, I think that is what many of the new firms are trying to reach within themselves to go to more high value added services, and then leave the more low-end manufacturing to China or other, you know, emerging economies. I think a question of whether this can be done probably, it depends on the nature of the technology itself. For certain types of technology, where maybe the manufacturing process can be quite easily decoupled from the product technology development, and maybe with the increasing use of the Internet and other forms of web-base corroborative network you can do that.

NIEs Seek High Value Added Services

Indeed, for example, Singapore has been able to for a long time, been the manufacturing base for hard disk drives for example, and yet most of the drive designs are done in the U.S. And Singapore has been able to maintain that because this process has been an efficient one. But one could argue that a certain type of technology or a certain stage of the new technology that may not be possible, or that may not be as optimal as if in fact you co-locate some of these activities.

So, I think in fact that the fear the Taiwanese have is that, you know, as they move a lot of the manufacturing to China and they do the product development and R&D in Taiwan, increasingly that may become a challenge because China itself has got a lot of good talents and so they are developing their own capability in China. And so that indeed some of the companies have decided to also relocate everything to China. So, unless you have something that is so sort of sticky, as to use George's term, that it will not move and that they will still come to, that it cannot really be replicated easily, then there is a real risk that in fact over time, you would be able to lose that capability.

Benefit of Glomeration Economies

And I think despite all this talk about, you know, they use the web base, the cooperation and so on, certain types of problems that have to require a lot more face-to-face and far more close interactions, there is still an advantage to a glomeration. In fact, I go back to the point that George has mentioned about can one do the new sort of web-base or software development activities that have the same kind of glomeration economies logic to it, than the whole sort of physical productions logic?

I think it would appear that it depends on the stage of the technology or product life cycle. So for example, you can have a lot of software being done out of Bangalore and yet the customers are actually American corporations and so on, so you have almost the replica of the whole manufacturing model. Product development is done in the U.S., manufacturing is done in Singapore, Taiwan. In this case the software specifications are done in the U.S. and the actual contract programming is done in Bangalore.

Now I think that can be done when you are dealing with something that is relatively well and at the relatively mature end of the product life cycle. You are making software products where this is well-developed, and you can sort of modularize it as a part of contract programming. You can't do that when you are at the more recent new products, where you need a much closer interaction where the interface cannot be that easily marginalized so to speak. And I think that that is why India is having particular problems to move up the value ladder. They can do contract programming for you know software jobs where the specifications are well defined, but they can't compete really in sort of innovating in new software product where there is a lot closer interaction needed.

So, I will say that the jury is not out yet as whether this can be done on the same scale, but I will also argue that I don't see the major

development of the digital economy as in web development or software development. It's actually in the applications, and that is the juice of the technology. If you look in the large part of Asia many of the manufacturing firms, they are not using a lot of this Internet technology to improve their process. And so the major gain is not so much at growing your own software, web development and services company but it's in having a large number of companies that are able to adopt and use these new technologies in a very effective way in the production process, in the logistic process.

And promoting that hybrid of infusions and adoption among the company is the major challenge and is the major productivity gain. And so, from that, people to do that are likely to be able to compete well on a global scale and are likely to be able to achieve a sort of a competitive performance.

Challenge of Using New Technology

So I see the challenge, it's not just web development but in how to use the technology and to use the technology is not a firm level decision because in that network, there are network externalities, so you can have in any case a single firm say in Singapore or Taiwan adopting certain technology of supply chain management by itself. Its customers, its suppliers all must agree to do so. And it is this diffusion where there might be some kind of a government role to try to facilitate this industry level kind of adoptions.

So this is just an illustration of this, for example the industry I've been talking for years about, you know using XML technology to allow firms to seamlessly integrate the selling and buying of complex product like computer hardware and many things you know. The problem is not with the technology, the problem is getting industry to agree on common standards and adopt them. And in this instance, the big competitors, the Hewlett Packard, the IBM and so on in their competitive rivalry they can't agree on a standard and do it.

Conversely, if you look at East Asia you have many small medium enterprises. You have to have some mechanism to actually get them to sort of come to adopt some common standards. Indeed, one of the real successes of Taiwan, for example, is the liquid crystal in the notebook industry. Right, Taiwan is a major manufacturer of the notebook industry because the government plays a role to bring these many small players into a consortium to agree on common standards on more juice that they can go and manufacture, and that's why Taiwan became very successful in notebook manufacturing.

So I think we need to look at that kind of challenge, the challenge of adopting these technologies rather than creating Internet technology per say.

Questioner: Thank you. I'm with the Economic Strategy Institute. A question and a comment. As it happens I just got back Friday from a tour of Asia and I saw several presentations in Hong Kong and Singapore of a similar kind, where the Hong Kong, and the Singapore, and Taiwanese, and others were talking about the strategy to deal with the challenge of China and the migration of manufacturing to China. So everybody is talking about building a new Silicon Valley and encouraging entrepreneurship and so forth.

Potential Growth in China

And aside from the questions that have been good ones that have been asked here, about the environment and the educational system and so forth, one of the things that kept striking me was that when I'm in China the Chinese make it very clear that they intend to do all that stuff too. They're not going to stay as commodity manufacturers and, in fact, it's very interesting to look at the rapid migration of semiconductor manufacturing out of Taiwan into China.

Morris Chang said recently that five years ago he didn't think China could do it, now he's

putting seven fabs in China. So you know, if China has good entrepreneurs, which it does, and it has the other factors, it wasn't clear to me how exactly Hong Kong or Singapore was going to find a new advantage in new entrepreneurs.

And secondly, there is kind of an assumption here that everybody has to be in high-tech and that everybody has to have entrepreneurs. But you know an interesting point, which was the same two guys who were classmates or maybe even brothers and one of them goes to work for the EDB in Singapore and the other one goes and starts a company in Silicon Valley, now why is that?

Well, part of it I think is because the environment in Silicon Valley is very different for start-ups. But one of the aspects of that Silicon Valley environment is that there is a big environment around it. So if you're going to start up a company you need customers, you're more likely to find them in a Silicon Valley because you've got the American market here than you are in Singapore.

And so I just wonder whether there is not kind of a built-in advantage in big markets for entrepreneurs that maybe doesn't exist in smaller markets. And so whether or not the strategy for a Singapore or a Hong Kong, whether the real strategy lies in becoming the next Silicon Valley or whether as Joe said it's more a services kind of a strategy.

My comment for Scott Shane is that, you made this point and I'm not sure exactly how you meant it, but you said how governments are so terrible at picking winners. And I'm not sure exactly what you meant by picking winners but I think if you're talking in terms of governments can't pick particular companies I think that's demonstrably true.

But it's hard to just, as you said, it's hard to find the major technology that hasn't had university base somewhere, it's hard to find a winning technology that hasn't had massive

government support. And in fact, you know if you look at Taiwan, for example, I mean Taiwan has been very good at semi-conductors. Why? Because they've got favorable financing from the Taiwanese government. So I think it's a mistake to dismiss the role of government working in conjunction with industry to promote technological advance.

Ikenberry: Dr. Wong why don't you start off?

Wong: Yes, I think this is precisely, your comment that China is trying to do the same so what can the NIEs do? But of course in some sense you could say that from a true economic standpoint that you know it is not a zero sum game that a prosperous China itself would sort of stimulate demand, and in the end you know everybody benefits. You know, it's better that you have a prosperous and strong China than to have a weak China or don't have the sort of buying power. So I guess the answer to that would be, that hopefully this strong development of China itself would stimulate a very major development in the Chinese market itself and that market itself would enhance trade and to some extent the specializations that these firms would present themselves in.

It would lead to some, sort of over time, some specializations is what trade economics would predict that at the end of the day the NIEs would have to find some area either because they have some special location or some other advantages that they can specialize in, in doing better. You know they can still do better by having them doing it and exporting it to China than to having it done in China itself; that's what true economics would suggest.

I think your other question about whether there is a bigger advantage for entrepreneurship in Silicon Valley, certainly there have been the first mover advantages that Silicon Valley had that according to a recent book you know about 1/3 of all the start-ups in the Silicon Valley are by ethnic Indian, and Chinese and many of them are actually immigrants from our side. So it's a self-selection

process. But then the question is that you don't have to replicate Silicon Valley but that you need to have some also hot base for entrepreneurs.

I think that the world can support more than one you know. And so in Asia itself there is enough of a huge market that may be better served. There are opportunities in Asia that may be better served by having entrepreneurs who are close to the market, who are close to the customer base here to be able to serve that better in Asia as well. So, I therefore, am not as pessimistic that everything will end up being in the Silicon Valley.

Shane: There are three pieces in this comment and question that I actually wanted to address. The first one relates to the market size issue. I actually think the evidence is there that the market size isn't that important. Actually, the Israeli example is quite a good example that the market size itself doesn't matter; there are many good mechanisms for the technology development in the home country, as long as there are ways to keep it from being appropriated by others, then one can start companies and exploit it in foreign markets. So I think that inherently locating in the same country that has a large market is not necessarily going to make that much of a difference.

Now, of course if there are barriers across countries to the transfer of that activity it's problematic. The second is the idea whether the technology part of the entrepreneurship activity is necessary. And I would argue that it is a necessary condition. If we look historically almost all of the opportunities that generated major growth come from new technologies. And so while there are changes in social and demographic factors that opened up opportunities the scope of the technological ones are quite large in comparison.

On the third issue of the picking winners—I think any entity is actually very bad at picking winners. If we look at picking anything, pundits picking future technologies, not a high

record of success of pundits picking what the next generation of technology is going to look like. Venture capitalists picking winning companies, governments picking industries, to focus on.

Role of Government

I will say, however, that doesn't mean that there is no role for government involvement. One is that the earlier in the system you are the less picking winners matters. So funding research where the research is going to lead to a general purpose technology that could have many, many market applications, the government funding and involvement role is not going to cut off as many avenues as trying to pick products at the end of the process.

The other is that when the government is fundamentally supporting all players in a particular area, for example, defense spending, supporting Silicon Valley in it's infancy at that broad level, of course there is benefit and support. But it's trying to say this particular defense investment and technology versus that one that runs into trouble.

Questioner: Stay with that for a minute. DARPA (Defense Advanced Research Projects Agency) picked the Internet. It wasn't a matter of funding broad technology, it was a matter of focusing our specific technology and then it was subsidized. I mean most people don't realize this, but the Internet was subsidized until about 1997 by the National Science Foundation. The U.S. dominance in aviation goes right back to 1914 and the establishment of the National Administration for Advancement of Aviation.

You talked about semi-conductors, it wasn't just broad defense support of the semi-conductor industry. It was DARPA and the defense department funding very specific product development in the semi-conductor industry. And it's very hard to find high definition television. The FCC organized the competition to find and drive a development

of a high definition standard. It's just really hard to find a technology that turned out to be a big winner that somewhere along the line didn't have very substantial government involvement.

Ikenberry: We have maybe a 30 second comment by Dr. Wong, we promised to end on time so keep it short if possible.

Wong: I just wanted to add that the role of the government picking winners depends on what stage of the technology you are talking about. When you are in an early catch up stage clearly it is easier to pick winners, like the Taiwanese, they were so far behind in semi-conductors

and all they wanted to do is not to innovate something that would kill semi-conductors but to become good at semi-conductors. You can easily learn from what other people have done, avoiding mistakes and also learning what to do. So, that I think is relatively easy. And I believe that the records the East Asian NIEs show that the role of the government has been positive. But it's only when you are near the technological frontiers than this comment by Professor Shane would apply more.

Ikenberry: Well, we'll let that be the last word. Would you join me in thanking our panel? (End)

About the Panelists

Main Speaker

Dr. Poh Kam Wong is an Associate Professor at the business school of the National University of Singapore, where he directs the Centre for Management of Innovation and Technopreneurship. He has consulted for a variety of international agencies, government agencies in Singapore and high-tech firms in Asia. Dr. Wong also has co-founded three technology companies and serves on the advisory board of several high-tech start-ups in Singapore and Malaysia. He was a Fulbright Visiting Scholar at UC Berkeley in 1984 and currently is a visiting scholar at Stanford's Asia-Pacific Research Center. He received his B.Sc, M.Sc and Ph.D from MIT. Dr. Wong has published articles in journals such as the *International Journal of Technology Management*, *Journal of Asian Business* and *Industry and Innovation*. Recently he completed a study on *Re-thinking the Development Paradigm: Lessons from Japan and East Asian NIEs*, funded by the Sasakawa Peace Foundation.

Discussants

Dr. George Shambaugh is Assistant Professor of international affairs and government at Georgetown University. He also has been a consultant to the World Resources Institute and the Institute of International Relations, Taiwan, and has served as a research and development analyst for the American International Group. Dr. Shambaugh received a B.A in Physics from Oberlin College, an M.I.A in International Affairs from Columbia and a M.Phil and Ph.D in Political Science from Columbia. He is the author of *States, Firms and Power: Successful Sanctions in U.S Foreign Policy* (1999), co-editor of *Anarchy and the Environment: The International Politics of Common Pool Resources* (1999) and co-author of *The Power of Process: Policymaking in the Executive Branch* (forthcoming).

Dr. Scott Shane is Professor of Entrepreneurship and chair of the department of entrepreneurship at the Robert H. Smith School of Business at the University of Maryland. He currently serves as editor of the Research and Development, Innovation and Entrepreneurship Division of *Management Science*. He has also taught in executive education programs in Norway, Poland, New Zealand and the United States. Dr. Shane earned his Ph.D at the Wharton School of the University of Pennsylvania. His more than 40 articles on entrepreneurship and innovation management have been published in such journals as *Management Science*, *Organization Science* and *Strategic Management Journal*. Dr. Shane's research has been quoted in *The Wall Street Journal, Inc.* and *Entrepreneur Magazine*.

Moderator

Dr. G. John Ikenberry is the Peter F. Krogh Professor of Geopolitics and Global Justice at Georgetown University. He is also a non-resident Senior Fellow at the Brookings Institution. Additionally, he was a Senior Associate at the Carnegie Endowment for International Peace and a Fellow at the Woodrow Wilson Center for International Scholars. He received his Ph.D. from the University of Chicago. Dr. Ikenberry is the author of numerous publications, including, *State Power and World Markets: The International Political Economy* (forthcoming), *After Victory: Institutions, Strategic Restraint and the Rebuilding of Order after Major Wars* (2001), and *Reasons of State: Oil Politics and the Capacities of American Government* (1988).