Keynote Speech

Interplay of National Innovation System and Corporate R&D in Asia

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1. Is there a global innovation ecosystem?

If a system can be called an ecological system, we need the following characteristics: diversity of species, open system, interaction among actors and feedback system, co-evolution, and self-selection process (survival of the fittest). Global innovation system (GIS) is made up of national innovation systems (NISs) and corporate innovation systems (CISs). NIS tends to be of stand-alone type, although internally an NIS requires an interaction among key actors, such as research labs, corporations and universities. Corporate R&D system, or CIS, is becoming global, but interaction among different corporate R&D systems is quite restricted due to the proprietary characteristic of corporate research. In this sense, 'global innovation system' cannot be called an ecological system at this stage, because CIS and NIS tend to closed and interaction among actors is limited.

2. Technology and sustainable development

Out of eight so-called millennium development goals as adopted by the United Nations, I would like to focus on three goals: eradicating extreme poverty, combating HIV/AIDS and ensuring environmental sustainability. I would like to propose that realizing these goals are not so much dependent on technology but more on political will and system. For example, eradicating poverty globally requires a relatively small amount of resources, but the political and institutional problems are standing on the way of achieving such goals. In reducing AIDS, the mankind has developed a vaccine system but there are institutional barriers for the medication to be applied to the poor in Africa and elsewhere. The organizers asked me to talk about the trade-off of economic development and sustainable society. But I would like to suggest that there is little trade-off between economic development and sustainable society. Almost all major social and economic problems, including all of the MDGs, require economic development and income growth. Even environmental degradation caused by economic development can be improved when a country reaches a certain level of income. One exception may be an area of global warming, where a high-income country such as the United States is the biggest polluter. As China develops rapidly and her population uses up more fossil fuels, the issue of economic development and sustainable society may become an acute issue in coming years. And yet I would like to argue that there is a positive correlation between economic growth and environmental quality.

3. Interplay of NIS and CIS in East Asia

Four economies (Japan, PRC, South Korea and Taiwan) in East Asia are driving R&D to gain advantages in global markets and further develop their economies. Each NIS in East Asia is spending a proportionately

high percentage of their GDP on R&D. Even China has revealed her ambition to become a technology superpower by 2020. R&D by multinationals is increasing in this part of the world as well, but they tend to be limited to adapting their products to local conditions. And foreign R&D does not interact with local technology clusters, at least according to a survey done in Korea. Even in East Asia, there are two different models of NIS. One can be called a 'self-contained NIS', mostly dependent on national budgets and national champions with little interaction with global corporate R&D, as shown in the case of Japan and South Korea. On the other hand, China shows a "MNE-participating NIS", a hybrid model based on national basic science system and MNEs' commercial R&D. However, even in East Asia, the dispersion of manufacturing in different locations is forcing the R&D to become more regional. Four East Asian economies are spending a high percentage of their GDP on R&D, and the total of R&D expenditures of these four economies exceeds that of the EU 15 countries. Since much of East Asia's R&D is concentrated in new technology areas, especially IT and related fields, there seem to be overlapping programs and excessive investments. It is not clear, though, what kind of cooperative mechanism can reduce resource wastes and develop a more effective regional innovation system.

4. Special cases of China and India

NIS in China and India has special meaning because these two countries contain 40% of the world population. How science and technology are upgrading the quality of life in these populous but still largely poor countries have direct ramifications for the subject matter of this conference. China is growing at a strikingly rapid pace at present largely through the increase of inputs. Total investment share out of GDP has exceeded 40 percent level in the last several years. This required a great amount of natural resources and has in turn put an upward pressure on the price of these resources world-wide. At the same time, rapid industrialization and urbanization has created severe environmental problems. China's leadership seems to be aware of the limit of input-based economic growth and pronounced a new development strategy based on quality improvement. And a key element in this new growth strategy is 'innovation through self-developed technology' (自主創新). In other words, China's leadership views NIS as a key to the sustainable development of her economy in the next decades.

India's strength in science is her human resources. Thanks to her availability of good-quality engineers, India has attracted software research labs of most global IT companies to Bangalore and other IT centers in the country. India's own IT companies such as Infosys and Tata Consultancy have already become global software powerhouses. I have to investigate further how the NIS in India is operating, but at the moment India seems to depend on MNEs for science and technology even more than China does. At the same time, India's excellent graduate schools of engineering have become an important strategic asset for India in the global innovation competition.

5. Concluding remarks

It is debatable whether there is a global innovation ecosystem. Because of the nature of technology as a source of competitive advantages for nations and companies, both NIS and CIS tend to be a closed system rather than an open one. To the extent that basic scientific findings and knowledge are shared among scientists and engineers globally, it can be argued that the system is an open one. Basic science field may well

be an open system, but product development and applied research have a strong need for protecting proprietary knowledge. Since corporations are spending their R&D money to gain competitive advantages, it can be argued that corporate innovation systems are highly corporate-specific and not amenable for sharing knowledge. In this sense, it is argued that the global innovation system is rather fragmented or compartmentalized, and there are many artificial and institutional barriers to become an open system.

Even in East Asian regional context, national innovation systems are more independent from each other, and NISs do not interact with global corporate R&D system, either. Although the pace of globalization is gaining speed in many areas such as trade, direct investment and capital flows, innovation systems tend to be closed and isolated from each other.