
Session 2 : Capitalization of Science to Socioeconomic Values -- Roles of Players

Chairperson: Dr. Masahiro Kuroda

Dr. Masahiro Kuroda: This session focuses on the final part of the innovation ecosystem, the outputs: how to achieve the research and new technology knowledge, how to supply it to society to create social value. We want to pick up important "elements" of the innovation ecosystem domestically as well as globally. We also want to consider the possibility of creating a global innovation ecosystem for the sustainability of the global society.

Mr. Nobuo Tanaka: The OECD has been working for years on national innovation systems and all member governments focus on the issue of innovation as a key driver of economic growth. Japan is among the leaders in terms of R&D spending. Concerning patenting, Japan is definitely one of the top performers, but it is not doing as well in terms of the proportion of firms reporting successful innovation. We are looking at R&D efficiency at the OECD, calculating the five-year time lag in R&D effect. In the late 1990s, R&D efficiency had come down in Japan but by 2003 it was on the increase. Japanese R&D efficiency has not improved as much as we had expected, but it is getting better. The key issue for Japan is how to extract economic value from high levels of R&D investment and how to modify self-contained innovation systems. This is probably the problem in Japan.

The issue at hand is much wider than science and technology policy. Weak framework conditions, namely education, financial markets and labor markets, explain the low performance in Japan. Japanese students have good math results but are weak in English. Also, our venture capital investment is very low compared to other OECD countries. Plus, the mobility of human resources in Japan is limited within universities, enterprises and public organizations. Other framework policies that constrain innovation are openness, restrictions on foreign direct investment, product market competition and intellectual property rights. Japan has some of the lowest incoming foreign direct investment among OECD countries when compared to GDP. Ireland is at the opposite end of the spectrum.

Japan has a low share of patents by foreign applicants. Japan also ranks the lowest on sharing patents with foreign co-inventors. Likewise, Japan ranks low on highly-skilled immigrants. English-speaking countries, by contrast, benefit from immigration. Another issue is R&D linkage. Japan ranks similarly low on science-industry links as measured by patent citations. In addition, the country needs to further reduce barriers to foreign direct investment, improve access to early-stage financing capital, strengthen industry-science linkage and promote innovation in services and clusters.

Intellectual assets should be developed, retained and commercialized for value creation by firms. The question is how to link them. Intellectual asset-based management, corporate governance and disclosure are important social infrastructure, especially for Japan. Additional public disclosure of intellectual assets would enhance financial market efficiency. Many countries already realize the necessity of these guidelines have practices in place. Japan last year issued guidelines and has begun to move in that direction. The important thing is to create a national system of utilizing firm-level intellectual assets, developing international and regional intellectual assets, and making them accessible to the economy or region.

Prof. Jong-Wha Lee: My question is whether FTAs or regionalism will promote more collaboration or innovation in East Asia.

Mr. Nobuo Tanaka: In East Asia, we do not have many FTAs. In the East Asian case, Japanese, Chinese and Singaporean companies operate their production in a very international, coordinated way. FTAs, regional free trade and global free trade are other keys for better collaboration among global companies. Government can play a very important role where there is not enough openness or integration of economies. It can force more global competition and collaboration.

Mr. Kazuhiko Toyama: I have been working for the IRCJ, a unique organization that was set up as a countermeasure to Japan's long-term recession and financial crisis. This organization's mission is to acquire troubled companies from Japanese banks. We have bought 41 companies and at the peak had more than 100,000 people working under us. We were a huge holding company. We are like a publicly-owned private equity fund.

The question is whether we can naïvely trust the capital market in the context of innovation. Even in yesterday's discussions, there was an assumption that the market is efficient, with the notion being that if we allow capital and human resource allocations to be governed by market disciplines, things will work. What we have seen in the real world is that this is not true. The dilemma we face at the IRCJ is that we buy companies and are supposed to sell them within three years. We have to enhance the price of the assets. This is not the intrinsic value of the company; just the price people pay for their shares. The capital market does not like uncertainty or risk. The more innovative the company is, the more risky and uncertain it may be. The best way to increase the price of the asset is to stop those kinds of things, such as reducing the R&D investment and reducing the headcount of people working in R&D.

I am not sure that the financial-capital market is really efficient and effective in the allocation of human resources. The most typical conflict between the human capital market and the financial capital market occurs in terms of the difference of time scopes. Shareholders change every day. They do not care about the future of the company because they do not have to. But on the other hand, people say that we should give more governance to the shareholders.

I did not say we should go back to the good old days when the bureaucracy controlled the economy, but I think we need to redesign the market system itself. This is especially true for capital market systems, which should be more adaptable to today's new knowledge-based industries.

Linkage between the financial/capital market and the human resources market is crucial. The financial capital market is not designed in a way that can truly encourage efficient reallocation in the human resources market. Nothing is disclosed about human resources or intellectual property. Intellectual property must be combined with truly good people in order to make money.

Overall, I believe there are many things to be done, not just on the market side, but also on the public sector side in terms of changing the rules and market design.

Prof. Jong-Wha Lee: Within the context of the South Korean economy, the question that must be raised is whether it can switch itself to an innovation-driven economy. Up to this point, South Korea has been an imitation-driven economy. We are trying to switch because we recognize that we're rapidly catching up, but for the most part this catch-up is attributed to capital accumulation rather than productivity growth. Since the financial crisis, we have recovered quickly and performed very well compared to other countries, but the speed of catching up to world technology frontiers has been slowed down. Technology progress was done by technology adoption (imitation) rather than creation (innovation).

The question is how to improve technology progress. R&D investment plays an important role. But why is the productivity of R&D investment in Korea relatively low? Some researchers claim that

South Korea's productivity is one-tenth that of the US. Korea's total R&D expenditures remain high, but innovation performance is not satisfactory.

The question is how to improve the productivity of R&D investment. The structure of research investments is important, not just the volume of research inputs. It is important to nurture long-term, risky investments for innovation and allocate them efficiently. Upgrading the quality of education at the tertiary level is crucial for technology innovation.

Unlike other countries, all business R&D is done by large enterprises, not by small and medium enterprises. Large enterprises are almost all in manufacturing, but the manufacturing sector only accounts for 20% of the economy. The question is what to do about the service sector. Even government-financed R&D spending goes almost exclusively to large firms.

The financial sector should play an important role. We suffered from the financial crisis, which led to financial restructuring and solved a lot of problems, but the sector is still very risk-averse. The question is whether financial systems based on the market can play an important role in encouraging long-term risk investment. If they cannot, what should the government do?

How to improve total factor productivity and innovation of the divisiveness sector will be the key for Korea. The theoretical model shows that the optimal structure of R&D investments depends on an economy's stage of development. Economic growth is positively correlated with the level of basic research activities. The quality of tertiary education also has a significantly positive effect on the productivity of R&D.

The implications of empirical analysis are that as the total factor productivity level of a country approaches that of the world frontier, there must be a change in the structure of R&D investment. What is more important is investment for knowledge creation. The public sector and academic sector should play important roles, not just the corporate sector. Companies invest, but only for applied models, not basic R&D. The question is how to overcome the political impediments to these improvements.

Dr. Feichin Ted Tschang: Of primary importance to Singapore has been outsourcing industry growth (which in the past has been manufacturing related, but now increasingly includes R&D and services), industrial upgrading, new sectors (services, creative industries), and modern notions of innovation/invention (creative product development, "social" phenomena, Internet/service business models). I feel there is less interaction between the three actors of private companies, universities and finance than should be taking place in a well-functioning innovative system, although this is the case in many countries.

The three sectors that Singapore is focusing additional resources on for the next 5 years and possibly onwards are interactive and digital media, water and environmental technology, and biotech. Mechanisms are in place to bring in the actual knowledge creators (foreign talent). Increasing the creativity of the population has involved educational reform and entrepreneurship. Other mechanisms that have been emphasized are the creation of clusters. Clusters are important in some industries, but not all. Other aspects of the US model have been replicated too (e.g. standards, infrastructure), but US outcomes were very organic and historical in nature. We are modeling outcomes when we perhaps should be modeling processes. In some industries like biotech, the more successful exit strategy of a startup is selling out to a larger company. That does not create an industry, but mainly a serial entrepreneur. We need ladders to become large firms.

One general problem is the changing nature of innovation. Traditional means of R&D and problem inquiry tend to be applied in specific areas in specific locations. Looking at the new innovation trends

that are occurring, we're moving from R&D in a product-led environment to, in some cases, business model-based innovation (e.g. Internet businesses like Priceline, Google and now, YouTube). Innovative products are increasingly experiential, such as movies and videogames. These require creative influences that are cross-media/cross-culture. Business model-based innovation looks at a different dimension in problem spaces. They identify things that are not obvious on the surface but are problems that you can resolve and that people will reward you for. There's also user-created innovation, which largely consists of content and technology created and distributed on the Internet.

Some of the issues involved in starting of these kinds of businesses are idea generation and entrepreneurship. But there is no shortage of ideas; the problem is rather the implementation. The question in innovation is what policy implications this all has.

Dr. Charles W. Wessner: We heard yesterday about the US advantages in innovation. I think the flexible capital and labor markets are particularly significant as an advantage while the US also faces major challenges. My message is that we have a good system but we are not funding the very things that have driven our economy, particularly in the IT sector.

In the US, when things go wrong there is an effort to fix them. However, you have to have someone who is willing and able to listen. The president has a Council of Advisors on Science and Technology. However, its reports have been ignored by the White House. The Congress did not ignore it and this resulted in a number of pieces of legislation. The US has institutions that are not partisan and provide objective advice. However, it is not certain that we'll see these things through.

In the US, norms and policies encourage equity-finance at small firms. We value commercial success, unlike some countries. We also have forgiving social norms. If you try, work well and fail, you are allowed to try again. We have bankruptcy laws that do not punish you for a long period of time.

In the US, we have the myth that if it is a good idea the market will fund it. The reality is that potential investors have a less-than-perfect knowledge, especially about innovative ideas. There is an asymmetry of information. Firms with promising ideas face major challenges. You can fund the research, but it is tricky to get to the product stage. There's also a myth that because US venture capital markets are broad and deep, there is no role for government awards. The reality is that venture capitalists focus on later stages of technology development and seek early exit. This is not a criticism of venture capital. I merely want to suggest that it is not a solution to every problem you have.

Flexibility is the differentiator in systems. It is not how much is spent but how well. We need to reform institutions or invent new ones, and we need to learn from each other.

Prof. Reinhilde Carine Veuglelers: The link between innovation and economic growth and jobs is at the heart of the current policy debate in the EU. The problem is that the EU has had disappointing growth performance relative to the US and emerging economies like China. The basic reason for this is that the growth performance which we do have is much less driven by innovation. In general, the EU is much less oriented towards high-growth sectors. It is partly a story of being specialized in medium-tech sectors like mechanical engineering. Within sectors, growth is much less related to innovation than the production and absorption of the technology. It is the lack of uptake of new technologies.

You can have deficiencies in innovative capacity at three major levels: capacity (supply), framework conditions (incentive/rewards; fragmentation), and systemic failure (networks, linkages). The EU has challenges in all these areas. They must be attacked simultaneously. The failure is at different levels and requires a broad policy approach. The Lisbon Strategy had this in mind. It was a process of structural reform, not only tackling investment in the knowledge-based economy and education, but

also taking account of product market reforms, financial market reforms, and labor market and social reforms.

The midterm diagnosis on the Lisbon Strategy is that there has not been much progress. The strategy was not wrong. The problem, instead, was with its implementation. It was not focused enough on innovation-based growth in jobs and was not systemic enough. It was a collection of individual programs rather than a coherent process of structural reform. To make the Lisbon Strategy much more a truly systemic approach, more attention needs to be paid to measures to enhance demand for innovation, more attention to improving R&D resources, more attention to measures to enhance diffusion and absorption capacity, and more attention to different forms of innovation.

Policymakers need to improve the policy governance process itself, with horizontal policy coordination among policy areas. This should be done at the EU level and within member states. In the EU, there is also the issue of vertical policy coordination. In the knowledge area, we have quite a lot of indicators already available. Unfortunately, the indicators are at a high-level aggregation. They lack a sectoral or regional dimension. It is important to develop a mechanism to evaluate indicators properly. It's not so much assessing them individually but as a system -- the linkages between the information that they provide.

Dr. Masahiro Kuroda: This panel discussion will focus on suggestions on how to make the global innovation ecosystem itself. The global innovation ecosystem is hard to define. According to my understanding, each country has a national innovation ecosystem. If we can get collaboration and competition globally, each country will gain. It is a win-win situation for global competition and collaboration but it is difficult to arrive at a concrete solution for the creation of a global system.

Prof. Reinhilde Carine Veuglelers: Our experience has been that we really do not want to impose too much top down from the EU on what individual member states should be developing in terms of science and technology. It is more trying to build in commitment at the level of the individual country to the science and technology policies they have developed internally. We want to provide a mechanism through the EU for individual member states to put innovation high on the policy agenda and commit to it. The second element is the role that the EU can play. It is in the area of providing information on what individual countries could do on this. We can gather together best practices and also wrong practices. The EU is a channel of information transmission across different member states. A third policy area is trying to use the policy instruments that we do have in order to incentivize different member states to take up science and technology instruments.

Dr. Masahiro Kuroda: From the point of international organizations like the OECD, what are the suggestions to national and global systems?

Mr. Nobuo Tanaka: Countries and regions should invest in knowledge using flexible systems and should open them to outside knowledge. How will you organize your system? That is the key for success. It is clear that international organizations like the OECD can help those countries as well as regions, localities or firms set their agenda and get their policies right.

Governments are traditionally organized in the same way that traditional industries and traditional knowledge are formulated. New technology, new industries are created as the convergence of different technology and knowledge, and the government is usually very slow to cope with these issues. Multidisciplinary coordination is necessary, but this is very difficult for governments to tackle. The Going for Growth exercise was the product of macroeconomics, science and technology analysis. We could, if the members wish, provide a forum for multidisciplinary analysis. Global innovation ecosystems have implications for multidisciplinary studies and are an interesting challenge for all

governments and international organizations.

Dr. Masahiro Kuroda: Dr. Wessner, you have emphasized the flexibility of capital markets. I think coordination is also important internationally. What are your thoughts?

Dr. Charles W. Wessner: It is important to cooperate, but the choice of partner is crucial. I tend to be an advocate of self-assembly and self-selection--spontaneous cooperation when there are common objectives and assets. I'm impressed by the role of multinationals. What is going on in China is phenomenal. It is something that we would be incapable of at the government level. At the public level, universities are engaged in a whole series of matchmaking and alliances.

Dr. Masahiro Kuroda: Both of the remaining speakers mentioned the contribution of multinational companies to the creation of innovation. What, from your experience, can multinational companies contribute to global collaboration schemes?

Prof. Jong-Wha Lee: We are seeing a more significant role for multinational firms in global innovation, especially in developing countries like China and India. We see a lot of technological alliances. The real question is whether global innovation systems can play more important roles in national innovation systems. I agree with Dr. Wessner that there are a lot of problems going forward toward this international collaboration. I think the innovation system is intrinsically more national than international because countries' innovative activities are based on the countries' national innovation systems rather than global innovation systems. I think the easiest way is to go back to more collaboration in basic research areas. Collaboration in the academic sector has been one important area at this point as has been other public research institutes.

Prof. Feichin Ted Tschang: Multinational corporations are closed systems and tend to operate in their self-interest. While there are opportunities within countries, the results are captured within the corporation to benefit themselves and there are little spillover effects of the local economy. How do domestic firms benefit from this? National systems are still not working well.