New Trends in Industrial Innovation and Implications for Policy : Global Perspective

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I. Introduction
Unprecedented globalization of economy is posing various issues at local as well as global level

- Global impact of financial crisis since 2007-2008 is still visible
- Increasing interconnectedness of world economy is making the traditional perspective based on a national economy obsolete and posing new challenges
- Emerging new technologies are one of the driving forces for the change of global production networks

Local/national industrial and innovation policy should consider the impact of global changes

- “Global Industry and Economy Forum 2013” deals with several issues in global trends and policy responses to them
Aims and scope

- **Aims of this presentation**
  - Examine rapidly changing conditions of innovation and international economic and industrial structure from the global perspective
  - Review the recent trends in industrial technological innovation
  - Draw implications for national as well as global polices from these trends (with some implications for Korea)

- **Scope**
  - Does not aim to be an exhaustive examination of the global trends: Focus on several aspects that have relative priority
  - Main focus is on the global perspective, yet many discussions are related to the situation in Korea, especially to the new policy agenda of “Creative Economy”
II. Changing Landscape of Global Innovation and Industry
Innovation after the crisis (1/2)

- Global impacts of recent financial crisis and the following retraction of demands
  - At least the investment on R&D and innovation has shown a quite good recovery similar to the pre-crisis level
  - However, slow recovery in demands is expected to have long-term effects on the investment on innovation

- Recovery in innovation investment varies by country
  - In most cases public sector is putting high priority on innovation
  - The position and role of high-tech industry sectors are important in the performance

- Channeling the investment into productive and promising areas in important
  - Efforts to overcome the recession should not hamper the process of “creative destruction”
  - Importance of the strategy for “smart reallocation” of resources
Innovation after the crisis (2/2)

PCT patent filings for selected countries (2003-2011, Index 2007=100)

Source: OECD, STI Outlook, 2012.
Decentralized creation of knowledge (1/2)

- Innovation is created by the global endeavor
  - Diminishing role of the traditional innovation powers (US, Germany, UK) compared to the increasing share of emerging economies
    - Ex: China’s share increased from 0.8%(2000) to 9.0%(2011)
    - Japan has also substantially increased its share (see figure)
- A general trend towards more decentralized creation and utilization of innovation is observed
  - However, a substantial change of innovation landscape is not identifiable yet
  - Long-term change along with the growth of emerging economies is expected
- This trend affects the global production networks
  - Make the firms to consider the location of R&D or manufacturing facilities based on the country’s innovation capability
Decentralized creation of knowledge (2/2)

Country share in total PCT filings (2000-2011)

Source: OECD, STI Outlook, 2012.
Global value chains (GVCs) (1/2)

- **GVC**: “the full range of activities that are required to bring a good or service from conception to delivery of final consumers which are taking place in inter-firm networks on a global scale” (Gereffi)
  - Interconnected in global production chains has considerably increased in the past 10 to 15 years.
  - Increasing number of firms (esp. related to MNCs) are participating in GVCs

- **Changes after the crisis (Cattaneo et al. 2012)**
  - Shifts in global demand: shifting markets to the South
  - Shifts in global production: consolidation of GVCs

- **Each stage’s contribution to value-added is also changing**
  - Diminishing importance of production is observed, while pre- and post-production stages are creating more value-added.
  - Implications on the incumbent “off-shoring” of manufacturing
Global value chains (GVCs) (2/2)

Production chain and its value-added

From off-shoring to re-/on-shoring?

- “Return of manufacturing” to advanced countries
  - Affected by the diminishing share of production stage in final goods or services
  - Increasing importance of proximity to local markets
- However, general trend is not observable yet
  - Long-term effects on the location of production along with technological advances
III. New Trends in Industrial Technologies
New trends in industrial innovation

- Blurring demarcation between manufacturing and services and convergence between two sectors
  - A considerable share of value-added in goods is already coming from the services industry
- “Additive manufacturing” and its impacts on manufacturing
  - Large potential to bring out considerable changes in traditional manufacturing
- Growth of internet economy
  - Global penetration of internet and emergence of “big data”
  - Dissemination of Smartphone at a global level and creation of new eco-system incorporating products and services
- Open, network-based type of innovation
  - Disruptive innovation increasingly tends to come from open mode of innovation
Blurring demarcation between manufacturing and services industry

- Many traditional manufacturing firms are expanding the business areas towards providing services and vice versa
  - A considerable share of value-added in goods is already coming from the services industry
  - Creation of new business opportunities through convergence of manufacturing and services (Ex: Smartphone and apps, u-Health)
  - Recent research results based on the international IO table by OECD show more complex picture on that issue
- Increasing role of innovation in services and “non-technological innovation”
  - More and more service firms are involved in innovation activities, but the full scope and contents of service innovation is not captured adequately by statistics yet
  - Organizational and marketing innovation: non-technological aspects become increasingly important
The case of “additive manufacturing” (e.g. 3D-printing)

- New approach to the production of goods
- Still available to limited areas of goods, but this mode of production is expected to expand to wider production areas
- Potential to lower the production cost and promote the customized production
- Make to reconsider the issue of production location: From the labor cost factor to the proximity to the customers
Disruptive technologies in manufacturing (2/2)

Concepts of additive manufacturing

Traditional
- Billet
- Machining
- Part
- Scrap

Additive Manufacturing
- Foil/Powder
- AM
- Part
- Scrap

Source: Homepage of Fabrisonic LLC.
Growth of internet economy

- The size of population connected to internet is increasing, especially in emerging economies
  - The focus is moving from the broadband to mobile internet with arrival of Smartphone

- Big data
  - Made available thanks to the everyday use of internet search machine (such as Google) and the dissemination of SNS (Social Network Services)
  - Accumulation and process of these data have great potential to identifying business opportunities or examining the market demand

- App economy
  - Combination of platform and software (apps)
  - New momentum for the re-emergence of internet economy
Growth of internet economy: Big data

Google’s data center
Growth of internet economy: Big data

Visualization of Twitter social connection
Growth of internet economy: App economy

Smartphone penetration in US

Growth of internet economy: App economy

Sizing the “App Economy” in US

Figure 1: Sizing the App Economy (jobs, thousands)

Open or network-based innovation

“A paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology” (Henry Chesbrough)

- Causes: increasing costs of R&D (resource constraints) and rapid pace of technological advances
- Incorporation of customers early in the development process

Models of open innovation

- Product platforming: Ex) Android OS
- Idea competitions
- Customer immersion: “User innovation” (ex: Linux)
- Collaborative product design and development
- Innovation networks: Involving incentive and reward scheme
Open or network-based innovation

Concept of open innovation

Research projects

Research

Development

New Market

Current Market

Boundary of the firm
IV. Challenges for Industrial and Innovation Policy
Securing effective investment for future growth

- Effective (re-)allocation of resources is important to secure sustained economic growth
  - Consider the budget constraints in era of fiscal austerity and the importance of innovation for the socio-economic growth

- Important aspects to be considered:
  - Establishing an effective division of labor between public and private sector (esp. for countries with the legacy of strong industrial policy)
  - Channeling the resources to younger, creative firms which will contribute to the increase in overall dynamic efficiency and job creation
  - Supporting (and not hampering) the process of “creative destruction” through reallocation of resources, establishing favorable framework conditions etc.
Taking advantage of global value chains and converging trends between industries

- **Key priority areas are**:  
  - Actively engaging in the global value chains (or production networks)  
  - Maximizing the value-added from the participation

- **Already a considerable portion of the value-added embodied in final goods is coming from services industry (OECD statistics)**  
  - In this background, effective policy instruments are required:  
    - (1) to promote the interaction between manufacturing and services industries and  
    - (2) to increase the productivity of service sector (esp. that of the knowledge-intensive business services)
Promoting collaboration and networks between different innovation actors

- Increasingly, disruptive innovations tend to come from the network-based open innovation activities
  - Limitation of capacity and resources within an institution against the complex nature of technological solution
  - Collaborative research is often most creative one

- Policy implications
  - Collaboration and networking across different sectors (industry, academia and public labs) should be strengthened
  - Better utilize the investment on R&D and innovation
  - Promote the dissemination and utilization of knowledge
Increasing the contribution of technology and innovation to societal demands

- Technologies are expected to play an increasingly important role for the overall society
  - Their role is not confined to the economic development, but also for the societal demands
  - Among the societal demands, global environmental problem, demand on health care in an era of aging society etc. are important

- The issue is how to design policy instruments in order to make technological advance for these social challenges possible
  - (1) Correction of market failure in terms of innovation investment
  - (2) Define level of policy intervention that would not lead to market inefficiency
  - (3) Combination of policies in order to societal demands (experimentation with policy-mix)
Facilitating “innovations” in innovation policies

- There seems to be no “silver bullet” for the success of innovation policy
  - Combination possibilities of different policy instruments and their overall effects should be examined continually and, according to the evaluation results, rearranged during the process of implementation.

- More innovation in innovation policies is required
  - In some countries (including Korea), incumbent policy instruments have sometimes been based on the technology-push perspective
  - In contrast, new and creative policy instruments should actively be experimented, combining the socio-economic demand and incentives of each innovator cleverly
  - Implications of the demand-based innovation policy in EU
V. Concluding Remarks
Concluding remarks

- Korea’s new agenda on “Creative Economy”
  - Policy response to the increasing need to overcome the incumbent “catch-up” mode
  - Continuity with the existing concepts regarding the important role of S&T and ICT, but also some differences such as emphasis on creativity and convergence
  - Also try to go beyond the incumbent growth model mainly based on the large enterprises and put priority in job creation

- Not the definition of “creative economy” but the way how we tackle the structural bottlenecks though which policy tools is important
  - Need to incorporate the global dimension more explicitly in the formulation and implementation of national policy
Thank you!

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