A Comparison Study of Solar PV Diffusion in Korea, Japan and Germany

Hak-Sung Kim

College of Business, Korea Advanced Institute of Science and Technology
E-mail: hskim86@business.kaist.ac.kr

Introduction

- The purpose of this work is to identify why some countries are more successful in solar PV diffusion while others are not
- Japan and Germany, which are relatively more successful in solar PV diffusion and Korea which is relatively less successful is the subject of this study
- The comparison study is done by evaluating the country's PV diffusion system in reference to ETIS (Energy Technology Innovation System)
- The objective of this study is to examine learning points for Korea from Japan and Germany

Research Question

- What were the success factors in Japan and Germany that made them a leader in terms of solar energy diffusion?
- What can Korea learn from Japan and Germany?
- Can Korea also become a solar PV diffusion leader like them?

Research Contribution/Methodology

- This is the first research to evaluate the country's solar PV diffusion in a holistic perspective
- This work applies ETIS (Energy Technology Innovation System) to analyze each country's solar energy diffusion system
- In order to examine the holistic diffusion model of the country, it explores and compares the supply-side and demand-side actors & institutions, and government regulation & policy between three countries

What is ETIS? (Energy Technology Innovation System)

- ETIS, also known as Energy Technology Innovation System, is an integrative evaluation approach of a country's technology innovation system
- This integrative approach takes into account all the actors & institutions involved with the system in a systemic approach
- While most innovation process emphasizes on linear model of innovation process as you can see in figure 1, ETIS emphasizes more on the interaction between various stages and actors, networks and institutions

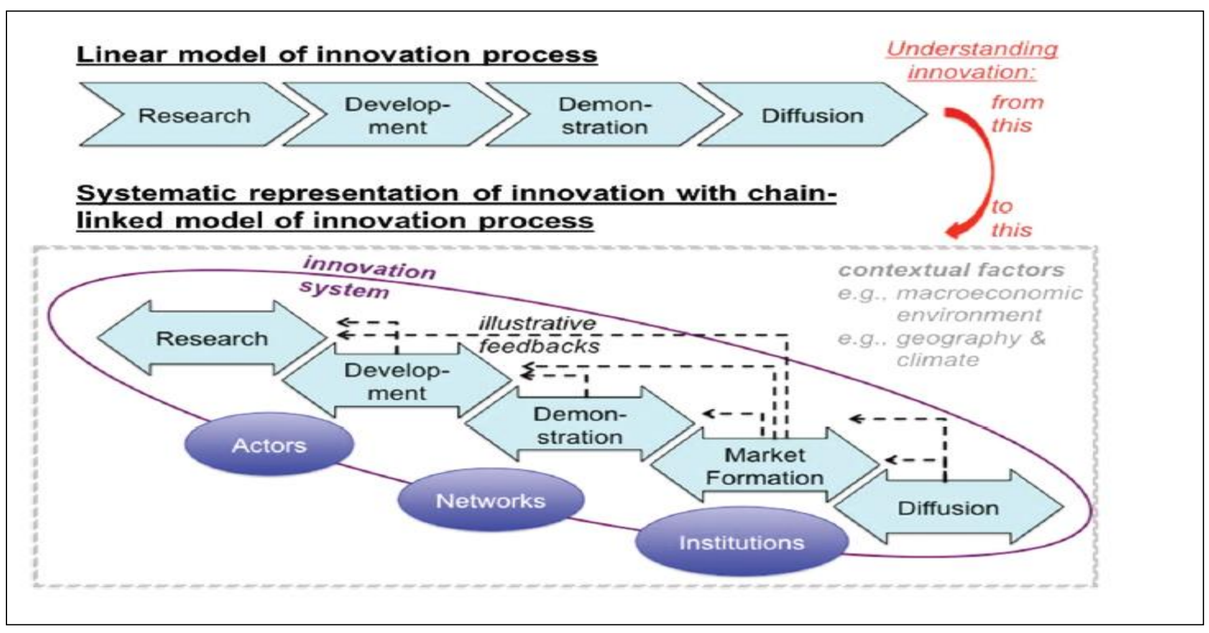

Figure 1. ETIS concept

Overview of Solar PV industry

- Global solar PV industry has been in stagnation until recently, due to the overproduction of PV materials from Chinese solar firms
- However, after many Chinese firms pulled out from the market, the solar industry is slowly rising again, showing prominent signs of investment
- As you can see in figure 2, Germany has the most PV installed, followed by Japan while Korea has the least amount of PV

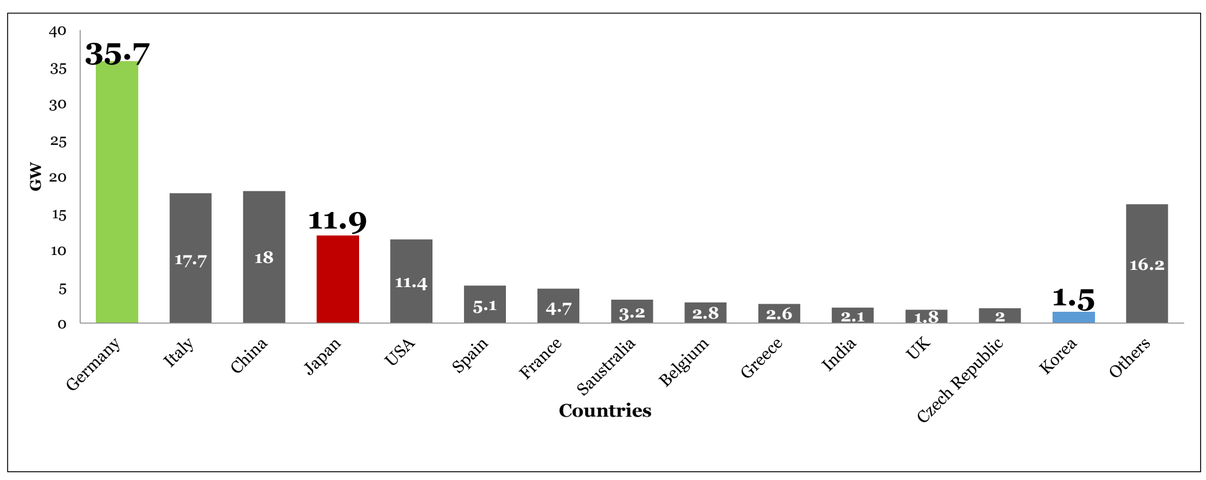

Figure 2. PV Capacity around the world 2013

Three dimensions of evaluation

- Supply and demand are the essential elements for the purpose of a market system
- Government regulation & policy intervene in order to gain control of the market
- In order to evaluate the holistic model of a country's solar PV diffusion, demand and supply side actors & institutions and government regulation/policy should be examined
- Actors refer to "the individuals, end users, consumers, producers, firms and public bodies involved in the activities of an innovation system"
- Institutions refer to "organizations and formal structures like rules and regulations, but also habits, practices, routines and norms of the various actors in an innovation system"

Japan

- Among the three countries, Japan seems to have the most well structured solar PV innovation system in all three dimensions
- Since the 70s, Japan has implemented various programs and regulations to foster its PV diffusion (such as Sunshine Policy)
- Japan provided certainty in its government regulation , which led many companies to invest in (long term) solar PV technologies
- In terms of demand-side actors/institutions, Japan provided demonstration projects in the early stages of the diffusion, which provided markets (demand) for those who are supplying the devices
- As you can see in figure 3 Japan also has a very effective supply side actors and institutions, which effectively implements the plans and voices their needs (such as coalition groups)
- Japan also had government financial support, such as FIT (Feed in Tariff)

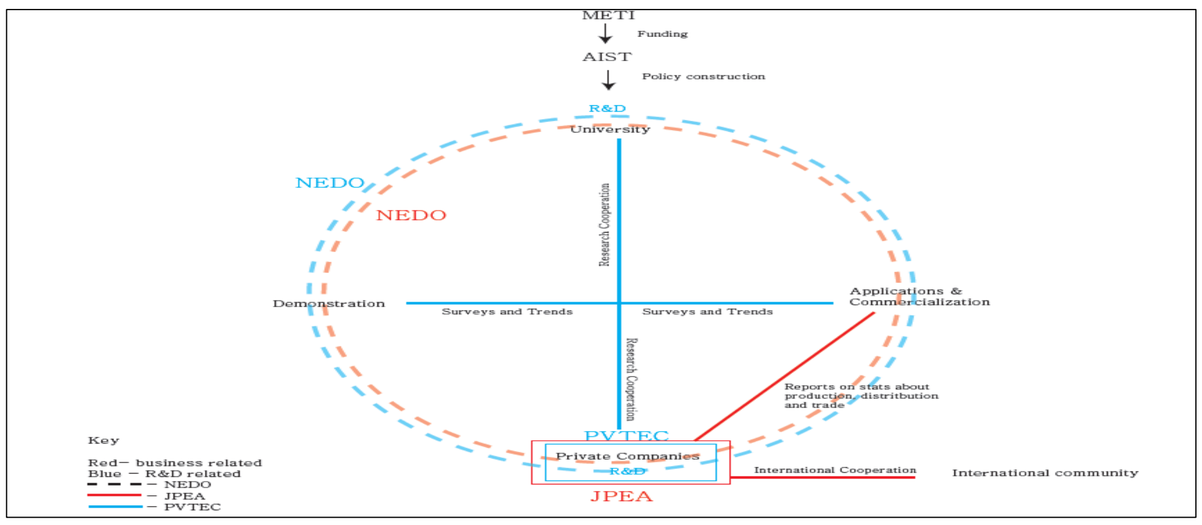

Figure 3. Japan's actors & institutions relationship

Germany

- Germany's greatest strength lies in government regulation and policy
- Germany had a strong determination to expand solar PV usage in the country
- EEG (German Renewable Energy Act) and Integrated Energy and Climate Program was the essence of providing certainty in its policy and regulation
- Similar to Japan, it was this certainty in regulation and policy that made firms, private entities invest in solar PV
- Germany also received FIT from the government
- Germany's demand was mainly from project development (Germany developed many projects related to solar PV which leads to high demand of PV products)

Three lessons learned from Germany and Japan

1. Japan and Germany was able to succeed in solar energy diffusion because of the government regulation and policy certainty which led to continuous investment from private firms
2. Japan and Germany had monetary support from the government, such as FIT
3. Existence of PV markets (demand)

Korea

- Korea does not have as much policy & regulation certainty like the other two countries: Korea's solar PV diffusion program was most active only during President Lee's administration
- Lack of policy & regulation certainty leads to such results: Amongst 165 solar PV projects (838.4 MW) ongoing, 22 projects (301.7 MW) were abandoned (about 35% of the projects ongoing), which is comparable to Japan (0.003% abandonment ratio) and Germany (0.046%)
- Lack of government support/subsidy: Korea used to implement FIT policy, but now RPS is being used
- Lack of demand-side actors & institutions: In terms of demand, Korea is more concerned about the installation phase, which does not require a large PV market
- Korea should try to enhance regulation & policy certainty, provide support/subsidy and create a bigger market for PV demands

References

[1] ArnulfGrubler, "Policies for the Energy Technology Innovation System," USA
[2] Kelly Sims Gallagher, ArnulfGrubler, Laura Kuhl, Gregory Nemet, Charlie Wilson, "The Energy Technology Innovation System," Annual Review of Environment and Resources, July 12
[3] StefanReichelstein& Michael Yorston, "The prospects for cost competitive solar PV power", Elsevier, Energy Policy, vol. 55, Apr 13 p. 118