COMBINED EFFECTS OF ELECTRICITY MAKET LIBERALIZATION AND CLIMATE POLICY: LESSONS FROM EUROPE

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Overview

Electricity market liberalization processes were pioneered in particular by the United Kingdom, which was a model - or at least an example - for the European Union (EU) to create a single liberalized European electricity market in 1996. In the meantime, the EU has committed to high CO2 emissions reductions through common initiatives, from the EU-ETS in 2005, to the NDC submitted to COP21-Paris agreement in 2015.

At the same time, in Japan, the Electriticy Market Reform has taken new steps by opening the residential sector to retail competition in April 2016. Japan is also bound, after the Paris agreement in 2015, to implement an ambitious CO2 emissions reductions plan containing major energy savings (e.g. a 17% reduction of electricity demand) and low-carbon energy objectives, in particular a new electricity mix target for 2030 with at least 40% low carbon electricity (both renewables and nuclear). Against this background, there are concerns regarding the compatibility between market liberalization objectives and national emissions targets, as the Japanese Electricity Market Reform aims at establishing cheaper electricity prices and a market-driven electricity sector. The paper aims at analysing the articulation of electricity market liberalization and climate policy in the European experience to extract lessons for the Japanese case. To do so, we conducted a review of the literature and a series of semi-directive interviews with 12 experts from academia and electricity industry. We then quantified the identified trends through data collection and econometrics assessments for several EU countries and Japan.

The paper is organized as follows: Section 1 explains the principles and goals of the electricity market liberalization and climate policy in Europe, first as separate policies and then as a combined policy package. Section 2 assesses the current results of policies implemented so far within the EU and identifies major issues linked with the interaction of liberalization and climate policy. Section 3 presents recommendations and solutions from literature and experts; last, Section 4 extracts lessons learned for the Japanese case.

Methods

Semi-directive interviews, literature review.

Results

As liberalization and climate policy were initially separate packages in EU policy and thus unharmonized until the latest packages, the EU was created a liberalized internal market while simultaneously taking out about 30% of generation out of market - renewables with Feed-in-Tariffs - at the same time. Due to the combined effects of climate policy - support to renewable investments through Feed-in-Tariffs mainly -, and liberalization in Europe - marginal cost pricing on wholesale markets -, wholesale prices were brought down by massive renewable integration and overall power overcapacity in Europe (under 30 €/MWh), while taxes for renewable support are constantly rising and thus rising electricity retail prices for final consumers. In the end, major utilities are facing a critical “missing money problem”, trapped in a vicious circle that does not allow them to paying fixed costs; the system is thus unable to phase out of support schemes and shift to clean energy investments only, and retail customers do not benefit from low wholesale market. Liberalization did not bring cheaper safer electricity supply to end users, on the contrary. On the long term, such prices trends could encourage consumers to shift to other option for energy supply (autoconsumption, curtailment, gas heating instead of electric heating), increasing losses for utilities. Both trends are shown on Figure 1.

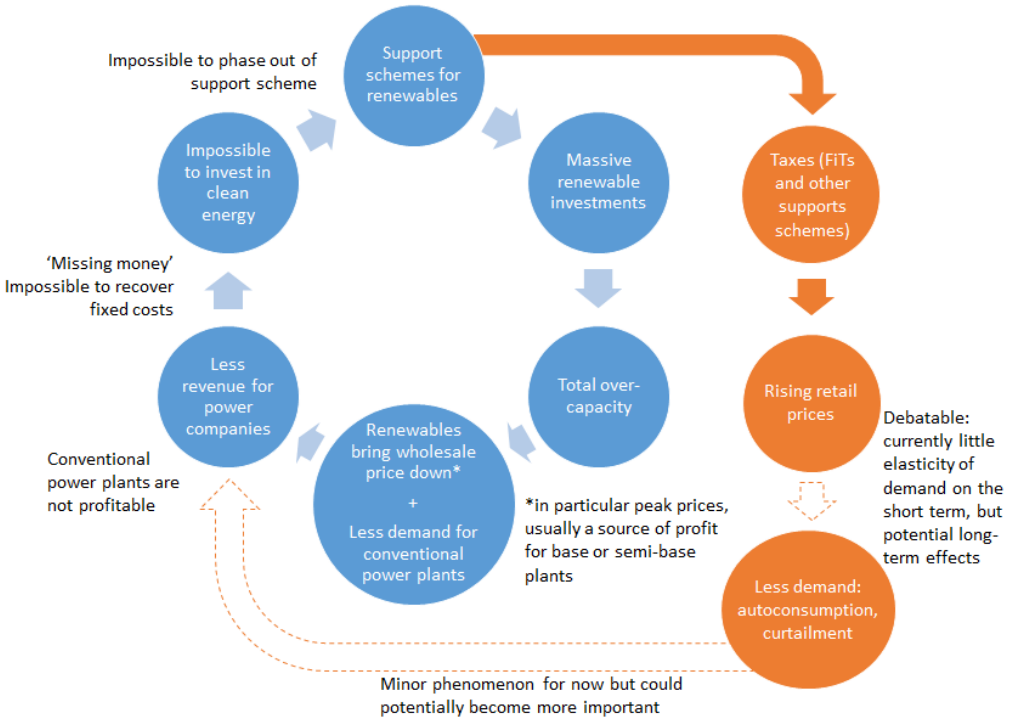

Figure 1: the combined effect of renewable support and liberalization (author figure)

The study of taxes, prices and production data allows to quantify economic losses induces by the phenomenons presented on Figure 1. Complex effects such as the price decline due to zero-marginal cost renewable, i.e., the merite order effect, requires econometrics approach to be quantified. Table 1 shows various assessment of the merit order effect in several European countries.

Table 1: Econometric assessments of the merit order effect (effect of a marginal increase of 1 GWh of renewable power generation) on wholesale price (€/MWh)

Country	Reference	Regression method	Electricity price data source	Data period	Impact of solar €/MWh	Impact of wind €/MWh
Germany	(Cludius et al. 2014)	augmented Dickey-Fuller test	day ahead SPOT price	2008-2012 for wind, 2010-2012 for solar	-0.84 to -1.37	-0.97 to -2.27
	(Benhmad et Percebois 2016)	augmented Dickey-Fuller test	day ahead SPOT price	2009-2013 (wind only)	NA	-1.23
France	(Percebois et Pommeret 2016)	least square method, Marquardt-Levenberg algorithm	day ahead SPOT price	2015	-1.38	-2.56
Italy	(Clò, Cataldi, et Zoppoli 2015)	augmented Dickey-Fuller test	day ahead SPOT price	2005-2013	-2.3	-4.2
Spain	(Costa-Campi et Trujillo-Baute 2015)	augmented Dickey-Fuller test	wholesale weekly price	2009-2013	-2.5	-1.1

In response to these issues, solutions tend to already appear on the market itself, such as re-regulation or hybrid energy markets design (electric vehicles, hydrogen…). Several recommendations are identified for EU from literature review and interviews of experts.

The relevance of these recommendations in regard to Japan's situation is then examined: Japan, as it is one country, avoids EU's complexity and its particular institutional framework. The re-regulation movement is pre-existing, as the energy mix has already been decided by the government. However, given Japan's ambitious objectives in terms of renewable integration and reduction of electricity demand, the identified risks for economic losses for electric utilities exists.

Conclusions

In a nutshell, through the comparison between EU and Japan regarding their ongoing electricity market reforms as they take place within very different environments, this paper discusses the level of government intervention that is desirable in a post-reform electricity sector and sorts out existing policy instruments to reconcile requirements for a liberalized market and an effective climate policy. The main lesson for Japan is that they have a chance to implement from the beginning the so-far identified solutions for smooth articulation between climate objectives and efficient liberalization: effects of renewables on prices are thus an issue to tackle, but existing planification and control is likely to limit free market ups and downs and protect national electricity sector more than in the EU.