INFLUENCES OF TRUMP'S ENERGY POLICY ON THE WORLD'S EFFORTS TO COMBAT CLIMATE CHANGE AND THEIR COSTS

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Overview

In November 2015 at the 21st Conference of the Parties of the United Nations Framework on Climate Change Convention (UNFCCC), the world reached a historical turning point, the Paris Agreement, after long years of international negotiations. It aims at curbing greenhouse gas (GHG) emissions to the level of keeping the global average temperature rise below 2 degrees Celsius from before the Industrial Revolution. Thought it involves all the countries in the world, it is highly dependent on the degree of major emitters' commitments, which holds some uncertainties. There still remains an argument that GHG mitigation is harmful for economy in industrialized countries, where little potential is left to reduce GHG emissions. The risky aspect of the agreement was timely made apparent by the U.S. presidential election in November 2016. The Trump administration prioritizes the production and consumption of domestic energy resources such as coal and gas. For this purpose, President Trump announced the withdrawal of the US from the Paris Agreement in June 2017.

Other countries are likely to be influenced through changes in the international flow of energy resources, leading to changes in their prices and costs of emissions reduction considering the significance of the US both as energy producer and consumer. Looking into the details of how the U.S. and other countries are influenced by the U.S. withdrawal will provide implications on whether other countries would pursue reduction efforts as they stated. This research aims at doing so based on quantitative analysis on direct and indirect economic effects of the US withdrawal from the Paris Agreement.

Methodology

GTAP-E Version 6-pre2 (2007) is employed for the analyses. GTAP-E is energy and environmental version of Global Trade Analysis Project (GTAP) model. It incorporated CO2 emissions from combustion of fossil fuels. The database used is GTAP Database Version 9, 2011. Since this analysis is on 2030 when many of the countries set their mid-term GHG reduction target, the baseline is updated to 2030 by giving exogenous figures to population, labor, and capital according to the forecast.

Each country's emissions reduction target, known as Nationally Determined Contribution (NDC), is recalculated to fit the model. Since GTAP-E only tracks CO2 emissions from energy consumption, the part of the NDCs which depend on reduction of energy consumption was identied. Energy related CO2 emission growth figure from 1990-2030 is also used for the recalculation.There are countries which do not describe clear reduction targets or with targets which only keep emissions at BAU level. For those, CO2 emissions are still exogenous and are given the value of zero so that their emissions do not exceed the baseline.

Simulations are conducted with regard to the following three scenarios; 1) all the countries/regions achieve their reduction targets under the Paris Agreement, 2) the US withdraws from the Agreement, and 3) the US withdraws and three countries (i.e., Canada, the UK and France) phase out coal in power generation by earlier than 2030.

Results

In Scenario 1, an extremely high price is observed in European countries, Japan, and Australia which have the relatively high target figures (Table.1). In addition to the level of targets, limitation of available reduction measures in the methodology contributes to rather high carbon tax rates of these countries.

Table.1 Real carbon tax rate (USD)

USA	MEX	CAN	CHN	JPN	KOR	IND	RUS	AUS	BRA	LSA	DEU	GBR	FRA	EU25	MENA	SSA
28.1	9.2	46.7	14.3	143.5	33.2	1.5	5.2	188.4	87.9	1.4	233.7	252.3	442.4	294.3	2.7	1.9

GDP in almost all the countries negatively changes. When its breakdown is observed, import in total is decreased (positive change in the total GDP change) in all the countries except India primarily due to a drop in production to curb emissions, which depresses firms' demand for intermediate. Regarding fossil fuels, import increases in those countries with low reduction targets because price rise of the composite (domestic and import from each

country/region combined) of each fossil fuel is relatively higher than imported one. In those with relatively stringent targets such as Japan, European countries, Australia, and Brazil, imports of fossil fuels decrease since price rise of imported fossil fuels as intermediate is higher than that of their composite. This tendency comes from the fact that the demand for fossil fuels shrinks more significantly in those countries with stringent targets and so the domestic price is relatively lower than import price, which reflects the price of other countries where demand drops less significantly.

In Scenario 2, the US' CO2 emissions increase by about 18% compared to the case of target achievement. In addition to the unachieved reduction of 16% based on its NDC, the emissions further expand by 2%. This additional increase is mainly due to increased firm's consumption of oil products, which accounts for 60% of fossil fuels used as intermediate. The US firm's demand for fossil fuels expands because they substitute electricity, which is affected by other countries' carbon tax on its intermediate. Further, other countries' demand shift to less carbon intensive oil products from other fossil fuels pushes up its price. Since the increase in import price is higher than the domestic one, emissions increase from domestic oil products consumption.

The US benefits from increased private demand mainly for gas and oil products, whose private consumption price does not rise as much as other products affected by carbon tax in other countries. Although the US export increases it loses competitiveness in trading as an energy exporter with its energy prices relatively higher in the world (See Table. 2) since its energy demand is not suppressed by emissions cap.

Table.2 Percent changes in supply price of energy products from the US to other countries/regions

	MEX	CAN	CHN	JPN	KOR	IND	RUS	AUS	BRA	LSA	DEU	GBR	FRA	EU25	MENA	SSA
coal	1.49	1.29	1.26	1.34	1.29	1.48	1.32	1.33	1.33	1.32	1.29	1.39	1.39	1.38	1.32	1.33
gas	3.14	2.94	2.94	2.97	2.98	3.14	3.14	3.14	3.14	2.95	3.14	3.14	3.14	3.14	3.14	3.14
oil	1.64	1.41	1.57	1.64	1.64	1.39	1.64	1.64	1.58	1.64	1.63	1.64	1.64	1.61	1.58	1.64
oil_pcts	0.03	0.02	0.02	0.01	-0.00	0.02	0.00	0.01	-0.00	-0.01	0.02	0.03	0.03	-0.00	-0.00	0.02

In Scenario 3, For analysis, result from Scenario 3 simulation is compared with that of Scenario 2 simulation. Canada, the UK and France experience negative changes in GDP while there is almost no influence on other countries. In these three countries, consumption and investment decreases and so does the export in France. Private demand falls particularly for electricity and services, due to a sharp price rise for the former and drop in per capita income for the latter. Since coal cannot be used as an input for electricity generation, a shift to more expensive fossil fuels and to capital takes place, leading to electricity price rises by about 386% in Canada, 609% in the UK, and 128% in France. The extent of price rise in France is much smaller than other two countries because it is originally less dependent on coal for electricity generation. For the same reason, negative change in GDP of France is smaller than other two coal phase-out countries.

Carbon tax falls in coal phase-out countries because they are enforced to substitute coal for power generation with non-coal fossil fuels, which are more expensive and less carbon intensive than coal. It lessens the need for imposing carbon tax which promotes the shift away from carbon intensive fossil fuels to the ones less so.

Table. 3 Changes in carbon tax from Scenario 2 to 3 (USD)

MEX	CAN	CHN	JPN	KOR	IND	RUS	AUS	BRA	LSA	DEU	GBR	FRA	EU25	MENA	SSA
-0.36	-24.54	0.14	0.48	0.13	0.03	0.04	0.70	0.14	0.19	0.36	3.73	-35.62	6.59	0.29	1.22

Conclusions

To seek a condition which prevents any other major emitting country to withdraw from the Paris Agreement, it needs to be clear how each country will be influenced by its own or other major emitter's withdrawal. The overall results of analysis shows that the US is rightly incentivized to withdraw from the Paris Agreement, but by looking into details, some of the influences might not necessarily encourage the withdrawal. For other countries, economic impacts from achieving their emission reduction targets do not change a lot as a result of the U.S. withdrawal from the Paris Agreement. Therefore, it is more important for the agreement whether each of the major emitting country can keep on track to meet its target rather than whether the U.S. gets back to making commitment to emissions reduction. A drastic measure like coal phase-out by just a few countries also does not provide a strong influence on the U.S. However, significant changes in energy system – rapid cost reduction and technological improvements leading to unprecedented growth of renewable energy– may bring about different results. Further researches should pursue what would make commitments to decarbonization beneficial under the dynamically changing energy system.