Nuclear Capability Development and the Political Spectrum of Governments

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1. Introduction

There have been various researches investigating the dynamics of nuclear proliferation. Especially, quantitative researches on the causes of nuclear proliferation have been advanced in several decades, starting from the Sagan's classical three models of proliferation; external security threat, domestic politics and international norms [1] and multivariate analysis using country-year dataset [2].

Early studies emphasized the importance of security threats in proliferation decisions, but the second wave of studies highlighted the importance of domestic politics and international norms [3]. In terms of domestic politics, representative studies investigated leader's psychology [4], domestic veto players [5], regime type [6] and rebel experience [7] as significant determinants for proliferation decisions.

However, whereas democracy, dictatorship and leader's characteristics have received a lot of attention, the governments' political spectrum has been received relatively little attention. The scope of the research has been limited since most countries pursued nuclear weapons ruled by a dictatorship, which was difficult to be identified as the classical "left-right" dimension.

Nonetheless, it becomes possible to analyze countries' proliferation decisions using relatively large number of countries by adopting the concept of nuclear latency, which has a continuous spectrum. Therefore, this study adopted a Large-N statistical analysis with the traditional country-year proliferation dataset, to investigate the difference characteristics on the development of nuclear capabilities between the "left" and "right" wing governments.

2. Dataset and Methods

We used the updated country-year proliferation data in Kim et al. (2020) [8], which covers 189 countries and the years from 1939 to 2012. To find out how the probability of latency development and proliferation decision changes according to the political orientation of the government, 4 variables indicating the status of nuclear capability development and proliferation attempt were used as dependent variables, and 2 variables indicating the status of political ideology of government was used as an independent variable.

2.1 Nuclear Proliferation and Nuclear Latency Dataset

First, the nuclear proliferation variables originally proposed in Singh and Way (2004) was used (*explore* and *pursue)*.

Second, the nuclear latency variable of Kim et al. [9] was also used. They proposed 5-level nuclear latency variable (*latency*) from level 0, which does not have any nuclear facilities, to level 4, which operates pilot- or commercial-scale ENR plants. Fig. 1 below describes each level of latency. It was coded based on Fuhrmann and Tkach (2015)'s nuclear latency dataset and IAEA Research Reactor Database (RRDB).

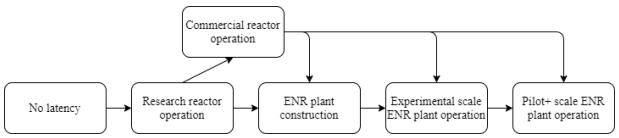

Fig. 1. Proposed Levels of Nuclear Latency.

Third, the dichotomous variable describing the status of nuclear power plant operation (*power*) was used.

2.2 Seki-Williams and DPI Dataset

As the independent variables, Seki-Williams Government and Ministers Data 2016 (SW) [11] and the Database of Political Institutions 2017 (DPI) [12] were used.

Among the variables in the SW dataset, The Ideological Complexion of Government and Parliament (CPG) is an indicator of ideological composition of governments. Among various codings, *cpg_sw2014* variable was used. DPI dataset also contains the variable named *execrlc* identifying the orientation of political parties. Both variables were normalized before further analyses, as shown in the Table 1 below.

Table I: Normalizing Variables Indicating Government Spectrum

SW (cpg)		DPI (execrlc)		Norma-lized value
Definition	Value	Definition	Value	
Left-wing dominance	5	Left	3	-1
Left-center complexion	4			-0.5
Balanced situation	3	Center	2	0
Right-	2			0.5

center complexion				
Right-wing dominance	1	Right	1	1

Both datasets have major limitations. DPI has wide country coverage, but covers only after 1975. SW covers from 1947 to 2014 with a relatively small number of countries. The significance of these limitations was discussed in the discussion section.

2.3 Statistical Analysis Methods

At first, bivariate regression analysis was performed with each of the four dependent variables (*explore*, *pursue*, *latency* and *power*), and two independent variables (*cpg* and *execrlc*). Therefore, a total of 8 analyses were performed. Logistic regression was used for dichotomous variables (*explore*, *pursue*, *power*), linear regression was used for ordinal variable (*latency*). After then, multivariate analysis was performed using the traditional three models of nuclear proliferation to investigate the difference of explanations for proliferation determinants between the models including the political orientation variable and models from the previous studies.

4. Results and Discussion

4.1 Bivariate Analysis

First of all, the results of bivariate analysis were as follows.

Table II: Bivariate Analysis

Dep. var	term	Coefficient	p.value
latency	execrlc	0.0933	4.823e-03
latency	cpg	0.3500	1.483e-05
power	execrlc	0.0442	6.958e-04
power	cpg	0.1073	7.442e-04
explore	execrlc	-0.0181	6.391e-04
explore	cpg	-0.0246	1.957e-01
pursue	execrlc	-0.0207	3.650e-03
pursue	cpg	-0.0273	9.183e-03

The most notable result is that both *latency* and *power* were significantly higher in the right-wing governments. They tend to favor the decision to construct nuclear power plants or possess enrichment and reprocessing (ENR) capabilities, as they value national prestige and economic development.

On the other hand, right-wing governments were less likely to explore and pursue nuclear weapons, contrary to common belief. This may be due to the fact that right wing governments tend to favor an alliance with the USA and have lesser motivation for acquiring their own nuclear weapons against the opposition of the USA. However, in order to verify this argument, it is necessary to test how does the effect of *allies*, dichotomous variable indicating the alliance with the superpower countries, changes through multivariate analysis.

4.2 Multivariate Analysis

Second, multivariate analysis was performed. Independent variables from previous large-N proliferation studies include economic capability (*lngdpcap*), industrial capability (*cinc*), international relations (*rivalry*, *disputes*, *allies*, *openness*), domestic politics (*democ*, *autoc*, *npt*) and international norms (*npt*, *safeguards*). The results were summarized in the Table II and III below.

Table II: Multivariate Analysis: *execrlc*.

Variables	*explore*	*pursue*	*latency*	*power*
execrlc	-0.003	0.010	0.044	-0.016
lngdpcap	0.004	-0.113***	0.118***	0.128***
cinc	-0.499	3.928***	15.990***	5.935***
rivalry	0.042*	-0.015	1.221***	0.127**
disputes	-0.011	0.027***	0.084***	-0.065***
allies	-0.034***	-0.031*	-0.389***	-0.168***
openness	0.005	0.140***	0.276***	0.106***
democ	0.003	0.042***	0.104***	0.022*
autoc	0.018***	0.068***	0.100***	-0.004
centdems	-0.145***	-0.200***	-0.576*	-0.402***
npt	0.032*	0.073***	-0.065	0.118***
safeguards	-0.073***	-0.050*	-0.403***	-0.057
Constant	0.055	0.756***	-0.531	-0.731***
Observations	1,274	1,361	1,612	1,612
R^2	0.109	0.328	0.370	0.246
Adjusted R^2	0.101	0.322	0.366	0.240
Residual Std. Error	0.151	0.204	1.017	0.436
F Statistic	12.855***	54.735***	78.418***	43.505***

*Note: *p<0.05, **p<0.01, ***p<0.005*

Table III: Multivariate Analysis: *cpg*.

Variables	*explore*	*pursue*	*latency*	*power*
cpg	-0.011	-0.039***	0.118	0.097***
lngdpcap	0.050*	-0.0005	1.343***	0.197***
cinc	-1.382	1.463***	5.949***	2.504***
rivalry	0.065**	-0.005	1.505***	0.078
disputes	0.016	0.067***	0.128***	-0.015
allies	-0.100***	-0.021*	-0.268***	-0.164***
openness	-0.055	0.065***	0.031	0.388***
democ	0.003	-0.028***	-0.254***	0.015
autoc	-0.024	-0.038***	-0.256***	-0.085*
centdems	0.081	-0.107*	-2.556***	-0.630***
npt	0.018	0.019	-0.454***	0.406***
safeguards	-0.315***	-0.084***	-0.716***	-0.043
Constant	-0.215	0.336***	-8.342***	-1.393***
Observations	1,063	1,086	1,309	1,309

R^2	0.259	0.292	0.466	0.197
Adjusted R^2	0.251	0.284	0.461	0.190
Residual Std. Error	0.227	0.124	0.930	0.449
F Statistic	30.629^{***}	36.939^{***}	94.275^{***}	26.517^{***}

*Note: *p<0.05, **p<0.01, ***p<0.005*

When other variables were controlled, *execrlc* was nonsignificant for all dependent variables, and *cpg* was nonsignificant for *explore* and *latency*. However, in *cpg*, it was observed that all variables showed the same direction effect as in bivariate analysis.
Allies showed a significantly negative effect in all models. Since *execrlc* and *cpg* lost significance in multivariate analysis, it is difficult to argue that political orientation directly affects the characteristics of nuclear capability development. Instead, it affects the selection of ally states, thus indirectly affecting nuclear capability development.

5. Conclusions and Policy Implications

Numerous studies have tried to find out how domestic politics affects the country's motivation to develop nuclear weapons. It is widely believed that the nuclear proliferation risk of democratic countries is lower than that of dictatorships. However, further studies are needed to understand the dynamics of domestic politics on nuclear latency and hedging in democratic countries.

In this study, we examined whether there is a difference of the attitudes toward nuclear weapons and nuclear capabilities, depending on political orientation. The results showed significantly different patterns of nuclear proliferation and nuclear capability development. While the right-wing governments encouraged nuclear capability development, they were less likely to explore or pursue nuclear weapons. The results of this study partially support that the dynamics of domestic politics affect nuclear proliferation risk indirectly rather than directly.

As a future work, the credibility of the arguments in this study should be supported by extensive case studies, because of the limitations of large-N statistical analyses based on country-year observations. Still, some historical cases shed light on the difference of the attitudes of democratic regimes towards nuclear capability, especially after the NPT era.

For example, South Korea is one of the countries not included in the analysis due to the limitations in the dataset. They have developed into a model nuclear nonproliferation country since the democratization in 1987. However, while progressive and conservative governments took turns taking power, their attitudes toward nuclear weapons and nuclear industries differed. For example, the progressive governments held a negative view on nuclear power generation. On the contrary, the laser uranium enrichment incident and the construction plan for nuclear submarines also took place at the progressive governments. This is the typical case supports the arguments of this study.

This implies the need for further research on the relationship between the government's political spectrum and nuclear capability development. Representative questions to be answered are as follows: 1) Does the government's time in office affect their intensity of nuclear policy? 2) Does the influence of veto players on nuclear policy decisions differ according to the political spectrum of governments? 3) Is it possible to perform large-N using country-year observations, or medium-N analysis using regime observations for all democratic countries by updating the data coverage? The answers to these questions will help expand the knowledge on the role of domestic actors in shaping the nuclear preferences.

ACKNOWLEDGMENTS

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (NRF-2016R1A5A1013919).

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