Electoral Candidates' Position-Taking on Nuclear Energy

in Post-Fukushima Japan

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<u>Acknowledgement</u>

Chapter 1: Introduction

This thesis aims to analyze Japanese politicians' position-taking on nuclear energy after the Fukushima Incident, a nuclear power plant accident caused by both natural disaster and mismanagement in 2011. Specifically, on the issue of nuclear energy, electoral candidates are pressured by their parties, voters, and financial incentives. How do they respond to these conflicting inputs and weigh the trade-offs?

Since nuclear energy has become highly controversial in Japan following the Fukushima Incident, Japanese politicians face pressure to take a stance on this issue. Initiated by a major earthquake and the following tsunami on March 11, 2011, the Fukushima Daiichi Nuclear Accident undoubtedly made an enormous impact on Japanese society. With the nuclear fuel melting and the release of radioactive material into the atmosphere, soil, and ocean, more than 100 000 people within a radius of 20 kilometers (approximately 12.4 miles) of the accident site were evacuated (IAEA 2015).

In addition to the direct, physical effect on the local environment and population, a nation-wide unease toward nuclear energy simultaneously began to emerge. Compared to the Japanese national opinion poll four years before the Fukushima Incident, a new survey conducted by the same newspaper in April 2011, a month after the Fukushima Accident, shows a 13% increase in responders who hoped to reduce or completely ban nuclear energy. Responders who wished to expand nuclear power plants also decreased by 8% (*Asahi Shimbun* 2011).

The Fukushima Incident had other disturbing consequences that directly affected citizens' wellbeing. For instance, after the incident, Japanese citizens suffered from soaring electricity

prices and the frequent blackouts due to an unstable power supply (METI 2015; *NY Times* 2011). Moreover, Japanese agricultural products were suspected of contamination in the both the domestic and international market (*Asahi Shimbun* 2018; FDA 2019).

Unsurprisingly, the Fukushima accident quickly captured the attention of both scholars and researchers (Vivoda 2012; Wittneben 2012; Nakamura and Kikuchi 2011). Yet, most of the literature is concerned with either the government's energy policy or the public opinion. This thesis focuses on politicians' position-taking on nuclear energy. Specifically, I would like to explore how Lower-House candidates responded to the Fukushima accident, and what factors determine their position-taking. With this new focus, I hope to contribute to the understanding of the political effects of the Fukushima Incident as well as the study of Japanese electoral politics.

I argue for and test the effect of three sets of input on the electoral candidates' position-taking on nuclear energy: candidate characteristics, district attributes, and party affiliations. To verify my argument, I developed multiple hypotheses and employ Multivariate regressions to test them. I find that my argument proves partially correct. Specifically, candidates' gender, seniority, and party affiliation have a consistent effect on their position-taking. Moreover, nuclear power plant-related subsidies can effectively offset the concerns for accidents and even drive candidates to support nuclear energy.

The remaining part of this thesis is structured as follows: I will first introduce the existing literature on the Fukushima Incident. I show that the majority of the literature does not concern politicians' position-taking yet provide useful models and findings that help me build my argument. **Chapter 2** introduces my four hypotheses of candidates' position-taking on nuclear power plant reopening and provides their rationales. **Chapter 3** gives a detailed description of the research design, methodology, and data. **Chapter 4** contains three parts of empirical tests. Part 1 explores

the general pattern of candidates' position-taking on plant reopening. Part 2 analyzes candidates' defection form party line and ambiguous positioning. Part 3 observes candidates' position convergence and divergence. **Chapter 5** summarizes the findings and concludes the thesis.

Literature Review

Before the Fukushima Incident, the literature on Japan's nuclear energy primarily focuses on the bargaining between the government and plant-hosting regions. Specifically, scholars mostly analyzed various mechanisms which the government had designed to expand nuclear power plants. For example, comparing to the U.S. case, Cohen et al attribute the robust development of nuclear power plants in Japan to the strong economic incentive generated by government subsidies, nuclear-related revenues, and corporate donations (Cohen et al 1995).

Aldrich's analysis, besides confirming Cohen et al's findings, introduced additional strategies crafted to persuade the residents of plant-hosting regions, such as infrastructure projects and job training, together with auxiliary tools such as hortatory and educational programs. Moreover, Aldrich finds that these instruments are successful because they are frequently updated by the bureaucrats based on local residents' demands. In general, the literature before the Fukushima Incident pays more attention to the bargaining process before the installation of power plants. In addition, the scholarly focus was narrow: most scholars conducted research on the incentives of national and local governments while little research was done on hosting residents or citizens outside of hosting regions.

In the post-Fukushima era, the balance of attention began to shift. Although scholars continue to address government policies, research on public opinion began to emerge. For instance,

Kato et al's study explores how hosting residents balance the risks and benefits related to nuclear power plants (Kato et al 2013). With social surveys conducted in two hosting regions, Kato et al conclude that local residents' support for plant hosting is strongly associated with per-capita economic incentives and family members' employment in nuclear power plants. However, most post-Fukushima literature only studies public opinion in plant-hosting communities. Few studies look into non-hosting regions or provides a nation-wide analysis.

Instead of studying public opinion, my research focuses on politicians' position-taking on the issue of nuclear plant reopening after the Fukushima Incident. In energy policy studies, politicians are often neglected: scholars often treat parties as the key actors. For instance, Cohen studies the Liberal Democratic Party's strategy of distributing pork-barrel subsidy to promote power plant expansion (Cohen et al 1995). I analyze, by contrast, the political candidates at the individual level. Moreover, with data including candidates from every Lower-House electoral district, my research covers not only plant-hosting districts but also non-hosting regions. With this comprehensive and untapped data source on Lower-House candidates' position-taking, I aim to fill the gap in Japanese energy studies.

Chapter 2: Theory and Hypothesis
The Determinants of Candidate Position-Taking on Nuclear Energy

The Puzzle

In 2012, the year following the Fukushima Incident and the year of Lower-House election, a voter survey conducted in March by *Asahi Shimbun* shows a general disapproval of reopening nuclear power plants: 57% of the responders opposed reopening, while only 27% indicated support. Moreover, more than 80% of responders had no confidence in the government's security measures for civilian nuclear energy (*Asahi Shimbun* 2012a).

This widespread opposition to nuclear plants shared by voters, however, was less evident among the politicians. **Figure 1** shows the position-taking on nuclear power plant reopening of electoral candidates in the 2012 general election. As **Figure 1** indicates, among the top-two candidates from the 300 single-member districts, there is more support than opposition. Specifically, 42.4% of the responded candidates supported reopening, 31.6% stayed neutral, and only 26.0% expressed opposition.

This mismatch of position-takings between voters and politicians seems puzzling at the first glance: in a democratic system, politicians are expected to represent the voters' interests to win their elections; in this case, voters' opposition to nuclear energy seems underrepresented. Yet, this disparity might be rationalized under certain conditions. For instance, since the voter survey was conducted nation-wide, it cannot show voters' position-taking at the district level. As a result, the disparity could be caused by the district constituency size. Other unaddressed factors may also

give rise to the mismatch. It is possible, for instance, candidates support plant reopening because the monetary benefits related to nuclear power plants are able to reverse voters' disapproval.

Figure 1 Position-taking on Nuclear Plant Reopening of the Top-two Candidates from 300 Single-Member Districts in the 2012 Japanese Lower-House Election
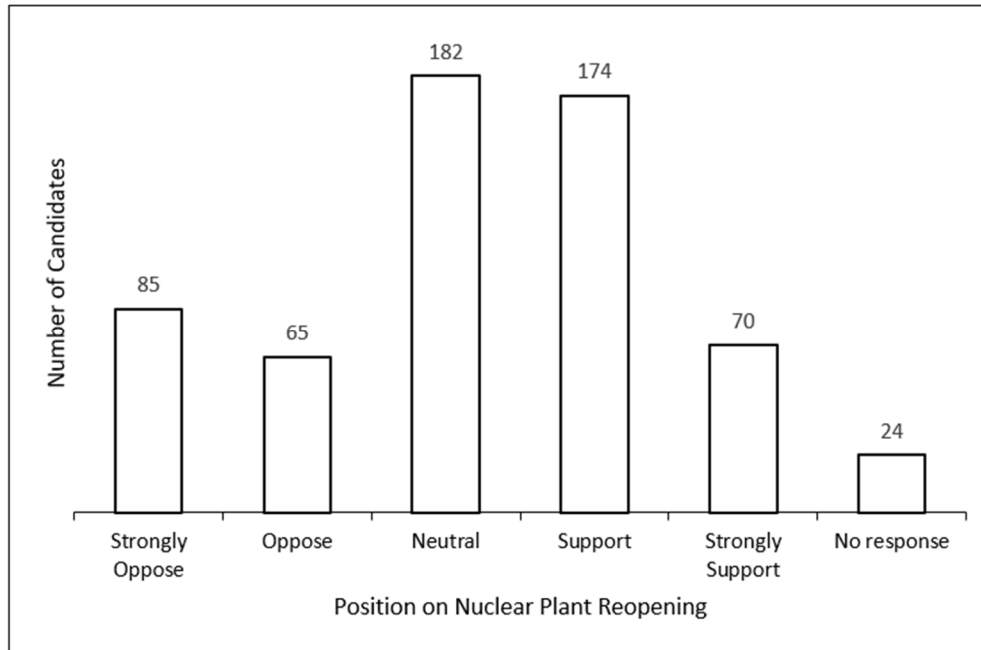
Note: The x-axis represents candidates' position-taking on plant reopening in the Todai Asahi Survey. The Y-axis represents the number of candidates who take the corresponding position. The question in the survey is: "Do you agree with the following question: It is unavoidable for nuclear power plants to reopen after regular inspection" The five-point Likert scale options available answers are: "disagree", "If must choose, disagree", "neither agree or disagree", "If must choose, agree", and "agree". I rename these five answers as "strongly oppose", "oppose", "neutral", "support", and "strongly support" to avoid wordiness.
Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", Masaki Taniguchi of the Graduate Schools for Law and Politics, the University of Tokyo and the *Asahi Shimbun*, 2012. (Available on http://www.masaki.j.u-tokyo.ac.jp/utas/utasindex.html, last accessed Mar 30, 2019)

In order to explain the mismatch of position-taking in a scientific way, speculation is not sufficient. I must first understand what affects the candidates' position-taking on nuclear energy. Overall, I hypothesize that four factors might be determinant: (1) a candidate's party affiliation, (2) the government subsidies related to nuclear power plant to a district, (3) a district's distance to the closest nuclear plant, and (4) the employment composition of a district. I will explain my hypotheses in detail in the following sections.

Hypotheses

Hypothesis 1: *Party Affiliation*

Party affiliation may affect candidates' position-taking on plant reopening due to the unique feature of the Japanese electoral system. The electoral system in Japan is designed in a way that parties possess a strong influence over individual candidates. Firstly, party label is more important than the candidates' characteristics in the majoritarian system in Japanese Lower-House election. After the electoral reform in 1994, the Lower-House electoral districts transformed from a proportional representative system to a mixed-member majoritarian system. Three hundred single-member districts contribute the majority of seats in the Japanese Diet in the new system (Scheiner 2006). Since parties usually endorse only one candidate in each single-member district, candidates' competition is partially transformed into party competition. For this reason, party endorsement and support are critical in Japanese Lower House elections.

In addition, regulations on campaign donation weakened candidates' capability to raise funds. The 1975 Revision of the Political Funds Regulation sets limit for contribution and donation, a restriction adding more pressure on an individual candidate than on parties. Under the new regulations, donations to individuals are effectively limited, but parties, with numerous sources of fundraising, are able to avoid the same fate. Similarly, other campaign restrictions also strengthen political parties at the cost of individual candidates. For instance, after the 1975 legal changes, individual candidates are forbidden from buying television time or newspaper space for advertisement, but parties are excluded from such restrictions. Moreover, under the same law, parties are not allowed to introduce endorsed candidates until close to the election, a regulation that further limited individual candidates' prominence (Curtis 1992). Thus, party affiliation

becomes a more critical indicator of individual candidates' policy preference when they cannot effectively publicize themselves. As a result of these regulations, candidates are forced to rely heavily on parties for both funding and advertisement.

From these factors, I hypothesize that party affiliation may affect candidates' position-taking in the Lower-House election. I predict that candidates are likely to align with their parties' platforms on energy policy. On the issue of nuclear power plant reopening, the two major parties in Japan, the Liberal Democratic Party (LDP) and the Democratic Party of Japan (DPJ) diverged in their official position-taking.[1] In their Manifestos published for the 2012 Lower-House election, the LDP indicates its support for reopening nuclear power plants while DPJ expresses disapproval. Therefore, I hypothesize that the LDP candidates are more likely to support plant reopening, while the DPJ candidates tend to show opposition.

Hypothesis 2: *Subsidy*

Monetary incentives are also likely to affect candidates' position-taking on plant reopening. Regions hosting nuclear power plants are heavily compensated with pork subsidies in order to offset the risk of accidents. In 2010, the total value of subsidies for all types of power plants reached 1.215 trillion yen (roughly 12 billion dollars), the majority of which were distributed to nuclear power plant hosting-regions (METI 2010). Moreover, based on the "Three Laws on Power-Source Sitting (*dengen sanpou*)", not only the hosting village, town, or city can receive the subsidy, the surrounding regions, as well as the whole prefecture, may also benefit for infrastructure construction and public facility maintenance (*Denki Shimbun* 2015). For example, in 2012, a 43-

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[1] I will use the abbreviations "LDP" and "DPJ" in the remaining of this thesis

million subsidy was given by the prefectural government for school reparation in Ikeda town, an area not adjacent to any plant-hosting regions but able to benefit due to the presence of nuclear plants in the prefecture (*Denki Shimbun* 2015; METI 2012). Since all districts in plant-hosting prefectures may receive the subsidy, I assume that candidates in districts covered by this pork subsidies are likely to show support for plant reopening. Specifically, the more plant-related subsidy received by the district, the more support candidates are likely to demonstrate.

Compared to the general public, corporations can more directly benefit from the existence of nuclear power plants. The Business Promotion in Power-Source Sitting Region Program (*denki chiiki shinkou sokushin jigyouhi*) was designed for attracting corporate investment in plant-hosting regions to create jobs and revitalize the local economy. For the business in plant-hosting regions, the government pays part of their electricity bills based on their locations and sizes (METI 2010). If the power plant shutdown continues, the plant-related corporate subside may cease in the future. As a result, a political candidate may want to maintain corporate investment and secure employment by supporting the nuclear plant reopening. Therefore, I hypothesize that the higher the plant-related subsidy received by local business, the more support candidates will show for plant reopening.

Hypothesis 3: *Plant Proximity*

The third factor that might be determinant for candidates' position-taking is the district's proximity to nuclear plants. The subsidy brought by nuclear power plants are highly correlated with geographical location: the hosting regions enjoy subsidies both for public works and for attracting business investment. Districts located far away from nuclear plants, on the other hand,

often receive nothing. Therefore, from an economic perspective, the geographic proximity to nuclear power plants is beneficial.

However, nuclear power plants do not only bring opportunities. The other side of the coin is the risk of contamination after a nuclear accident. As the Fukushima Incident exemplifies, nuclear power plants are potentially disastrous to both residents' health and the local environment. Besides the plant-hosting regions, the surrounding areas also bear such risk: the mandatory evacuation zone with a 20-kilometer (roughly 12.4 miles) radius of the Fukushima incident indicates that a much broader region could be exposed to nuclear radiation after a nuclear accident (IAEA 2015).

Moreover, the magnitude of the potential plant-related harm is also highly correlated with geographic distance: in the case of Fukushima Incident, Okuma, the town hosting the Fukushima Daiichi Power Plant, suffered the highest level of ground radioactive iodine among all affected regions. The radioactive level drops when spreading to farther regions. For instance, Minamisoma, a city located 6.2 miles away from the Fukushima Daiichi Power plant, detected radioactivity at least 10 times weaker than in Okuma (Hayakawa 2012). As a result, geographic distance to power plants also determines the quantity of the risk a region is exposed with.

Unsurprisingly, regions bear the risk of nuclear pollution after a Fukushima-like disaster are also heavily subsidized. After all, the plant-related subsidies were designed to pacify local communities for plant installation and operation (Denki Shimbun 2015). Due to this overlapping, it is difficult to predict the effect of plant proximity in candidates' position-taking: some candidates might value more economic opportunities, while others may prioritize regional safety. Moreover, the benefit and risk related to nuclear power plants might offset each other, turning plant proximity

into an insignificant factor. For this reason, I hypothesize that the plant proximity may not effectively influence candidates' position-taking due to this offsetting effect.

Hypothesis 4: *District Employment Composition*

Since I am not able to gather voter data at the district level, I use the employment composition of a district as a substitute to represent voters' opinion on nuclear power plant reopening. I predict the employment composition in local districts may affect candidates' position-taking. The conventional wisdom is that voters will vote for policies that benefit their employment (Cahan and Kaempfer 1992). Because sectors often function dissimilarly, their expectations may vary or even conflict. For instance, agricultural workers, as producers, expect a growth in food price, while manufactory workers, as consumers, often favor policies that bring down the food price. As a result, because voters' professions effectively affect their voting behaviors, it is reasonable for the candidates to take local employment composition into consideration. In my research, I plan to focus on three sectors that are most affected by nuclear power plants: agricultural sector, manufacturing sector, and energy sector.

For agricultural producers, I argue the existence of nuclear power plants is more of a threat than an opportunity. After the Fukushima incident, radioactive materials were detected from food produced in the affected regions. The contamination nearly crushed the local agricultural sector. Based on the data from the Ministry of Agriculture, Forestry, and Fisheries, only 16.7% of the formal agricultural land in Fukushima Prefecture was restored for production and 17.3% agricultural business reopened in 2012. When asked "Why not reopen your agricultural business," 96.1% of the formal owners answered: "because of the Fukushima Incident (PRIMAFF 2017)."

Moreover, the Fukushima incident's impact on agricultural sector proves to be long-lasting. Though the Japanese government has repetitively guaranteed the safety of Fukushima-produced food, its reputation suffered heavily in the international market. Even today, due to possible radioactive commination, the US Food and Drug Administration still maintains an import alert, allowing the Customs to detain without physical examination more than one hundred types of food produced in 13 Japanese Prefectures (FDA 2019). In this regard, agricultural producers are likely to oppose plant reopening in order to maintain their own businesses intact. Therefore, politicians running in agricultural production-based districts are expected to oppose plant reopening in exchange for public support.

For Manufacture workers, nuclear plants may generate more positive effects. The manufacturing sector is energy-consuming due to the huge electricity demand for production (Javied et al 2016). Therefore, the manufacturing sector has an incentive to bring down the electricity price for lower production cost. In the case of Japan, it is noticeable that the nuclear power plants helped reduce the electricity price. **Figure 2** visualize the electricity price change by year for industrial and family uses in Japan. As **Figure 2** indicates, the electricity price for industrial use slowly but steadily rises after the Fukushima Incident, from 13.65 yen/kWh in 2010 to 15.73 yen/kWh in 2012.

This increasing trend was largely caused by the nuclear power plant shutdown. Before the Fukushima Incident, the 54 nuclear reactors in Japan supplied roughly 29% of the country's electric power; in May 2012, all of the nuclear plants were shut down for inspection and maintenance. This huge gap in energy supply was later filled by more expensive fossil fuels such as coal and LNG, whose costs were further raised by the instability of the Middle East (METI 2018a). Without nuclear energy, the electricity price may keep rising, a situation undesired by the

manufacturing sector. Therefore, manufacturing workers are expected to support plant reopening for job security. For this reason, political candidates are likely to support reopening in districts composing a large share of manufacturing workers.

Figure 2 Electricity Prices for Industrial and Family Uses in Japan by Year
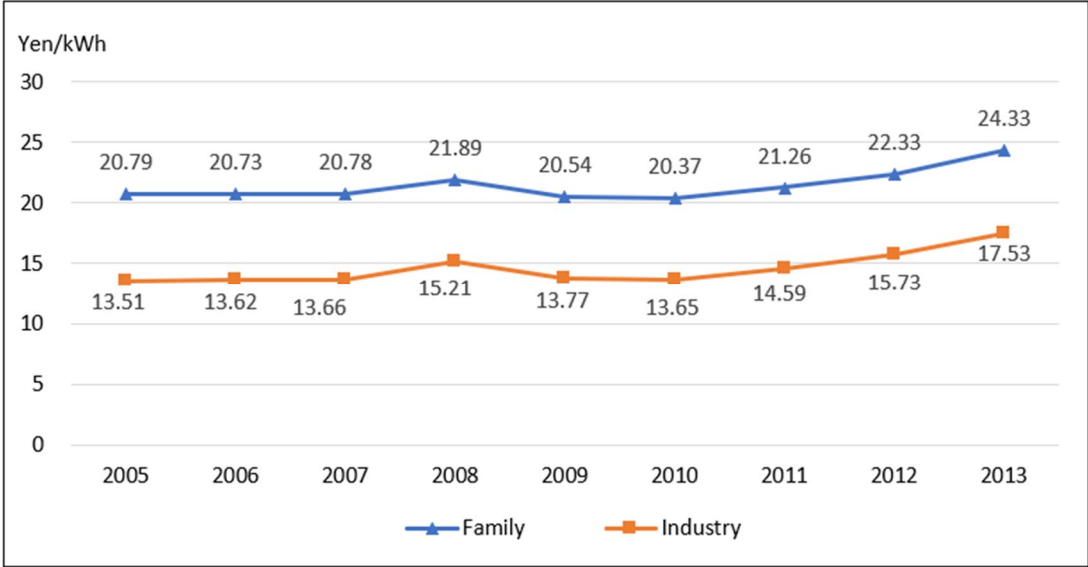
Note: The X-axis represent the year. The Y axis represent the price of electricity per kWh. Triangle markers show the price of family-use electricity and the square markers represent the price of industrial-use electricity.
Source: Ministry of Agriculture, Forestry, and Fisheries (Japan), "Change of Electricity Price," *2015 Energy White Book (HTML Version)*, Chapter 2, Section 4, 2015. (Available on https://www.enecho.meti.go.jp/about/whitepaper/2015html/, last accessed Mar 30, 2019)

The third sector largely affected by nuclear plant shutdown is the electrical power industry. With the whole-scale nuclear reactor shutdown in 2012, nuclear plant employees consequently lost their jobs. In addition to nuclear plants, other electrical facilities might suffer as well. For instance, when the nuclear power plants were shut down, the whole electricity delivery network around the plants, including transformers and power grids, simultaneously stopped functioning. Besides the nuclear power plants and the surrounding electrical facilities, the energy sector in Japan can be affected as a whole by the Fukushima Incident. By the year 2012, the several most powerful electrical companies in Japan were more or less engaged in nuclear energy. With the closure of

nuclear power plants, these companies were forced to adopt less efficient substitutes such as thermal generators, a move raising the electricity generation cost. Therefore, the shutdown may bring a shock to the whole energy sector in Japan. Similar to the manufacturing workers, employees of electrical companies may also favor plant reopening for job security and a lower production cost. For this reason, I argue that candidates are more likely to support plant reopening in districts where the proportion of electrical workers is high.

To summarize, this Chapter developed four hypotheses as follows.

H1: *Party Affiliation Hypothesis*: LDP members are more likely to support plant reopening compared to the DPJ candidates

H2: *Subsidy Hypothesis*: Candidates are more likely to support plant reopening when local districts receive higher prefectural and corporate subsidies related to nuclear power plants.

H3: *Plant Proximity Hypothesis*: Districts' geographic proximity to the nearest nuclear power plant has no clear effect on candidates' position-taking. I argue that the distance to nuclear plants represents both risk of radiation exposure from accidents and opportunity to receive subsidies, and these two considerations may offset each other.

H4: *District Employment Composition Hypothesis*: Candidates in agricultural-production based districts are more likely to oppose plant reopening. By contrast, in districts with a high share of manufacturing or electrical workers, candidates tend to support plant reopening.

Chapter 3: Research Design

Empirical Strategy

Data Source

For empirical tests of my hypotheses, I use a pre-election candidate survey data conducted by University of Tokyo and *Asahi Shimbun*, merged with originally collected district-level data on district proximity to nuclear power plants, plant-related subsidies and employment composition.

For most variables in my research, I mainly use data from the Todai-Asahi Survey, a pre-election survey of district candidates in the 2012 Japanese Lower-House election, conducted by the University of Tokyo and *Asahi Shimbun*. There are three reasons for choosing this survey: High response rate, good survey design, and a broad dissemination of the survey results through *Asahi Shimbun*.

Firstly, the response rate is significantly high: by the end of December 14, 2012, two days before the Lower-House election, 93.4% of the total 1504 candidates responded to the survey. In addition, the survey asks specific questions and offers answers based on a five-point Likert scale. The survey asks candidates about their position-taking on various issues including economic (e.g., social welfare and tax rate), social (e.g., nuclear plant reopening and education reform), and security policies (e.g., constitution revision and threat from DPRK). The respondents are required to choose one of the five-point Likert-scale responses: "agree", "if must choose, agree", "neither agree or disagree", "if must choose, disagree", or "disagree" (UTokyo and *Asahi Shimbun* 2012). With the Likert-scale responses, candidates can take a finer position than giving a binary answer.

Another merit of the survey is its easy accessibility to voters. The responses were both published online and in hard-copy *Asahi Shimbun*, one of the top-two national newspapers in Japan. Since the survey was completed right before the election and easily accessible to voters, it approximates candidates' position-taking during their campaigns: a discordance between campaign promises and survey responses can risk the candidates' reputation.

In addition to the strengths of the survey described above, the 2012 election was also ideal for a comprehensive study of politicians' position-taking on nuclear energy. As explained in Chapter 1, the 2012 Lower-House election was less than two years after the Fukushima Incident and nuclear energy was a highly concerning issue for the general public. Based on a pre-election voter survey conducted by *Asahi Shimbun*, 17% of the responders considered the issue of nuclear power energy to be more important than the economic climate, social welfare and national security (*Asahi Shimbun* 2012c). Another survey by the Association for Promoting Fair Election shows that nuclear energy policy was the sixth most concerning issue from a list of eighteen issues (APFE 2013). These surveys indicate that the traumatic memory of the Fukushima Incident still remained among the voters.

Therefore, when responding to the survey, candidates must carefully calculate their position-taking by balancing the benefits and risks of plant reopening: Securing the various benefits related to nuclear power plants might appeal to voters. On the other hand, insisting on plant reopening may backfire due to the lingering public fear of another Fukushima Accident.

Another significance of the 2012 pre-election survey is that the survey asked candidates to take positions on nuclear power plant. Until then, most surveys rarely included questions on such topic. After the Fukushima Incident when nuclear energy became a national concern, Todai-Asahi Survey unprecedently requested all candidates to publicize their position-taking on this particular

issue. This survey is significant because it could substantially affect the candidates' public image: When learning candidates' positions on plant reopening, voters form their first impression of the candidates about this particular issue. This impact might be greater in non-hosting regions where nuclear power plant had not been a concern until the Fukushima Incident. As numerous studies have shown, initial information constitutes a key element that shapes the voters' overall impression of the candidates (Lodge et al 1989; Klein 1991; Sundar et al 2003). In sum, the 2012 pre-election survey conducted by the University of Tokyo and *Asahi Shimbun* provides an ideal source to test my arguments.

Universe of Respondents: Top-Two Candidates in Lower-House Single-Member Districts

For empirical analysis, I choose position-taking by the top-two candidates who received the highest vote shares in each single-member district in the 2012 Japanese Lower-house election. I only include the top-two candidates for two reasons. First, the top-two candidates, by definition, together receive the most ballots in a district. This allows me to study how candidates' position-taking reflects constituency characteristics. In addition, I include both the winner and the runner-up in each district because it allows me to study the position-taking of candidates from both the LDP and the DPJ, two major parties in Japan. Since the LDP constitutes a majority party in the Lower-House, by including the "best losers," most of whom were DPJ members, I can compare the effect of party affiliation on position-taking among candidates from both parties.

Second, I hope to test the median voter theorem by comparing the top two candidates' position difference in each single-member district: based on the median voter theorem, a majority rule voting system "will select the outcome most preferred by the median voter." As a result, candidates' positions are expected to converge to the median voter in order to absorb maximum

votes (Black 1948; Downs 1957). On the issue of plant-reopening, I would like to explore whether candidates' positions converge as the median voter theory predicts. In addition, I intend to test the effect of electoral competition on the convergence of candidates' positions: will the top-two candidates' positions converge more with a higher level of electoral competition? For these two reasons, I choose to observe both the winner and the runner-up in each single-member district of the 2012 Lower-house election.

Dependent Variables

For empirical analyses, I conduct three sets of hypotheses tests. The first set of analyses tests my hypotheses of top-two candidates' position-taking on nuclear power plant reopening in the 2012 Lower-House Election. The second set explores the pattern of defection from the party line and ambiguous positioning among LDP and DPJ candidates. The third set of tests verify my hypothesis on electoral competition and position convergence.

I use different dependent variables in each set of tests:

Test Set 1: *Support (1-5 Likert Scale)*, *Support (0.1)*

Test Set 2: *LDP Defector*, *DPJ Defector*, *LDP Neutralist*, *DPJ Neutralist*

Test Set 3: *Position Difference*, *Position Converge (Including Neutral)*,
      Position Converge (Excluding Neutral), *Position Diverge*

I will explain each variable in detail in the next chapter.

Independent and Control Variables

Party Affiliation:

LDP, *DPJ*

To test the effect of party affiliation, I include the LDP and DPJ dummies while using minor party candidates as a base category. In this way, I create two dichotomous independent variables: *LDP* and *DPJ*. If a candidate is endorsed by the LDP, I code the candidate as 1 under *LDP*; if not, I code the candidate as 0. Similarly, for the variable *DPJ*, DPJ members are coded as 1 while other candidates 0.

The reasons to focus on LDP and DPJ candidates are as follows: First, as the top-two major parties in Japan, the LDP and the DPJ endorsed the majority of candidates in the 2012 Lower-house Election. Second, both parties provided clear party positions on the issue of plant reopening: in their Manifestos published and distribute among citizens for the 2012 election, the LDP supported civilian nuclear power and planned to reopen nuclear power plants while DPJ called for a complete removal of nuclear power in electricity generation by 2030 (LDP 2012, *Asahi Shimbun* 2012b). With clear, diverging positions on plant reopening, the LDP and the DPJ are decent targets for studying the effect of party affiliation and discipline on candidate position-taking.

Subsidy:

Corporate Subsidy, *Prefectural Subsidy*

To test my hypothesis of monetary benefit, I employ two independent variables: *Corporate Subsidy* and *Prefectural Subsidy*. *Corporate subsidy* represents nuclear power plant-related

subsidies directly distributed to local business; I use Aid for Businesses Located in Nuclear Power-Source Region (*kigyou ricchi shien hojyokin*) (METI 2010). This subsidy was designed to attract corporations to invest in plant-hosting regions. Specifically, the government pays part of the electricity bill of corporations located in or nearby nuclear plant-hosting regions.

The corporate subsidy is divided into three tiers: Tier three subsidies are distributed to corporations located in hosting regions, based on their size and number of employees, who receive the highest bill reduction. Tier two subsidies are distributed to corporations in regions surrounding the hosting village, town, or city, who receive bill reduction roughly half as much as Tier-three firms. Corporations located in locations adjacent to the surrounding regions may also enjoy the bill reduction, but the least among the three tiers (METI 2010). I recode the corporate subsidy into a numeric variable based on the district's tier: districts with no corporate subsidies are coded to 0, Tier one to 1, Tier two to 2 and Tier three to 3. The higher number represents a higher tier of the local corporate subsidies related to nuclear power plants.

Another dependent variable I use is *Prefectural Subsidy*. Besides monetary benefits enjoyed by local corporations, the whole plant-hosting prefecture also receives a government subsidy named Power-Source Sitting Region Prosperity Promotion Subsidy (*genshiryoku shisetsu ricchi chiiki kyousei koufukin*) (METI 2010). This subsidy is distributed to both prefectural governments and governments of plant-hosting villages, towns, or cities for public works such as infrastructure, hospital and park. The value of the subsidy is determined by local nuclear power plants' capacity.

However, though the subsidy value remains roughly unchanged at the prefectural level every year, there is no fixed amount distributed to each town or city. For instance, Sapporo received 27 million yen from the prefectural subsidy for fire truck maintenance in 2013, but in the

next year, without a valid reason, the city received nothing (METI 2019). For this reason, I use the value of subsidies at the prefectural level to measure the benefits that overall districts within can potentially derive. The potential caveat of this operationalization is that the prefectural government might be more likely to distribute subsidies to regions proximate to power plant—that is, some districts may have a higher possibility to benefit from the prefectural subsidy. Yet, since there is no means to specify the subsidy to the district level, I can only apply the prefectural-level value to each district covered. As a result, all districts in the same prefecture are assigned with the same amount of receipt under the variable *Prefectural Subsidy*.

Employment Composition of a District:

Agricultural Worker Share, *Manufacturing Worker Share*, *Electrical Worker Share*

I test the effect of local employment composition on candidates' position-taking. Specifically, I focus on three sectors largely affected by the existence of nuclear power plant: agricultural, manufacturing and electrical power sectors. I use three variables, each represents the employment share of the corresponding workforce at the district level: *Agricultural Worker Share*, *Manufacturing Worker Share*, and *Electrical Worker Share*. For instance, if 20% of the employed population at District A work in the agricultural sector, District A is assigned with 20 under *Agricultural Worker Share.*

Notice that *Agricultural Worker* include employees in agricultural, fishery and forestry because all the three sectors rely on soil or sea vulnerable to nuclear contamination. *Electrical Worker* count not only employees of nuclear power plants, but also ordinary workers such as grid

maintainers. I include all electrical workers because, as I argue in Chapter 2, I believe their employments are all affected by the nuclear plant shutdown.

Plant Proximity:

District Distance to Closest Power Plant

District Distance to Closest Power Plant represents the geographical distance from each district to the closest nuclear power plant in miles. With Google Map and ArcGIS, I managed to measure this variable: To test the plant proximity of a district, I first draw a circle centered at the closest nuclear power plant, increase its radius until the circle touches the border of the targeted district, and then measure the radius of the circle. In this way, I record the distance from all districts to the closest power plants.

However, this measurement could be problematic due to the variance of the district size. Since electoral districts are divided with roughly equal population, large districts are often sparsely populated. Therefore, residents in the same districts may have different perceptions of nuclear power plants. For instance, in a large district where a nuclear power plant is located nearby the southern border, residents living in the northmost city may not perceive the same threat and receive equal benefits than the plant-hosting community. For this reason, the measurement could be inaccurate. Still, since I cannot find a better solution, I stick to my original measurement method.

<u>Control Variables</u>

I also control for the following characteristics of candidates. All these variables are available from Todai-Asahi Survey.

Age: a candidate's biological age

Male: a candidate's gender. Male candidates are assigned with 1 and female with 0

Term: seniority. How many times a candidate being elected in office

In the next chapter, I will present and analyze three sets of empirical tests, each associated with different dependent variables measuring candidates' position-taking: (1) candidates' position-taking on nuclear power plant reopening, (2) candidates' defection from the party line and ambiguous positioning on plant reopening, and (3) candidates' position convergence and divergence on plant reopening in each single-member district.

Chapter 4: Empirical Analysis

Part 1: Explaining Lower-House Candidates Position-taking on Nuclear Energy

In the first part of this chapter, I will test my four hypotheses about Lower-house candidates' position-taking on the reopening of nuclear power plants in the 2012 Japanese general election. To recap, the four hypotheses are as follows:

H1: *Party Affiliation Hypothesis*: LDP members are more likely to support reopening compared to the DPJ candidates

H2: *Subsidy Hypothesis*: Candidates are more likely to support plant reopening when their districts receive higher prefectural and corporate subsidies related to nuclear power plants.

H3: *Plant Proximity Hypothesis*: Districts' geographic proximity to the nearest nuclear power plant has no clear effect on candidates' position-taking. I argue that the distance to nuclear plants represents both risk of radiation exposure from accidents and opportunity to receive subsidies. I predict these two considerations offset each other.

H4: *District Employment Composition Hypothesis*: Candidates in agricultural-production based districts are more likely to oppose plant reopening. By contrast, in districts with a high share of manufacturing or electrical workers, candidates tend to support reopening.

Data, Variables and Estimation Strategies

To test my hypotheses, I run multivariate linear regressions with candidates' position-taking on plant reopening as the dependent variable. The dependent variable represents the top-two candidates' position-taking on the nuclear plant reopening in each single-member District in the 2012 Lower-House election. I extract and process the dependent variable from candidates' responses to one survey question in the Asahi-Todai Survey: "Do you agree that after regular examinations, reopening of nuclear power plants is unavoidable?" Candidates can select responses from five given options: "Agree," "If must choose, agree," "Can't say one or the other," "If must choose, disagree," or "Disagree (UTokyo and *Asahi Shimbun* 2012)."

To make the interpretation of the regression coefficient more intuitive, I recode the five Likert-scale answers as follows: As **Figure 3** shows, I recoded "agree" to 5, "if must choose, agree" to 4, "can't say one or the other" to 3, "if must choose, disagree" to 2, and "disagree" to 1; larger number indicates higher support and vice versa.

Figure 3 Todai-Asahi Survey Question and Responses on a Five-Point Likert Scale

Survey Question: Do you agree that after regular examinations, the reopening of nuclear power plants is unavoidable?				
Five-Point Likert-Scale Responses:				
Disagree	If must choose, disagree	Neither agree nor disagree	If must choose, agree	Agree
1	2	3	4	5

Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid*.

For a more straightforward analysis, I also dichotomize the Likert-scale into a dummy variable of 0 and 1. Specifically, I recode "Disagree", "If must choose, disagree" and "Can't say one or the other" into 0 to represent the lack of support for plant reopening. I recode "Agree" and "If must choose, agree" to 1 to indicate support. With the dichotomous dependent variable, I aim to explore what causes candidates to shift their positions from opposition to support on the issue of nuclear plant reopening.

In the linear multivariate regressions, I use four different models to test my hypotheses. The four models differ in their dependent variables. In Models (1) and (2), the dependent variable is the candidate position-taking on a five-point Likert scale. In models (3) and (4), I use the dichotomized position-taking as the depend variable. Moreover, the models have different functions: the first two models explore how much does each factor helps increase candidates' support measured on the Likert scale of 1 to 5, while the second set of models explains what causes candidates to shift their positions from opposition to support on the issue of plant reopening.

Another difference of the models is within the *Party Affiliation* variable. As explained in Chapter 3, independent variables *LDP* and *DPJ* represent whether the candidate is endorsed by the corresponding party. In Model (1) and (3), I only include the variable *LDP* while Models (2) and (4) contain both *LDP* and *DPJ*. With this arrangement, Models (1) and (3) set the affiliation with DPJ and minor parties as the base category and explore how being an LDP member affects candidates' position-taking relative to DPJ and minor-party candidates. By contrast, Models (2) and (4) analyze the effect of both LDP and DPJ affiliation relative to minor-party members.

Results

      Table 1 shows the results of the linear regressions. Model (1) and Model (2) summarize how each covariate affects candidate position-taking on nuclear power reopening on a Likert scale of 1 to 5. In Models (3) and (4), the results explain what causes candidates to shift their positions from opposition to support for plant reopening.

      Overall, the results lend support to the *Party Affiliation Hypothesis*, *Party Proximity Hypothesis*, and my expectation for Agricultural Worker Share in the *Employment Composition Hypothesis*. Yet, the results do not meet my prediction about Manufacturing Share and Electrical Worker Share in the *Employment Composition Hypothesis*. Nor do they support the *Subsidy Hypothesis*. I will discuss the findings for each hypothesis below.

H1: *The Party Affiliation Hypothesis*

      The results suggest that, among the top-two candidates in the 300 Lower-house districts, LDP candidates are more likely to support reopening than candidates of other parties. As Model (1) shows, on a 1 to 5 Likert scale, being an LDP member can increase the candidate's support for plant reopening by 0.9 point. Similarly, Model (3) indicates that with other variables controlled, LDP members are 26% more likely to support plant reopening than candidates of other parties.

      However, when I include the dummy variable *DPJ* and use minor-party candidates as the base category in Models (2) and (4), the results become more complicated. Indeed, DPJ members seem to be less likely to support reopening compared to LDP members: model (4) suggests DPJ members are 17.5% less likely to support reopening than LDP members. Yet, the same model indicates that DPJ members have a 19.7% higher likelihood of supporting reopening than minor-party candidates.

Table 1 Candidates' Position-taking on Nuclear Plant Reopening, Top-Two Candidates of 300 Single-Member Districts in the 2012 Japanese Lower-House Election

	Support (1-5 Likert scale)		Support (0, 1)	
	(1)	(2)	(3)	(4)
H1: Party Affiliation				
LDP	0.910***	1.384***	0.261***	0.372***
	(0.092)	(0.113)	(0.040)	(0.051)
DPJ		0.844***		0.197***
		(0.127)		(0.057)
H2: Subsidy				
Corporal Subsidy (1-3 Tier)	0.006	0.002	-0.003	-0.004
	(0.077)	(0.075)	(0.034)	(0.033)
Prefectural Subsidy (Billion Yen)	0.022	0.016	0.004	0.002
	(0.017)	(0.016)	(0.007)	(0.007)
H3: Plant Proximity				
District Distance to Closest Plant (mile)	-0.001	-0.001	-0.0005	-0.0003
	(0.001)	(0.001)	(0.0005)	(0.0005)
H4: District Employment Composition				
Agricultural Worker Share (%)	-0.020*	-0.012	-0.004	-0.002
	(0.010)	(0.010)	(0.005)	(0.005)
Manufacture Worker Share (%)	0.010	0.010	0.003	0.003
	(0.007)	(0.007)	(0.003)	(0.003)
Electrical Worker Share (%)	0.339	0.248	0.085	0.064
	(0.256)	(0.247)	(0.111)	(0.110)
Control Variables				
Age	-0.008	-0.005	-0.002	-0.002
	(0.005)	(0.005)	(0.002)	(0.002)
Male	0.394**	0.396**	0.111	0.112
	(0.163)	(0.157)	(0.071)	(0.070)
Term	0.092***	0.060***	0.025***	0.018*
	(0.022)	(0.022)	(0.010)	(0.010)
Constant	2.338***	1.794***	0.202	0.075
	(0.350)	(0.347)	(0.152)	(0.155)
Observations	576	576	576	576
R^2	0.207	0.265	0.098	0.117
Adjusted R^2	0.193	0.251	0.082	0.100
Residual Std. Error	1.091 (df = 565)	1.051 (df = 564)	0.474 (df = 565)	0.469 (df = 564)
F Statistic	14.781*** (df = 10; 565)	18.499*** (df = 11; 564)	6.134*** (df = 10; 565)	6.791*** (df = 11; 564)

Note: *p<0.1; **p<0.05; ***p<0.01; linear estimates
24 among the 600 candidates did not answer the survey

Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid.* and "産業別×男女別 15 歳以上就業者数 [Employment composition by industry and gender at the district level]", CSIS, 2018.

A possible explanation is that DPJ members have a weak party discipline. Therefore, defection from the party line was more prevalent among DPJ candidates than those endorsed by the LDP. Patrick Köllner's research on Japanese party factionalism lends support to this interpretation: he finds that the DPJ has a weaker party discipline compared with the LDP because the current DPJ was founded only recently in 1998.[2] Moreover, the DPJ was formed by formal politicians of both central-left parties such as Japan Socialist Party, and central-right parties such as the LDP (Köllner 2004). Therefore, the DPJ is intrinsically ideologically-diverse and suffers from a relative weak leadership as well as a factionalism based on formal party affiliation. In the case of plant reopening, it is possible that DPJ members disobey the party leadership and support reopening because of the weak party discipline.

Another interpretation is that, since minor parties often adopt extreme positions to appeal to marginal voters, most of their candidates might express strong opposition to nuclear reopening in the Todai-Asahi Survey.[3] For instance, Japan Communist Party and Japan Socialist Party are known to oppose nuclear energy, and most of their candidates selected "disagree" in the survey. DPJ candidates, on the other hand, mostly expressed relatively moderate opposition by selecting "if must choose, disagree" (UTokyo and *Asahi Shimbun* 2012). Therefore, with minor parties as the base category, DPJ members comparatively are more likely to support plant reopening.

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[2] Though the LDP is also a result of party merger, its more recent change was absorbing the New Liberal Club in 1986, a party created by formal members who broke away from the LDP. Due to the similarity in ideology, the merger had no significant effect on the LDP.

[3] Notice that by the 2012 election, though the majority seats of Japanese Lower House are contested in 300 single-member districts, the remaining 180 seats are assigned to 11 block districts in a proportional representation system. In this electoral system, each voter votes twice, one for the favored candidates and another for the preferred party. The second vote is calculated in the proportional representation system. Since major parties usually take moderate positions, minor parties can attract marginal voters by extreme positioning and win seats in the proportional representative system.

The results show no statistically significant effect of the two types of plant-related subsidies on the candidates' position-taking. Furthermore, the results indicate no systematic relationship between the district distance to closest nuclear power plants and candidates' position-taking on plant reopening.

Several interpretations may explain the null results. For the prefectural subsidy, its lack of effect might be caused by ecological inference issues. As Gary King discusses in his studies, ecological inference problem occurs when using aggregated data to predict relationships at individual level (King 2013). In the case of my research, unable to obtain district-level data, I use the prefectural-level subsidy to infer information at the district level. As a result, this research design may give rise to the ecological inference issue.

Yet, as Gary King shows in his book, ecological inference is not always unsuccessful (King 2013). If so, why did my ecological inference fail? The reason could be my failure to manifest the mechanism of the subsidy distribution system in my research design. Ideally, all districts in plant-hosting prefectures have a possibility to receive plant-related government subsidies. However, the reality is that the subsidy distribution is often concentrated in a few towns nearby the power plants (Kato et al 2013; Kingston 2013). In this case, though all districts in plant-hosting prefectures may enjoy the prefectural subsidy, the monetary benefit is not distributed evenly. Based on this distribution mechanism, the plant-hosting towns and villages usually receive much more monetary benefit than other regions. When I applied the plant-related government subsidy to all districts in a prefecture, however, I falsely inferred that all districts have the same possibility of receiving the monetary benefit. Due to this misjudgment, my research fails to specify the potential share each

district may receive. As a result of the flawed design, ecological inference issue occurs in the results.

However, the null results can still help me understand the candidates' position-taking. The results at least demonstrate that the total amount of government subsidy at the prefectural level had no coherent effect on position-taking of candidates in the same prefecture—that is, candidates in plant-hosting districts may value the prefectural subsidy differently from those in non-hosting districts. More specifically, in districts that are less likely to receive the subsidy, candidates might care less or even ignore the prefectural subsidy despite its considerable total value at the prefectural level.

For the corporate subsidy and plant proximity, the null results could be explained by the coexistence of risk and opportunity in plant-hosing regions. As addressed in the previous chapters, nuclear plants bring both risks and opportunities to the hosting regions. For instance, orporate subsidy coverage is often highly correlated with the risk faced by the local region. As a result of this coverage mechanism, districts located more closely to power plants are more likely to receive plant-related subsidy, and vice versa. As I expected in the *Plant Proximity Hypothesis*, the economic incentive and the potential threat possibly offset each other in politicians' decision making. Notice that this offsetting effect is precisely what Kakuei Tanaka, the prime minister who introduced nuclear energy into Japan in the 1960s, envisioned in his design of plant-related subsidy distribution (Cohen et al 1995); his strategy seems to work properly after nearly half a century.

In addition to the interpretations above, there is another possible explanation for the null results in the corporate subsidy and plant proximity tests: because how to weigh the balance between the benefit and the risk is likely to differ from candidate to candidate, the effect of district

proximity to nuclear power plants on candidates' position-taking might also be heterogeneous. For this reason, the regression models cannot detect an aggregated effect. Thus, the results show no clear correlation of candidate position-taking on reopening with either corporate subsidy coverage or district plant proximity.

H4: *Employment Composition Hypothesis*

Surprisingly, the results show no notable patterns for the employment variables measured at district level. The only exception is in Model (1), where the share of agricultural worker at the district level has a minor effect on candidates' position-taking: with a 10% increase in the agricultural worker share of the district employed population, candidates decrease their support for plant reopening by 0.2 point on a five-point Likert scale. This finding conforms with my hypothesis that in agricultural-production based districts, candidates tend to increase their opposition to plant reopening to represent agricultural producers' interests.

Except for this particular finding concerning agricultural workers in Model (1), the majority of models testing *District Employment Composition* give null results. For agricultural and electrical power sectors, the null results might be caused by their relatively small sizes of workforce. For instance, the total share of agricultural workers counted only 3.96% in Japan in 2012; in most districts, agricultural workers comprised less than 5% of the total employment. Similarly, by the year 2012, most districts contained electrical workers no more than 1% of the total employment (World Bank 2019; CSIS 2018). As a result of the majoritarian electoral system, candidates are likely to ignore agricultural and electrical workers due to their small shares in the district workforce and instead, in order to win a majority, target a larger constituency such as service or manufacture workers.

However, the employee size theory cannot explain the null results for manufacturing worker share. By 2012, Japan had roughly 26.2% of manufacturing sector employees of all employment. The share of manufacture workers at the district level district was also much larger than that of agricultural or electrical employees, varying from 10% to 30% in most districts (World Bank 2019; CSIS 2018). With a relatively larger share of employment, I expected the manufacturing sector to effectively influence candidate position-taking on plant reopening. Yet, the null results disprove my hypothesis, showing that there is no clear effect of the manufacturing sector on candidate position-taking.

Findings from the *Control Variables*:

Gender

Besides the findings discussed above, the results indicate gender and term may affect candidates' position-taking on plant reopening. Models (1) and (2) show that with other variables controlled, a male candidate expresses 0.4 point higher support for reopening than a female candidate on a five-point Likert scale. This finding generally conforms with other studies of how gender affect position-taking on nuclear energy. For instance, a voter survey conducted by *Asahi Shimbun* in 2012 shows that 41% of male responders supported the reopening of nuclear power plants, while only 15% of female responders took the same position (*Asahi Shimbun* 2012). In addition, studies have shown that when planning to install a new nuclear power plant, bureaucrats and electrical companies often spend more effort pacifying local female residents who usually expressed more solid opposition than males (Aldrich 2005).

<u>Seniority</u>

For the seniority of candidates, i.e., the number of terms that a candidate has been elected, the results indicate that senior candidates are more likely to support reopening than junior ones. More specifically, Models (3) and (4) show that one term increase in a candidate's seniority raises his or her likelihood to support plant reopening by 1.8% to 2.5%. That is to say, for candidates who had been elected ten times before 2012 is approximately 20% more likely to support plant reopening than those never been elected.

The effect of seniority could be explained by the theory of vested interest. With more times being elected, candidates may possess a deeper vested interest in nuclear power plants, including government subsidies and donations from electrical companies. Government subsidy, as explained previously, benefits local community by supporting infrastructure maintenance and attracting business. Senior candidates, who already developed core constituency by virtue of the plant-related subsidy, may wish to secure the subsidy to maintain the voters' support.

Moreover, in plant-hosing regions, legislators may regularly receive donations from electrical companies because the nuclear power plants require legislative support for installation, operation, and more importantly, reopening after the Fukushima Incident. With longer terms in office, senior candidates are more likely to receive such donations during their incumbencies than junior candidates. Notice that this donation sometimes exceeds its legal limit. As Blechinger points out in her study on Japan's political corruption, bribery scandals are more numerous in some industries, including the energy sector, than others (Blechinger 2000). If that is the case, senior candidates may access even more contribution from electrical companies than regulated by law, leaving them with more incentive to maintain such donations by supporting plant reopening.

In the case of LDP candidates, there is another explanation for seniority's effect on position-taking: Since LDP's agenda is to reopen nuclear power plants, LDP senior candidates may support Party's platform in exchange for future endorsement and campaign support. With multiple times being elected, LDP senior members already received assistance from the Party in the previous elections; they may try to maintain the party endorsement and support which, as I explained previously, are critical in Lower-House elections. As a result, whether to practice reciprocity or to win future elections, senior LDP candidates are more likely to support Party's agenda than their junior counterpart.

Summary

In this part, I test my four hypotheses concerning top-two candidates' position-taking on plant reopening in 300 single-member districts. The results show that party affiliation, gender and seniority of candidates have statistically significant effects on candidates' position-taking. Specifically, the LDP and DPJ candidates are more likely to support reopening than minor-party members, male candidates are more likely to support reopening than female candidates, and senior candidates tend to show more support for plant reopening than junior ones.

By contrast, the results show no clear effect of prefectural subsidy, corporate subsidy coverage, district distance to closet plant, or district employment composition on candidates' position-taking. As I explained in each analysis section, the null results might emerge from various measurement errors or offsetting effects, including the ecological inference issues of subsidy measurement, the offsetting effect of opportunity and risk, and politicians' likely neglect of sectors with relatively small employment share.

In the next part, I will investigate two prevalent phenomena of candidates' position-taking: (1) candidate's defection from the party line on plant reopening, and (2) candidates' ambiguous positioning, i.e., taking a neutral position by selecting "Can't say one or the other" in the Todai-Asahi Survey. My goal is to understand what candidate characteristics or district attributes are associated with Lower-House candidates' defection from the party line, and with candidates' hesitance to give a clear stance on nuclear energy.

Part 2: Explaining the Defection from the Party Line and Ambiguous Positioning

The Puzzle

In Part 1, I studied what factors affect the top-two candidates' position-taking on reopening nuclear power plant in the 2012 Japanese Lower-house election. The results show that party affiliation is determinant in shaping candidates' stances—that is, party discipline, especially within the LDP, effectively oblige candidates to support the party platform. However, this restraining force fails to regulate all party members; defection from the party line and ambiguous position-taking occur among both LDP and DPJ candidates.

"Defection" differs for the LDP and the DPJ due to their conflicting official position-taking on plant reopening. The LDP officially supported plant reopening, and thus the LDP defectors are candidates who oppose plant reopening. By contrast, since the DPJ opposed nuclear energy in its manifesto of the 2012 election, DPJ defectors are those who support plant reopening (I will use *defector* to describe candidates rejecting their party platforms). Meanwhile, some candidates choose to neither align with the party platform nor defect, only giving a neutral position on plant reopening (I name these candidates "neutralists").

Figure 4 visualizes the top-two candidates' responses to the Todai-Asahi Survey about plant reopening based on party affiliation; the striped bars represent defectors of the party lines. As **Figure 4** shows, the LDP seemed to have a stronger party discipline because there were only 23 defectors among the total of 270 LDP candidates—that is, less than 9% of LDP candidates defected by opposing plant reopening. Compared to the LDP, defection was strikingly more

prevalent in the DPJ: among the 169 DPJ candidates, 68 of them chose to defect from the party line, with a defection rate as high as 40.2%.

As for position ambiguity, 34.8% LDP candidates and 34.3% DPJ candidates chose to give a neutral position on plant reopening. It seems that ambiguous positioning was much more prevalent than defection among the candidates on the issue of nuclear power plant reopening.

Figure 4 Position-Taking on Nuclear Power Plant Reopening by LDP and DPJ Candidates
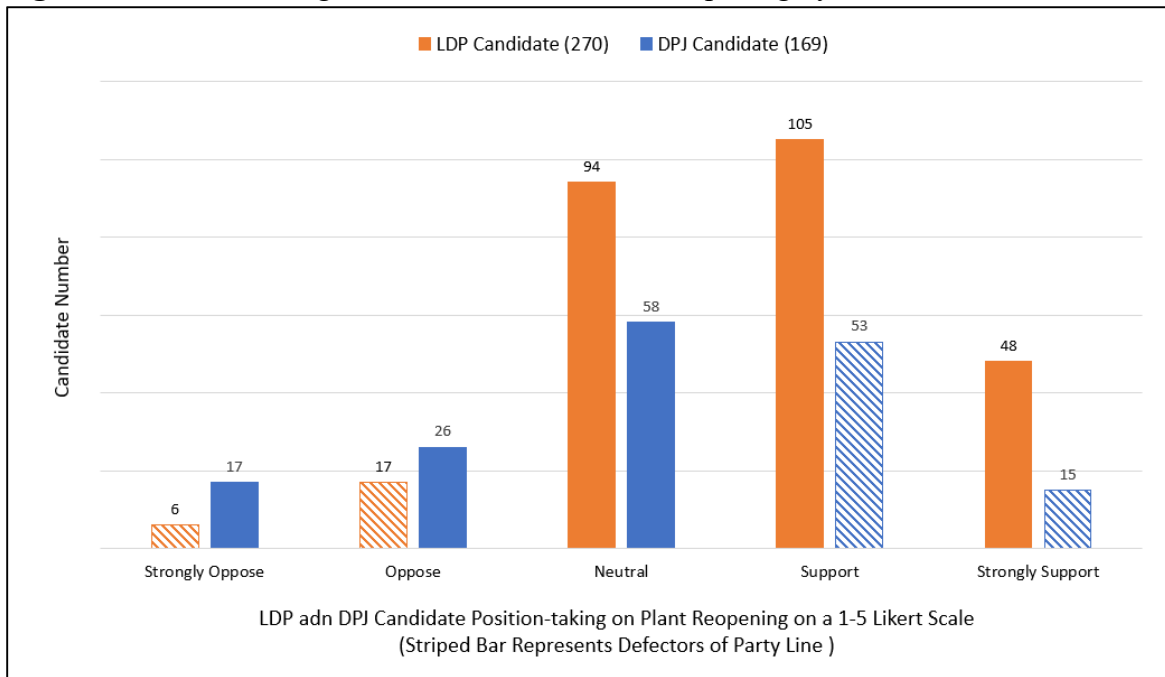
Note: The X-axis represents the candidates' position-taking on nuclear power plant reopening on a 1-5 Likert scale in the 2012 Japanese Lower-House election. Y-axis represents the number of candidates who took the corresponding position. The orange color represents LDP candidates and the blue color represent DPJ candidates. Striped bars represent candidates who defected from their party line while solid bars represent those who did not.
Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid*.

The phenomena of defection and ambiguous positioning among candidates on plant reopening pose a new puzzle: Why would candidates defect from the party line or give an unclear stance? As I explained in Chapter 2, candidates heavily rely on party endorsement, funding, and support in Japanese Lower-House elections. It is then puzzling why electoral candidates defect or

take an unclear position at the risk of punishment by their parties. In this part, I aim to solve the puzzle of defection and ambiguous positioning. In the remaining, I will first explain my data selection and test design. Then, I will present the test results and try to explain the puzzle based on my findings.

Data, Variables and Estimation Strategies

Similar to the previous test, I use multivariate linear regressions to study candidates' defection and ambiguous positioning on the issue of nuclear plant reopening. I also use the same data, the Todai-Asahi Survey to candidates in the 2012 Japanese Lower-House election. Unlike in my previous study on position-taking, I only include the LDP and DPJ candidates among all top-two candidates in each single-member district. The reasons are as follows. First, as I discuss in the previous section, defecting from the party line and adopting an ambiguous position were prevalent among LDP and DPJ candidates; these two phenomena, by contrast, rarely appear in in minor parties. Second, I only focus on the LDP and the DPJ because these two parties have been dominating Japanese politics in the past few decades. For instance, in the 2009 Lower-House election, LDP and DPJ together won 89% of the 480 seats (*Asahi Shimbun* 2009). Therefore, I believe studying the two major parties is sufficient to understand defection and ambiguous positioning in Japanese electoral politics.

In my research on defection and ambiguous positioning, I run four multivariate linear regressions with four different dichotomous variables as dependent variables. The four dependent variables are *LDP Defector*, *DPJ Defector*, *LDP Neutralist* and *DPJ Neutralist*. Specifically, *LDP Defector* represents LDP members who oppose reopening in the Todai-Asahi Survey by selecting "Disagree" or "If must choose, disagree;" I coded the LDP defectors with 1 and other LDP

members with 0. By contrast, DPJ defector support plant reopening and are assigned with 1 under *DPJ Defector*, while other DPJ members with 0. For the variables *LDP Neutralist* and *DPJ Neutralist*, I code candidates who selected "Can't say one or the other" with 1 and others with 0. Notice that in the tests, I only include members of the corresponding party shown in the dependent variable. For instance, in the test with *LDP Defector* as the dependent variable, the observations only include LDP candidates.

For independent variables and control variables, I include the same variables as in the previous study on candidate position-taking: I use prefectural and corporate subsidies, district distance to the closest nuclear power plant, and district employment composition in agricultural, manufacturing and electrical power sectors as independent variables, whereas age, gender and term as control variables. I dropped *Party Affiliation* because there is no variation in candidates' party affiliation in each individual test.

Results

Table 2 shows the results of the linear regressions. Models (1) and (2) respectively summarize which factor causes LDP and DPJ members to defect from the party line, and Models (2) and (4) show what compel candidates to take a neutral position on plant reopening. Overall, the results show that male LDP candidates are less likely to defect from the party line than female LDP candidates, while DPJ male candidates are more likely to defect than their female counterparts. Moreover, senior LDP candidates are less likely to take an ambiguous, neutral position than junior LDP members. The third finding is that in districts where the plant-related subsidy is high at the prefectural level, DPJ candidates tend to defect from the party line by supporting plant reopening. I will interpret each finding in detail below.

Firstly, the results indicate that female LDP candidates and male DPJ candidates are more likely to defect from the party line. Model (1) and Model (3) shows that being a male candidate decreases an LDP member's likelihood to defect by 14.7% and increases a DPJ member's possibility of defection by 27.3%. That is to say, male LDP candidates are more likely to align with party platform and support reopening than female LDP candidates. By contrast, male DPJ candidates are more likely to defect by supporting plant reopening than female. This finding conforms with the analysis of gender's effect on position-taking in Part 1: male candidates tend to support reopening while female politicians are more likely to oppose reopening.

Another finding is that politicians may defect from the party line to keep the district's access to plant-related subsidies. Model (3) shows that an increase of 1 billion yen (roughly equals 1.25 million USD in 2012) in the nuclear plant subsidy at the prefectural level can increase the likelihood by 3% for DPJ candidates to defect and support plant reopening. For districts with prefectural subsidy less than 0.1 billion yen, the effect of monetary incentive is miniscule and thus neglectable. However, in plant-hosting prefectures where plant-related subsidy ranges from 10 to 15 billion yen, DPJ candidates may have a large enough incentive to reject the party platform and instead support plant reopening.

In order to verify this finding, I use a conditional density plot to visualize the effect of plant-related subsidy on DPJ candidates. **Figure 5** plots the value of plant-related subsidies in billion Japanese Yen distributed to a prefecture on X-axis and DPJ candidates' position-taking on Y-axis. As the plot shows, in districts with plant-related prefectural subsidy above 7 billion yen, the possibility of defection by DPJ members is very high
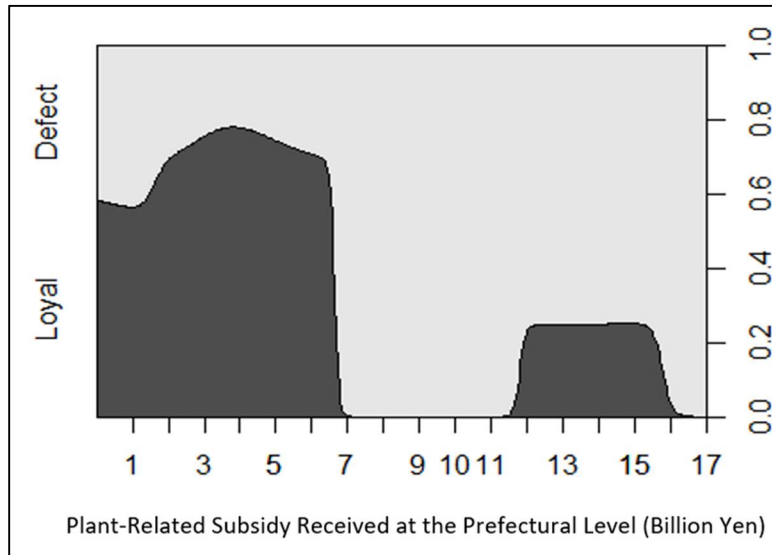
Table 2 Candidate Defection from the Party Line and Ambiguous Positioning

	(1) LDP Defector (Oppose Reopening)	(2) DPJ Defector (Support Reopening)	(3) LDP Neutralist	(4) DPJ Neutralist
Subsidy				
Corporate Subsidy (1-3 Tier)	-0.039	0.014	0.046	-0.003
	(0.027)	(0.061)	(0.046)	(0.060)
Prefectural Subsidy (billion yen)	0.007	0.031**	-0.006	-0.012
	(0.006)	(0.013)	(0.010)	(0.012)
Plant Proximity				
District Distance to Closest Plant (mile)	-0.0003	0.0005	-0.00002	0.001
	(0.0004)	(0.002)	(0.001)	(0.002)
District Employment Composition				
Agricultural Workers Share (%)	0.001	-0.012	-0.0003	0.011
	(0.004)	(0.011)	(0.007)	(0.011)
Manufacture Worker Share (%)	0.002	0.006	-0.003	0.002
	(0.003)	(0.006)	(0.004)	(0.005)
Electrical Worker Share (%)	-0.005	0.178	0.113	0.035
	(0.089)	(0.184)	(0.155)	(0.182)
Candidate Control Variables				
Age	-0.001	-0.001	0.003	-0.006
	(0.002)	(0.005)	(0.003)	(0.004)
Male	-0.147**	0.273**	0.134	-0.016
	(0.060)	(0.131)	(0.103)	(0.129)
Term	0.001	-0.009	-0.030**	0.027
	(0.007)	(0.023)	(0.013)	(0.022)
Constant	0.249*	0.037	0.093	0.462
	(0.128)	(0.297)	(0.221)	(0.294)
Observations	285	173	285	173
R^2	0.042	0.091	0.036	0.027
Adjusted R^2	0.011	0.041	0.004	-0.026
Residual Std. Error	0.271 (df = 275)	0.484 (df = 163)	0.470 (df = 275)	0.480 (df = 163)
F Statistic	1.355 (df = 9; 275)	1.807* (df = 9; 163)	1.133 (df = 9; 275)	0.509 (df = 9; 163)

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Same as **Table 1**

Figure 5 Conditional Density Plot for DPJ Defection by Prefectural Plant-Related Subsidy

Note: The X-axis represent the nuclear power plant-related subsidy received at the prefectural level for a district. The Y-axis represent whether DPJ candidates defect from the party line (assigned with 1) or not (assigned with 0). The shaded region shows the probability for DPJ candidate to defect, while the white? region indicates the possibility for DPJ candidates to stay loyal.

Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid.*, and 電源立地地域対策交付金を活用した事業概要の公表について [Project Summary of the Application of the Subsidy for Power-Source Hosting Region], Ministry of Economy, Trade, and Industry, 2019.

Defection from the party line in highly subsidized districts could be a campaign strategy for DPJ candidates. If the shutdown of nuclear power plants continues, plant-related subsidies could be ceased accordingly. It is possible that the majority voters in heavily subsidized districts are reluctant to give up their vested interests in nuclear power plants. In such districts, therefore, politicians opposing plant reopening are likely to be unpopular. Similar situation occurred in the Postal Privatization debate: many LDP candidates rebelled against the party leadership because the party platform conflicted with the interests of their core constituencies (Nemoto et al 2008). It is possible that the DPJ candidates faced the same dilemma on the issue of plant reopening. As a result, in order to win the election, DPJ candidates may choose to defect from the party line and support plant reopening when the districts receive high plant-related subsidy.

However, the above explanation is insufficient to account for the null results of the corporate subsidy. Why does the corporate subsidy have no clear effect on the DPJ candidates' pattern of defection? There could be multiple explanations. First, since the LDP is known to be pro-business and has been in power for a long time, the LDP politicians might have a deeper vested interest in and more access to the corporate subsidy, leaving little space for their DPJ counterparts to effectively access the same monetary aid (Curtis 1998; Cowhey 1995; Catalinac 2016).

Another interpretation is based on the majoritarian system's effect on candidates' campaigning. Running in single-member districts, candidates need to attract the majority vote to win the election. Compared to the corporate subsidy distributed only to a few firms, plant-related prefectural subsidy may benefit the general public with projects such as infrastructure maintenance and hospital construction (METI 2019). Therefore, the prefectural subsidy may help mobilize a larger multitude of voters who benefit from these public projects. Amy Catalinac also points out in her study on programmatic campaigning that after the electoral reform from a proportional representative system to a mixed-member majoritarian system, candidates began to shift their focus from pork subsidy distribution to programmatic welfare in campaign promises (Catalinac 2016). Therefore, in order to win in a majoritarian system, DPJ candidates are likely to weigh the prefectural subsidy with more importance than the corporate subsidy.

The last finding is that senior LDP candidates are less likely to take ambiguous positions. Combined with the finding in Part 1, the tests show that senior LDP candidates are less likely to take ambiguous positions and more likely to support plant reopening than junior ones. I interpret this result similarly as the previous analysis on candidates' position-taking: Firstly, senior LDP candidates tend to have a deeper vested interest in nuclear power plants than junior ones. In addition, since they have won elections by virtue of party endorsement and support in previous

elections, by demonstrating loyalty on the issue of nuclear energy, senior LDP candidates may wish to maintain the party support in future elections. For these two reasons, senior LDP candidates are less hesitant to support the party platform than junior ones.

However, this finding contradicts the existing study of candidate defection in Japanese political parties. Nemoto et al's research on candidates' rebellion against the party leadership show that within the LDP, both junior and senior candidates are more likely to defect from the party line than mid-career candidates (Nemoto et al 2008). Two reasons may explain the gap between our findings. First, Nemoto et al's research focus on LDP candidates' defection over the Postal Privatization in 2005, a dissimilar issue from nuclear plant reopening. Therefore, it is possible that the pattern of candidates' defection differs based on the issue characteristics.

Second, the gap might emerge because the threats to senior LDP members' vested interest came from opposite directions. In the debate of Postal Privatization, senior LDP candidates rebelled against the party leadership and opposed the reform because they have deep vested interest in the existing system. By contrast, on the issue of plant reopening, senior LDP candidates stay loyal possibly because the party agenda helps secure their vested interest. In other words, senior LDP candidates' behaviors in policy debates, i.e., aligning with or defecting from the party line, depend on whether the party platform threatens their vested interests; they tend to take the position that helps maintain their vested interests.

Summary

In this part, I explore who, among the LDP and DPJ candidates, are more likely to defect from the party line and who are more likely to take ambiguous positions. The results indicate that

gender is a critical factor influencing defection: male LDP candidates are more likely to stay with the party platform to support plant reopening compared with female LDP candidates, while male DPJ candidates are more likely to defect from the party line and support reopening compared with their female counterparts. The overall pattern demonstrates that male candidates tend to support plant reopening compared to female candidates, regardless of their party platforms.

In addition, the results manifest the power of plant-related subsidy on DPJ candidates: with higher prefectural subsidy related to the nuclear power plant, DPJ candidates are more likely to defect from the party line and support plant reopening. The third finding is that senior LDP candidates are less likely to take an ambiguous position on plant reopening. Together with the results discussed in the previous part, I argue that senior LDP candidates are more decisive in their alignment with the party platform because they have vested interest in nuclear power plants and intend to maintain the party support in further elections.

In the last part of this chapter, I will shift my analysis from individual candidates to the 300 single-member districts in the 2012 Japanese Lower-House election. My goal is to explore how district attributes and the level of electoral competition affect the position difference of the top-two candidates.

The Puzzle

In the first two parts of this chapter, I primarily focused on individual candidates' position-taking on plant reopening. Though it allows me to explore the effect of personal characteristics and party affiliation on candidates' position-taking, this research design fails to include a critical factor of an election—that is, the existence of rival candidates who run in the same district. In a majoritarian electoral system, candidates need to receive more than half of the vote share to win the election. Therefore, in order to win a majority, candidates sometimes need to revise agenda to attract swing voters or even core constituencies of their rivals (Williams 2015). In other words, candidates are more likely to mutually influence each other in campaign tactics and election promises in a majoritarian system. For this reason, I must not ignore the effect of the rival candidate in my research. Therefore, in this chapter, I will mainly focus on district level competition instead of individual candidates.

One renowned theory on electoral competition is the median voter theorem, which states that candidates in a majoritarian system take policy position consistent with that "most preferred by the median voter (Black 1948; Downs 1957)." This theory predicts that, with two running candidates and voters only voting for a single issue, both candidates will converge their position onto the point mostly preferred by the median voter. Does this model fit the case in Japanese elections? In each single-member district, do the top-two candidates converge in their position-taking on plant reopening?

To explore these questions, I again use candidate's position-taking on nuclear plant reopening in the Todai-Asahi Survey. I calculated the position difference between the top-two candidates in each district on a five-point Likert scale. **Figure 6** visualizes the position difference on plant reopening of the top-two candidates in Lower-House districts. As **Figure 6** shows, the Japanese case in fact conforms with the median voter theorem: among the 276 districts where the top-two candidates both responded to the survey, more than half have position difference less than 2 Likert-scale points; only 42 districts, roughly 15.2% of the 276 districts, have more extreme position differences of 3 or 4 points.

Figure 6: Position Difference on Plant Reopening of the Top-Two Candidates in 276 Single-Member Districts in 2012 Japanese Lower-House Election
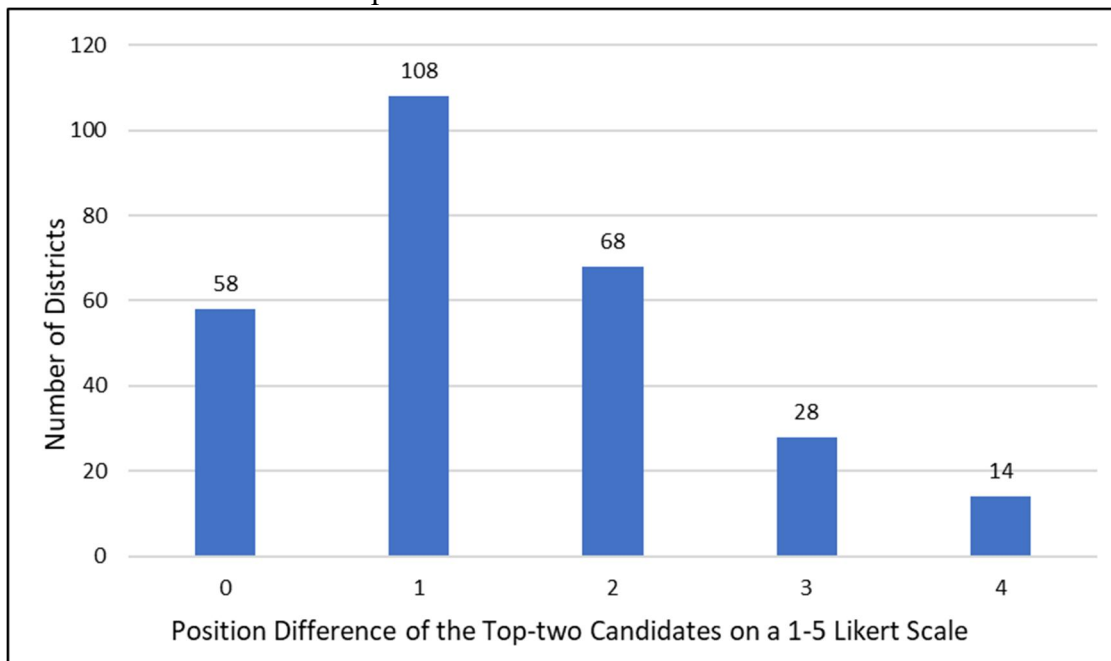
Note: The X-axis represents the distance of the top-two candidates' position taking on plant reopening on a 1-5 Likert Scale. The Y-axis represent the number of districts with the corresponding position difference between the top-two candidates.
Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid*.

Unable to gather the voter data at the district level, however, I cannot test whether the convergence of candidate position moves toward the median voter. Still, it is fair to say that on the

issue of plant reopening, the majority of single-member districts follow the prediction of median voter theorem that the top-two candidates tend to converge in their position-taking.

Yet, even though the median voter theorem fits well in the Japanese case, the cause of candidates' position convergence remains unclear. Therefore, in the remaining of this chapter, I aim to explore the following question: what causes the top-two candidates to converge in their position-taking? My hypothesis is that in districts with high level of electoral competition, the top-two candidates tend to converge in their position-taking on plant reopening. I will elaborate this hypothesis in the following section.

Hypothesis: *Electoral Competition Hypothesis*

My hypothesis is that the level of electoral competition at the district level affects the distance of position taking between the top-two candidates. Specifically, in districts with high level of electoral competition, the top-two candidates tend to converge in their positions on plant reopening. This hypothesis is built on the same logic of the median voter theorem: when the level of electoral competition in a majoritarian system is high, a candidate's position is likely to converge with his or her rival's because both try to attract the majority of voters. On the other hand, when running against weak competitors, candidates do not necessarily need to revise their agenda to appeal to the median voters. Based on this rationale, I expect districts with high level of electoral competition end up with position convergence on plant reopening.

Data, Variables and Estimation Strategies

Like previously, I test the *Electoral Competition Hypothesis* with multivariate linear regressions with four dichotomous dependent variables: *Position Difference*, *Position Convergence*, and *Position Divergence*. *Position Difference* represents the distance between the top-two candidates' positions on plant reopening on a five-point Likert scale; the variable could range from 0 to 4. For instance, if Candidate A selected "Agree" and Candidate B chose "If must choose, disagree" in the Todai-Asahi Survey, then Candidate A takes a position 3 Likert-scale points higher than Candidate B; their position difference is 3 points. The higher the position difference, the more distance there is between the two candidates' positions.

Position Convergence shows whether the top-two candidates converge in their positions on plant reopening. Candidates converge in their positions when they take similar position on reopening—that is, if the top-two candidates both support or oppose plant reopening, their positions converge. Districts with converging position-taking is coded as 1, whereas those without position convergence as 0

Position Divergence indicates whether the top-two candidates diverge in their position-taking on plant reopening. In contrast to *Position Convergence*, candidates diverge when they take dissimilar positions. For example, if one candidate selected "agree" in the Todai-Asahi Survey and the other candidate "If must choose, disagree," then the two candidates diverge in their position-taking. Districts with position divergence is coded as 1 while district without position divergence is assigned with 0. Notice that if either candidate takes a neutral position by selecting "Can't say one or the other," the district is not identified as position divergence due to the ambiguous positioning.

In order to calculate *Position Convergence* and *Position Divergence*, I recode the positions on the five-point Likert scale into three new categories: *support* (4 or 5 points on the original Likert scale), *neutral* (3), and *oppose* (1 or 2). If both candidates oppose or support reopening, then I would define this situation as a position convergence. If, for example, a candidate supports reopening while the other one opposes, then this is a case of position divergence.

However, the existence of the neutral position (3 points on the original Likert scale) creates more complications. Since the neutral position represents "Can't say one or the other" in the survey question, I treat it as ambiguous positioning. For Divergence, as mentioned above, I excluded all districts with either candidate taking the neutral position because one cannot diverge from a candidate with an ambiguous stance. For Convergence, I run two models, one model including and the other excluding neutral position in the test.

The purpose for using two models to test *Position Convergence* is that I do not know, empirically, what causes the convergence to the neutral position. Since the neutral position does not deliver clear message to the voters, I doubt such ambiguous positioning help attract swing voters.

Yet, Tomz and Houweling's research contradicts my assumption. Their study shows that ambiguous positioning can be a winning strategy in partisan elections. Specifically, they find that voters who feel uncertain about their own policy preference may embrace candidates with ambiguous positions (Tomz and Houweling 2009). Therefore, in the case of the nuclear plant reopening, candidates may take an ambiguous position to attract voters without clear preference on plant reopening. For this reason, I prepare two models to test candidate position convergence: Model (2) counts position convergence to the neutral position as convergence, while Model (3) does not.

To test my hypothesis about level of electoral competition, I employ a new independent variable: *Margin of Vote*. *Margin of Vote* represents the vote margin by percentage of each electoral district in the 2012 Lower-House election. For control variables, I use the following factors: district corporate subsidy, district prefectural subsidy, district distance to the closest nuclear plant, district share of agricultural worker, district share of manufacturing worker, and district share of electrical worker.

Results

Table 3 shows the results of the regression. Model (1) summarizes how each factor affects the position difference of the top-two candidates on a five-point Likert scale. Models (2) and (3) both explain position convergence, but they differ in the measurement of convergence. In Model (2), I count the convergence to the neutral position as position convergence, while in Model (3) I dropped district cases where the both candidates took neutral positions. Finally, Model (4) shows the results for position divergence between the top-two candidates in each single-member district.

Overall, the results disprove the *Electoral Competition Hypothesis*: all of the four models indicate that the level of electoral competition has no clear effect on the top-two candidates' relative position distance. Together with the previous findings, the null results imply that party discipline might be a more critical determinant than electoral competition. In other words, party discipline may effectively restrain candidates from shifting positions or converging to their rivals.

Table 3 Top-Two Candidates' Position-Taking at the District Level, 2012 Lower-House Election

	(1) Position Difference (1-5 Likert Scale)	(2) Position Converge (Including Neutral)	(3) Position Converge (Excluding Neutral)	(4) Position Diverge
District Election Tightness				
Margin of Vote (%)	0.008	-0.001	0.001	0.002
	(0.005)	(0.002)	(0.002)	(0.002)
Subsidy				
Corporal Subsidy (Billion Yen)	-0.140	0.046	0.009	-0.013
	(0.110)	(0.046)	(0.041)	(0.042)
Prefectural Subsidy (Billion Yen)	-0.006	0.008	0.012	-0.013
	(0.024)	(0.010)	(0.009)	(0.009)
Plant Proximity				
District Distance to Closest Plant (mile)	-0.0004	-0.0004	-0.0004	0.001
	(0.002)	(0.001)	(0.001)	(0.001)
District Employment Composition				
Agricultural Worker Share (%)	0.023	-0.002	-0.007	0.014**
	(0.015)	(0.006)	(0.006)	(0.006)
Manufacture Worker Share (%)	-0.019*	0.005	0.005	-0.006
	(0.010)	(0.004)	(0.004)	(0.004)
Electrical Worker Share (%)	-0.312	0.101	0.078	-0.114
	(0.359)	(0.152)	(0.138)	(0.138)
Constant	1.645***	0.215*	0.135	0.289**
	(0.303)	(0.124)	(0.113)	(0.113)
Observations	276	300	300	300
R^2	0.054	0.030	0.027	0.053
Adjusted R^2	0.029	0.007	0.004	0.030
Residual Std. Error	1.066 (df = 268)	0.468 (df = 292)	0.425 (df = 292)	0.425 (df = 292)
F Statistic	2.186** (df = 7; 268)	1.300 (df = 7; 292)	1.172 (df = 7; 292)	2.334** (df = 7; 292)

Note: *p<0.1; **p<0.05; ***p<0.01

Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid.*, and "Employment composition by industry and gender at the district level," *ibid.*, and "第 46 回衆議院議員選挙 [The 46th Lower-House election]," Senkyo.com, 2018.

Another cause for the null results could be the violation of assumptions required by the model. The median voter theorem has several assumptions that are unfulfilled in the 2012 Japanese Lower-House election. For instance, the model requires the presence of only two party, while more than two parties participated the 2012 election. Grofman also points out in his study on two-party convergence that the standard Downsian convergence may disappear when one or more of the assumptions is violated (Grofman 2004). Therefore, it possible that the expected position convergence fails to show in districts with high level of electoral competition due to the discrepancy between the model and reality.

Though my hypothesis proves to be wrong, there are several unexpected findings. Firstly, Model (1) shows that the share of manufacturing worker may affect the position difference between the top-two candidates. Specifically, the results reveal that the position distance between the top-two candidate will reduce by 0.19 point if the share of manufacturing workers increases by 10%.

My assumption is that this position convergence occurs toward support for reopening. As I explain previously, the manufacturing sector benefits from nuclear power plants for lower cost of electricity. Therefore, I predict that in manufacturing-based districts, the top two candidates are likely to converge their positions toward support for plant opening.

In order to test this hypothesis, I regroup the top-two candidates in each district into two categories: Category 1 contains candidates with relatively higher support for plant reopening compared with their rival candidates in the same district, and Category 2 includes candidates with relatively lower support. Then I visualize the data on a scatterplot with the two categories of candidates as the dependent variables and the share of manufacturing worker as the independent variable. The distribution is presented in **Figure 6**. The results in **Figure 6** proves my prediction:

the trendlines of the distributions of the two groups of candidates' position-taking converge with the increase of the share of manufacturing workers at the district level. In other words, the distance between the top-two candidates' position-taking is more likely to decrease when the share of local manufacturing worker grows. In this case, the local manufacturing sector proves effective in affecting candidates' position-taking on the issue of plant reopening.

Figure 6 Position on Plant Reopening of the Top-two Candidates from 276 single-member districts in the 2012 Japanese Lower-House Election by District Share of Manufacturing Worker
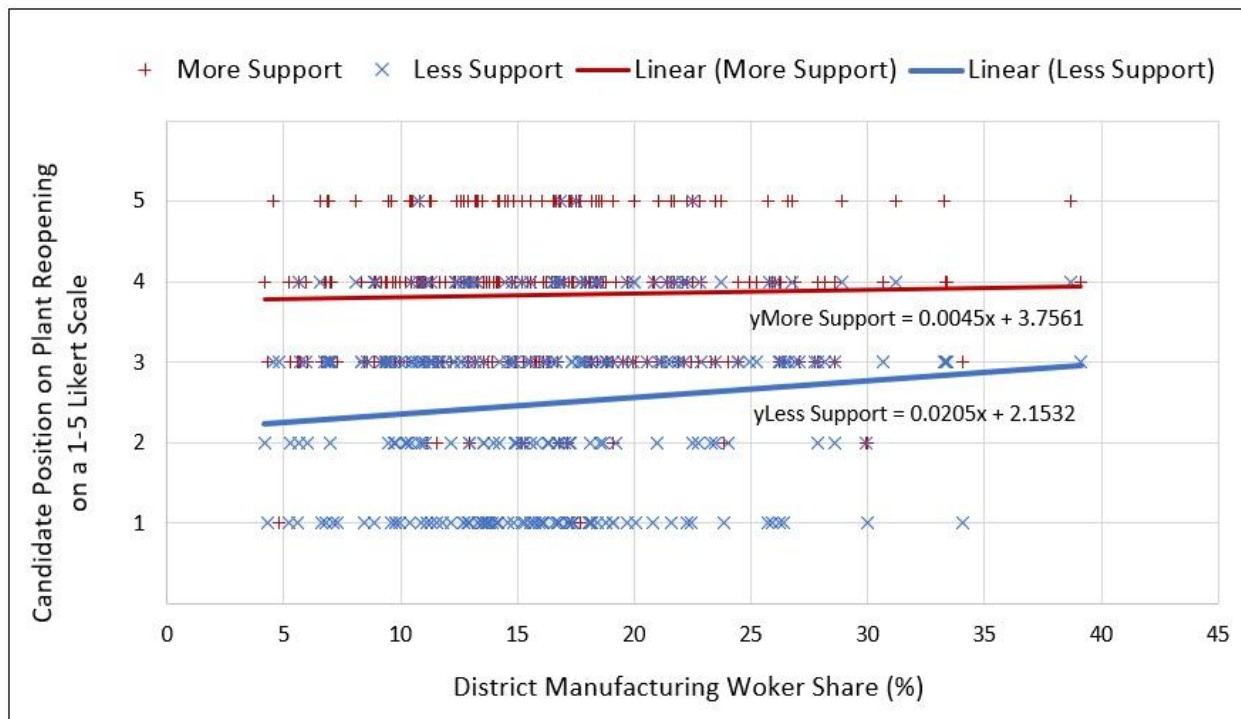
Note: The X-axis represent the employment share of manufacturing workers in a district. Y-axis represents candidates' position-taking on plant-reopening on a 1-5 Likert scale. The red, "+" markers represent the position-taking of the candidates who had relatively higher support for plant reopening among the top-two candidates in a district. The blue, "×" markers represent the position-taking of candidates with relatively lower support.
Source: "The UTokyo-Asahi Survey of 2012 Japanese Lower-House Election", *ibid.*, and "Employment composition by industry and gender at the district level," *ibid.*

Another finding is that the share of agricultural worker is associated with *Position Divergence*. According to the results in Model (4), when local share of agricultural worker increases by 1%, the top-two candidates become 1.4% more likely to diverge from each other in
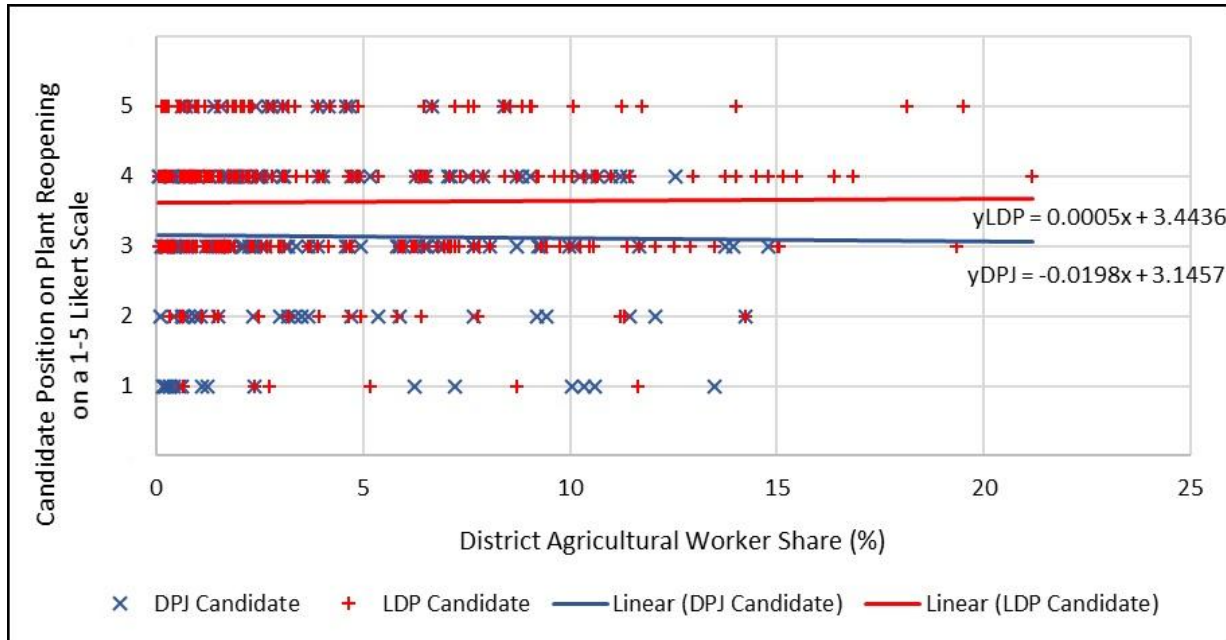
their position-taking on plant reopening. This phenomenon, I predict, is caused by DPJ's platform on agricultural sectors. In the 2009 Japanese Lower-House election, DPJ targeted agricultural households in rural regions and successfully secured seats in traditionally LDP-supporting agricultural regions. As explained previously, not only Fukushima farmers but also the whole agricultural business in Japan heavily suffered from the nuclear accident. Therefore, agricultural workers are expected to oppose nuclear reopening, a position conforms with DPJ's party platform. As a result, I assume that in agriculture-based districts, DPJ candidates tend to target voters engaged in agricultural production by decisively opposing plant reopening. My hypothesis is that, if a district has a higher share of agricultural worker, DPJ candidates will show more opposition to plant reopening.

In order to test this hypothesis, I visualize the distribution of DPJ candidates' position-taking on plant reopening on a scatterplot. I also include the LDP candidates' position-taking as a benchmark. **Figure 7** shows the distribution of LDP and DPJ candidates' positions based on the share of agricultural workers at the district level. The trendline of DPJ candidate position distribution has a negative coefficient. This proves my hypothesis that DPJ candidates tend to oppose more on the issue of plant reopening when the district shares of agriculture worker increase.

On the other hand, the distribution of LDP candidates' positions seems constant regardless of the share of agricultural worker. There are two possible explanations for this pattern. One interpretation is that most LDP candidates ignored agricultural sectors and instead targeted other industries in the election of 2012. However, since LDP's core constituencies are mostly located in rural regions, it is unlikely for the LDP to abandon its strongholds. Therefore, I assume LDP candidates appeal to agricultural producers with a different approach compared to DPJ candidates. Instead of opposing plant reopening, LDP candidates may distribute pork subsidy to maintain the

support from agricultural workers, a clientelist strategy frequently adopted by their party (Scheiner 2006). Therefore, the more likely interpretation is that agricultural producers receive other benefits that are able to offset the negative impact of LDP candidates' support for plant reopening.

Figure 7 Top-Two Candidates' Position-Taking on Nuclear Plant Reopening by Party Affiliation and by the Share of Agricultural Worker

Note: The X-axis represent the employment share of manufacturing workers in a district. Y-axis represents candidates' position-taking on plant-reopening on a 1-5 Likert scale. The red, "+" markers represent the position-taking of the candidates who had relatively higher support for plant reopening among the top-two candidates in a district. The blue, "✕" markers represent the position-taking of candidates with relatively lower support.
Source: Same as figure 6.

Summary

In this Chapter, I study the position difference, convergence, and divergence between top-two candidates in each single-member district on the issue of nuclear power plant reopening. The results disprove my hypothesis and indicate that the level of electoral competition has no clear effect on the position convergence.

However, the results show that employment composition effectively affect the difference of position-taking by electoral candidates. Specifically, the top-two candidates are likely to converge their position toward supporting plant reopening in manufacturing-based districts in order to appeal to manufacturing workers. Another finding is the top-two candidates tend to diverge in position-taking in districts with high shares of agricultural worker. My explanation is that DPJ candidates are more likely to show strong opposition in agricultural production-based districts to in order to appeal to agricultural producers, whereas LDP candidates do not share this pattern.

In the next chapter, I will conclude my thesis by reviewing my findings, introducing Japan's post-Fukushima energy structure, and predict the future of nuclear energy in Japan.

Chapter 5: Conclusion

This thesis studies Lower-House candidates' position-taking on nuclear power plant reopening after the Fukushima Nuclear Accident. Using multivariate regressions, I test my hypotheses of three inputs: candidate characteristics, district attributes, and party affiliations. The results show that in most situations, candidates' position-taking on plant reopening is associated with personal characteristics and party affiliations, but not with district attributes. Specifically, I find that male candidates are more likely to support nuclear energy than female candidates, and senior candidates tend to support plant reopening more than junior ones. Moreover, the LDP has a stronger party discipline than the DPJ, which effectively restrains LDP candidates from defection from the party line on the issue of plant reopening.

Still, there are a few cases in which electoral candidates choose to represent the voters' interests. For instance, I find that because the manufacturing sector benefits from the low electricity price maintained by nuclear energy, the top-two candidates in manufacturing-based districts tend to converge their positions toward support for plant reopening. Another example is that DPJ candidates tend to show strong opposition to plant reopening in agricultural based districts to represent farmers' interests.

Back to the puzzle addressed in Chapter 2: why is there a mismatch between the public opinion and politicians' position-taking on nuclear power plant reopening? I attribute this mismatch to the imbalance of pressure from the three inputs of the electoral candidates: their own financial incentives, parties, and voters. My findings demonstrate that the Lower-House candidates tend to perceive the first two inputs critical for winning election and often neglect the voters' interests.

A more interesting phenomenon is that voters failed to effectively punish the candidates who did not represent their interests: as the election result shows, candidates supporting plant reopening still received high voter support. Why did voters refuse to punish these candidates in elections? A possible answer is that they do not have a strong enough incentive to do so. Among Japanese citizens, other concerns may outweigh their unease about nuclear safety. As several public opinion surveys indicate, most Japanese voters cast ballots based on the economic or welfare policies instead of energy plans (*Asahi Shimbun* 2012c; AFPFE 2013). As a result, it is possible that candidates supporting plant reopening were still able to win election due to their appealing campaign promises in other fields. Afterall, democracy has its limits: in most cases, only the aggregated interests are represented.

Moreover, potential response bias may give rise to inaccuracy of the opinion poll. Frequently witnessing the suffering of the local community from the Fukushima Incidents on mass media, responders supporting nuclear energy may feel pressure from society. Therefore, they might hide their support for plant reopening and give a more socially desirable response. A similar case would be the inaccurate polls of the 2016 US Presidential election: responders were more likely to conceal support for Donald Trump than for Hillary Clinton because they felt the former was less socially acceptable (Brownback 2018; Enns 2017).

Limitation, Improvement and Future Research

This thesis has several limitations. Firstly, the measurement of some variables is inaccurate. For example, my measurement for plant proximity has a larger margin of error in larger districts. Moreover, unable to gather data on the value of plant-related subsidies at the district level, I have

to use the subsidy amount at the prefectural level to infer the district-level data, a design that may give rise to ecological inference issues. I hope to develop better solutions in future studies.

This thesis can also be improved by including quantitative data on voters' opinion. My initial plan was to compare candidates' position-taking with voters' opinion on plant reopening to test whether candidates effectively represent voters' interests. Unfortunately, the sample size for the voter data at the district level is too small to accurately approximate the population. Therefore, I can only employ substitutes such as employment shares to indicate voters' interests.

In future research, I plan to expand my empirical analysis to the elections after the 2012 Lower-House election: can my findings on candidates' position-taking be applied universally in Japanese electoral politics? Another topic I would like to explore is the change of candidates' position-taking. Specifically, what may cause the same candidates to shift or maintain their position-taking on plant reopening in different elections? Answering these questions may help me better understand energy and electoral politics in Japan.

Post-Fukushima Era and the Future for Japan's Nuclear Energy

How long-lasting are the impacts of the Fukushima Incident? Some still prove salient after nearly a decade from the nuclear accident. By September 2018, there were still roughly 58 000 nuclear evacuees displaced. Among them, many voluntary evacuees were forced to return to their hometowns with the government financial support withdrawn (The McCurry 2017; *Mainichi Shimbun* 2018; *Sankei Shimbun* 2018).[4] Moreover, Japanese food producers still struggle to restore their reputation in the international market. Even today, the US Food and Drug Administration

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[4] Residents within the 20-kilometer radius evacuation zone were forced to evacuated. "Voluntary evacuees" refer to those residing outside of the evacuation zone but voluntarily evacuated after the Fukushima Incident.

imposes restrictions on various Japan-imported agricultural products; Taiwan even banned of food imports from five Japanese prefectures (FDA 2019; Ko 2017).

The Fukushima Incident also reorganized Japan's energy structure. After the shutdown of all nuclear power reactors, Japan began to rely heavily on imported fusel fuels to fulfill the domestic energy demand. This energy crisis is partially alleviated by the expansion of renewable energy. Under the new Feed-in Tariff Scheme, renewable energy producers are able to sell electricity with long-term fixed-price contracts guaranteed by the government (METI 2012). Due to this incentive, investors crowded into the Japanese renewable market. Moreover, in order to stabilize the electricity price, Japanese government liberalized the electricity retail market. In 2016, the retail electricity market became completely free for competition, which effectively helped bring down the electricity price (METI 2018).

Yet, renewable energy and system reforms are inefficient to tackle the energy crisis. Renewable energy cannot provide a stable power supply, whose output fluctuates due to weather conditions. Moreover, despite its booming market, renewable energy contributes less than 10% of the total electricity generation in Japan. Most of the gap resulted from nuclear power plant shutdown is filled by imported LNG and oil (METI 2015). System reforms, though helps stabilizing the electricity price, do not necessarily increase energy supply. Without qualified substitutes for nuclear energy, Japan's energy self-sufficiency rate dropped from 20.2% in 2010, before the Fukushima Incident, to 8.3% in 2016 (METI 2017).

Japanese government offers a simple but controversial solution to the energy dilemma: readopting nuclear energy. The incumbent Abe cabinet strives to promote nuclear energy and restart the closed nuclear power plants. In 2014, the Abe administration halted the projects of phasing out nuclear energy, a program initiated by the previous DPJ-led government (*Asahi*

Shimbun 2018). Recently in the 2018 Strategic Energy Plan, the government announces its ambition to reconstruct the energy mix: by 2030, the ratio of nuclear energy is targeted to be at least 20%, a goal requires at least thirty nuclear reactors operating. (Sekine 2018; METI 2018b).

By February 2019, nine of the forty-two operable nuclear reactors have already been reactivated (WNA 2019). If the LDP continue to win future elections, the government is likely to maintain the current energy policies. In that case, a new wave of nuclear power plant restarts is possibly unavoidable.

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