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Non-converging Policy Competition under Agenda Control

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박 준 태

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이 논문을 석사학위논문으로 제출함.

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Abstract

Non-converging Policy Competition under Agenda Control

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The electoral competition takes two steps in real world. The first stage is policy suggestion stage, and the second stage is advertisement or agenda control stage. Since the forward looking behavior about the advertisement affects to the policy platform suggestion stage, the agenda control possibility should be incorporated. I incorporated the two stages in a three-dimensional policy space. In the model, parties try to sway relative issue salience weight through advertisement efforts with an intention to maximize expected vote-share. The agenda control possibility results in a non-converging policy suggestion decision in the first stage. This divergent result is congruent with the recent empirical research on the electoral competition and campaign spending.

Keywords : Electoral competition, Policy competition, Multi-dimensional policy space, Agenda control, Political polarization

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1 Introduction

In a democratic society, the electoral competition in voting process takes important role. It aggregates heterogeneous individual preferences into social decision. Regarding this issue, the optimal policy platform suggestion decision during the electoral competition has long been an important research agenda in political economy literature. The spatial theory of electoral competition begins with the seminal work by Hotelling (1929). According to the earliest contributions of Hotelling (1929) and Downs (1957), when each candidate chooses its policy platform with the purpose of maximizing the probability of winning the competition, the election game has a unique Nash equilibrium, where both candidates announce the same platform, the ideal point of median voter's.

As Duggan (2005) states in his survey paper, the convergence result could also be extended to the multi-dimensional policy spaces, in some restrictive conditions. When candidates are uncertain about voter's preferences – stochastic preference model – provided that they share a common prior about the location of the median ideal point, policy platforms converge to the estimated median voter's ideal point. Duggan (2005) says the equilibrium outcome as '*Generalized median in all directions*'. However, Herrera et al (2008) refers recent empirical literature and suggests both political polarization and the increase of campaign spending as stylized facts, which are not consistent with the 'Median Voter Theorem'.

I suggest the possibility of agenda control[1] could be a starting point to break through the incongruity. In a multi-dimensional policy space, each voter considers relative importance of each issues - issue salience - when (s)he chooses for which

[1]The behavior of candidates to manipulate the relative issue salience of voters' is called agenda control behavior.

candidates to vote. In response to the voter's behavior, an extensive literature documents that political parties, with an intention to maximize the probability of winning the election, make advertisement effort to manipulate issue salience weights. Thus, optimal advertisement behavior of candidates by selectively emphasizing various policy issues should be incorporated into the analysis on the electoral competition, particularly in the multi-dimensional policy spaces.

With this motivation, I characterized the voting process as a two-stage game – policy platform suggestion stage and advertisement stage – rather than a policy-suggestion-one-stage game and solved it through subgame perfect equilibrium. The characterization itself is not new. Aragonès et al (2015) suggests sequential framework by separating a policy quality decision stage and a communication stage. However, Aragonès et al (2015) has limitation in that it treats policy as an ideologically neutral one and fails to make a close link with the policy convergence result, thus fails to deal with aforementioned incongruity - policy polarization, or policy divergence. Dragu and Fan (2015) deals with the optimal advertisement behavior of parties, but neglects the policy-platform-suggestion stage and assumes policy is fixed.

My contribution is to develop the traditional spatial theory of electoral competition to incorporate the agenda control behavior under the assumption that the number of issues is three; the ideal points of voters' are multivariate-normally distributed; the candidates also have their own ideal positions in each issue; the objective of candidates' is to maximize expected vote-share. The equilibrium results shows that the forward looking behavior of candidates at the policy suggestion stage makes two candidates suggest different policy platforms from each other. The key factor driving the result is the finding that two candidates would never

advertise the same issue at the same time, which is consistent with the analysis on the agenda control behavior by Dragu and Fan (2015). This makes only two issues would survive as meaningful criteria when voters cast votes.[2] Thus, candidates do not need to make much effort for the other issues, and stick to their own ideal position, which could be a source of policy divergence.

The theoretical findings from the model is some restrictive in that the model only deals with the symmetric case regarding the advertisement ability of candidates'. Additionally, the model assumes the three issues are independent from each other. However, the model suggests theoretical framework which could be a starting point to explain real world observation on the policy polarization and the increase of campaign advertisement.

2 Model

2.1 Environment

The players in the model are two parties and infinitely many voters. The number of issue is three, that is a policy space is multi-dimensional with $i \in \{1, 2, 3\}$, *where* i denotes issues. Each issue has their own salience weight represented by w_i. The way voters take account the issue salience weight when they cast vote for parties will be characterized in detail at the following sections. Then, issue salience vector

[2]With a more generalized parameter values, the third issue may not disappear entirely, thus candidates would make effort to meet the needs of voters'. However, even in this case, we can guarantee that the relative weight of the third issue always decreases from the initial weight, which leads lesser effort of candidates.

can be represented as :

$$W = (w_1, w_2, w_3)' \quad s.t. \quad w_1 + w_2 + w_3 = 1$$

For simplicity, I will assume that each issue is given the same weight, initially - that is, $w_1 = w_2 = w_3 = 1/3$ case. After I introduce the agenda control possibility by parties' advertisement effort, parties will compete to manipulate the initial weight to increase expected vote share. The focus of my model is to analyse the effect of the agenda control possibility on the policy competition behavior of parties.

2.2 Party

There exist two parties denoted by $p : p \in \{A, B\}$. The objective of parties is to maximize expected vote share by suggesting a policy platform in issue i denoted by x_i^p and in a vector notation, $X^p = (x_1^p, x_2^p, x_3^p)'$. However, each party has his own ideological preferences in issue i represented by $o1_i^p$, which implies parties feel costs when they suggest policy platform. In accordance with the assumption on the ideal points of voters' - the ideal preference points of median voter's in each issue are characterized as 0, without loss of generality, I assume that party A is a right-wing party, and party B is a left-wing party, thus $O_i^A > 0$, $O_i^B < 0$ for all i. Additionally, I assume that $|O_1^A| = |O_2^B| < |O_3^A| = |O_3^B| < |O_1^B| = |O_2^A|$, which is a common knowledge for both parties. It represents that party A has ideological advantage in issue 1, in that his preference point is closer to ideal point of median voter's than party B's preference point. With a similar analogy, party B has an advantage in issue 2, and no parties have advantage in issue 3. Further, the amount of advantage is the same in issue 1 and 2, which makes a perfectly symmetric case.

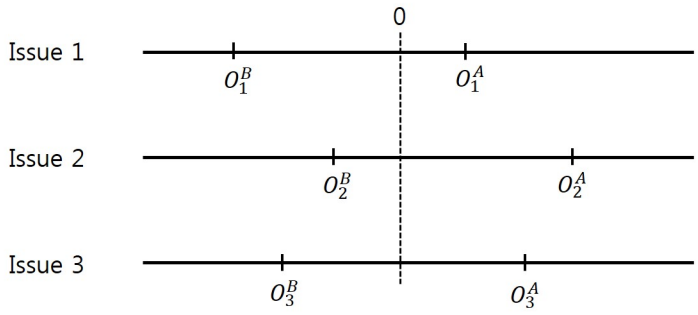

Figure 1: Ideological Preference Points of Parties'

The above characterization can be represented graphically as Figure 1.

If I assume that parties have to face a quadratic cost when they suggest policy platform which is different from their own ideological point, party A's objective function can be represented as following:

$$u^A[v^A(X^A; X^B, W)] - \sum_{i=1}^{3}(O_i^A - x_i^A)^2 \tag{1}$$

where $u^A(\cdot) = u^B(\cdot)$ denotes utility function with regard to expected vote-share for both parties, and v^A denotes an expected vote-share for party A (that is, $v^B = 1 - v^A$). The second term of the objective function represents the quadratic cost of suggesting policy platform. Note that the marginal cost gets higher when the suggested policy is far from ideological preference points of parties'.

2.3 Voter

There are infinitely many voters with continuum of unit 1. Each voter j has an ideal preference point in issue i represented by z_i^j. I assume that the ideal points of voters' follow multi-variate normal distribution. That is,

$$Z \sim N(\mu, \Sigma_{3\times 3}), \quad where \quad Z = (z_1, z_2, z_3)'$$

Parties have information only on the form of distribution and the parameter values μ and Σ, thus each voter j is ex ante identical to parties. In this sense, this model can be interpreted as a *representative voter model with stochastic preference.*

In addition, I will make some technical assumptions on the voter's preferences. Firstly, each issue is normalized with voter's ideal points (i.e. $\mu = (\mu_1, \mu_2, \mu_3)' = 0$). Further, each issue has the same variance and independent from each other (i.e. $\sigma_{11} = \sigma_{22} = \sigma_{33} = \sigma$ and $\sigma_{ij} = 0$ when $i \neq j$). According to Dragu and Fan (2015), the relaxation of these assumptions does not change the key result of the analysis.

Each voter j also considers quadratic costs from when the policy platforms suggested by parties are different from his or her ideal preferences. In detail, voter j votes for party A if and only if the voter feels less costs for party A :

$$\sum_{i=1}^{3} w_i (z_i^j - x_i^A)^2 < \sum_{i=1}^{3} w_i (z_i^j - x_i^B)^2 \tag{2}$$

which can also be written as:

$$\sum_{i=1}^{3} w_i \cdot d_i(z_i^j; x_i^A, x_i^B) > 0 \quad where \;\; d_i(z_i^j) \equiv (x_i^A - x_i^B)(z_i^j - \frac{x_i^A + x_i^B}{2})$$

I can interpret $d_i(z_i^j)$ as representing electoral advantage of party A in issue i. That is, if $d_i(z_i^j) > 0$ party A has an advantage in issue i, if $d_i(z_i^j) < 0$ party B has an advantage in issue i, and if $d_i(z_i^j) = 0$ no parties have an advantage in issue i. The vector notation for d_i is defined as $d(Z) \equiv (d_1(z_1), d_2(z_2), d_3(z_3))$.

2.4 Vote-share

With the assumptions made in the model, vote-share for party A can be calculated as following:

$$v^A(X^A; X^B, W) = \Pr(Z|\sum_{i=1}^{3} w_i \cdot d_i(z_i) > 0) = \Pr(Z|W \cdot d(Z) > 0)$$

Note that the distribution of $d(Z)$ is also multi-variate normal, because $d(Z) = \{(x_i^A - x_i^B)(z_i - \frac{x_i^A + x_i^B}{2}\}_{i=1}^3$, and the only random variable z_i follows normal distribution. Then, by introducing new parameters γ and λ, distribution of $d(Z)$ can be represented as following:

$$d(Z) \sim N(\Gamma, \Lambda)$$

where $\gamma_i = (x_i^A - x_i^B)(\mu_i - \frac{x_i^A + x_i^B}{2})$, and $\lambda_{ii} = (x_i^A - x_i^B)^2 \times \sigma$. Γ and Λ are vector notations for γ and λ, respectively.

Then, by standardization process, an expected vote-share for party A can be represented with cumulative normal distribution. That is,

$$v^A(X^A; X^B, W) = \Phi(\frac{W \cdot \Gamma}{\sqrt{W' \cdot \Lambda \cdot W}}) = \Phi(\frac{\sum_i w_i \gamma_i}{(\sum_i w_i^2 \lambda_{ii})^{1/2}})$$

where $\Phi(\cdot)$ is cumulative normal distribution.

Since both parties' objective is to maximize expected vote-share by suggesting policy, party A's optimization problem is:

$$max_{X^A} \quad u^A[\Phi(\frac{\sum_i w_i \gamma_i}{(\sum_i w_i^2 \lambda_{ii})^{1/2}})] - \sum_i (O_i^A - x_i^A)^2 \tag{3}$$

3 Equilibrium without Agenda Control

3.1 Generalized Median in all Directions

The results by Duggan (2005) is an useful starting point for the equilibrium analysis. Remark that the following definition comes from Duggan (2005).

Definition 1. A policy x is a *generalized median in all directions* if, compared to every other policy y, the voter is more likely to prefer x to y than the converse.

A *Theorem 13 of Duggan (2005)* suggests that in a multi-dimensional policy competition model with vote-share maximizing parties and with representative voter who has stochastic preferences, there exists an equilibrium policy platform suggested by parties (x_A^*, x_B^*) if and only if there exists a 'generalized median in all directions'. Further, the equilibrium is the 'generalized median in all directions' itself.

The only difference of model in this paper is that parties have their own ideological preferences, thus parties have to take into account their costs when they suggest policy platforms. Thus, a natural starting point of an equilibrium analysis is the 'Generalized median in all directions', and to investigate whether parties have an incentive to deviate from the initial policy platform due to their costs.

Note that the policy $\mu = (\mu_1, \mu_2, \mu_3)$ is a unique *'Generalized Median in All Directions'* in this model, because

$$\Pr[Z|\sum_i w_i(z_i - \mu_i)^2 > \sum_i w_i(z_i - y_i)^2] \leq \frac{1}{2}, \quad \forall\, Y = (y_1, y_2, y_3)$$

3.2 Deviation from μ

In this section, I will investigate whether parties have an incentive to deviate from the policy platform, $\mu = (\mu_1, \mu_2, \mu_3)$. Recall that ideological preference points of parties' are represented as

$$O_i^A > 0, \quad O_i^B < 0 \ \forall i$$

$$\text{and} \quad |O_1^A| = |O_2^B| < |O_3^A| = |O_3^B| < |O_1^B| = |O_2^A|$$

Without loss of generality, I will focus only on the party A by symmetry of the model. Considering the distance between party A's ideological preference point and μ, party A's marginal cost of staying at μ is the highest in issue 2. In turn, it means party A has the biggest deviation incentive at issue 2.

The change of the cost of party A's in issue 2 when it suggests a policy in issue 2 slightly different from $\mu_2 = 0$ can be calculated as following:

$$\frac{\partial \sum (O_i^A - x_i^A)^2}{\partial x_2^A} = -2(O_2^A - x_2^A) = 2x_2^A - 2O_2^A < 0$$

The interpretation on the above equation is that at μ, by slightly increase x_2^A, party A can save its cost by $|2x_2^A - 2o_2^A|$, since the new policy is closer to the ideological preference point of party A's.

Now, I have to consider the change of utility when party A deviates from μ. For simplicity in calculating the marginal utility of deviation, I defined a new variable.

$$\begin{aligned} \text{let } \psi &\equiv \frac{w_1\gamma_1 + w_2\gamma_2 + w_3\gamma_3}{(w_1^2\lambda_{11} + w_2^2\lambda_{22} + w_3^2\lambda_{33})^{(1/2)}} \\ &= \frac{w_1(x_1^A - x_1^B)(-\frac{x_1^A + x_1^B}{2}) + w_2(x_2^A - x_2^B)(-\frac{x_2^A + x_2^B}{2}) + w_3(x_3^A - x_3^B)(-\frac{x_3^A + x_3^B}{2})}{(w_1^2(x_1^A - x_2^B)^2\sigma_{11} + w_2^2(x_2^A - x_2^B)^2\sigma_{22} + w_3^2(x_3^A - x_3^B)^2\sigma_{33})^{1/2}} \end{aligned}$$

Then, marginal utility of party A when slightly deviates from $\mu_2 = 0$ while party B is still staying at μ is:

$$\frac{\partial u}{\partial \Phi} \times \frac{\partial \Phi}{\partial \psi} \times \frac{\partial \psi}{\partial x_2^A} = \frac{\partial u}{\partial \Phi} \times \frac{\partial \Phi}{\partial \psi} \times (-\frac{\sqrt{\sigma_{22}}}{2\sigma_{22}}) < 0$$

The interpretation of the equation is that by deviating from μ, party A will loose some amount of vote-share, which is harmful to his utility. By comparing the marginal utility of deviation with the negative marginal cost, party A will decide whether to deviate or not.

With the similar analogy, we can calculate the marginal utility and the marginal cost of party A at issue 1 and 3, too. Note that by technical assumption of

$\sigma_{11} = \sigma_{22} = \sigma_{33} = \sigma$, the marginal utility effects of deviation from μ are the same in all issues. However, as mentioned above, party A has the biggest deviation incentive at issue 2, and once party A deviates at issue 2, the marginal utility of deviation in other issues gets more complicated, because x_2^A is not 0 any more. The calculation of marginal costs is more simple. By the difference in ideological preferences and by the quadratic cost function, the absolute value of the negative marginal costs gets bigger as the ideological points are far from the μ.

3.3 Equilibrium Cases

By comparing the relative amount of marginal utility and marginal costs in issues, I can characterize the equilibrium into several cases.

Case 1 $|MU^A| > |MC^A|$ in all issues.

In this case, the 'generalized median in all directions' will be an equilibrium outcome. That is, both parties will suggest μ, which is a policy convergence outcome. With this parameter values, the ideological points of parties' are so close that the cost of suggesting μ is small enough. In this trivial case, the agenda control possibility will not change the result.

Case 2-1 $|MU_1^A| > |MC_1^A|$, $|MU_2^A| < |MC_2^A|$, $|MU_3^A| \geq |MC_3^A|$

In this case, party A wants to deviate in issue 2, since staying at μ is too costly in issue 2. In turn, party B wants to deviate in issue 1, by symmetry. Thus, party A will have an electoral advantage in issue 1, and party B will have an electoral advantage in issue 2.

Case 2-2 $|MU_1^A| > |MC_1^A|$, $|MU_2^A| < |MC_2^A|$, $|MU_3^A| < |MC_3^A|$

The outcome in issue 1 and 2 will be similar to those in Case 2-1. The difference comes in issue 3. Both parties want to deviate in issue 3, but the amount of deviation will be the same, which means no parties will have electoral advantage in issue 3.

Case 3 $|MU_1^A| < |MC_1^A|$, $|MU_2^A| < |MC_2^A|$, $|MU_3^A| < |MC_3^A|$

With above parameter values, both party A and B will deviate in all issues. The extent of deviation by party A in issue 1 will be the smallest, and that of issue 2 will be the biggest. The interpretation on this equilibrium case is that due to the existence of ideological preferences of parties' we get divergence equilibrium. However, there still exists strong force to convergence equilibrium, because parties put effort even in issue 3 where no one has electoral advantage.

Since the goal of this paper is to analyse the effect of agenda control on the convergence behavior of parties', I will focus on the Case 3 in the following analysis. Then, I will investigate how the equilibrium will change with the introduce of possibility of agenda control.

4 Equilibrium with Agenda Control

4.1 Model

With the possibility of agenda control, the voting game can be characterized as a three-stage game:

- Policy suggestion stage

- Agenda control stage (advertisement stage or communication stage)

- Voting stage

Main research question of this paper is to investigate the effect of agenda control stage on the policy suggestion stage. Thus, the equilibrium will be characterized as a *Subgame Perfect Nash Equilibrium.*

I assume that both parties are endowed with the same amount of advertisement time, and spend it costlessly. The t_i^p denotes the amount of time that party p devotes to issue i. Then total amount of advertisement by both parties in issue i is $t_i = t_i^A + t_i^B$. Further, by the assumption on the total amount of endowment of time, $t^A = \sum_i t_i^A = 1/2 = \sum_i t_i^B = t^B$.

Recall that initial issue salience weight is represented as $W = (w_1, w_2, w_3)'$. After parties make advertisement efforts, relative salience of issues' will be changed as following way:

$$\tilde{w_i}(t_i) = \beta \cdot t_i + (1 - \beta) \cdot w_i$$

Note that $\tilde{w_i}(t_i)$ is increasing function of t_i, and β reflects effectiveness of agenda control ($0 \leq \beta \leq 1$).

Given the policy platform suggested in stage 1, parties decide advertisement time in issues to manipulate the issue salience weight to maximize expected vote-share. Without loss of generality, party A's objective problem in stage 2 is:

$$max_{t^A} \quad u^A[\Phi(\frac{\sum_i \tilde{w_i}(t_i^A)\gamma_i}{(\sum_i \tilde{w_i}(t_i^A)^2\lambda_{ii})^{1/2}})] \tag{4}$$

Note that party A does not consider cost function at stage 2, because cost at stage 1 is already sunk, and party can spend advertisement time costlessly. Additionally, policy suggested in stage 1 is fixed, thus γ_i and λ_i are fixed at stage 2, and t_i^A is the only choice variable.

4.2 Optimal Advertisement

To identify an optimal advertisement behavior of parties', the most important finding is that parties will not advertise the same issue at the same time.

Proposition 1. *The two parties will not advertise the same policy issue.*

Proof. for party A, optimization problem at stage 2 is:

$$max_{t^A} u^A[v^A(t^A; t^B, X^A, X^B, W)]$$

by the monotonicity of u,

the condition for party A to spend time in issue i is $\frac{\partial v^A}{\partial t_i^A} > 0$. However, since only the two parties are competing against each other, $v^B = 1 - v^A$. This means $\frac{\partial v^B}{\partial t_i^B} < 0$ if $\frac{\partial v^A}{\partial t_i^A} > 0$. Thus, party B will never invest his advertisement time in issue i if party A invests in issue i. ■

Remark that the result of this proposition is similar to *Proposition 1* in Dragu and Fan (2015). From the result of the *Proposition 1*, we can guess that each party will specialize in certain issue, rather than put effort to all issues. Before I make theoretical prediction, I will introduce some useful definitions.

Definition 2. The *majority party* is the party whose equilibrium vote share is greater than $1/2$ and the *minority party* is the party whose equilibrium vote share is less than $1/2$.

Definition 3. For $p \in \{A, B\}$, we define party p's electoral popularity on issue i as $\gamma_i^p = (x_i^A - x_i^B)(\mu_i - \frac{x_i^A + x_i^B}{2})$ and party p's electoral popularity on the n policy issues as $\sum_{i=1}^{3} w_i \gamma_i$.

Remark that the above definitions follow *Definition 3* and *Definition 1* in Dragu and Fan (2015), respectively. Note that the model in this paper is symmet-

ric, thus if both parties play the same strategy, they will be the majority party and the minority party at the same time. That is, I expect that both parties will place the same strategy, which makes the vote share for both parties 1/2. Then, the following proposition provides theoretical prediction on the optimal behavior of parties' in stage 2.

Proposition 2. *The majority party does not advertise an issue on which its opponent has electoral advantage or on which neither party has electoral advantage (that is, if party p is the majority party, then* $t_i^p = 0$ *if* $\gamma_i \leq 0$*)*

Proof. Without loss of generality, let party A be majority party, and assume that there exists an equilibrium policy where party A invests in issue i (i.e. $t_i^A > 0$), and party B has an electoral advantage(i.e. $\gamma_i < 0$).

By *Proposition 1*, party B will not put advertisement effort in issue i, because party A is advertising in issue i (i.e $t_i^B = 0$), thus the total amount of time invested in issue i is $t_i = t_i^A$. Then equilibrium vote share for party A can be represented as:

$$\Phi\left(\frac{\sum_{k=1}^{3} \tilde{w_k}(t_k) \cdot \gamma_k}{\sum_{k=1}^{3} \tilde{w_k}(t_k)^2 \cdot \lambda_{kk}}\right)$$

where $t_i = t_i^A$ for issue i.

Then, since $\tilde{w_i}$ is increasing function of t_i, and by the assumption that $\gamma_i < 0$ in issue i, party A would have a profitable deviation strategy to $t_i^A = 0$. That is, $\sum_{k=1}^{3} \tilde{w_k}(t_k) \cdot \gamma_k$ with $t_i^A = 0$ is bigger than $\sum_{k=1}^{3} \tilde{w_k}(t_k) \cdot \gamma_k$ with $t_i^A > 0$, because party A is majority party be the assumption, which implies there exists issue $j \neq i$ with $\gamma_j > 0$.

With similar analogy, it can be easily proved that party A has no incentive to invest advertisement time in issue i when neither party has electoral advantage in

issue i (i.e. $r_i = 0$). As a result, party A's vote share will increase by the deviation to $t_i^A = 0$. Thus, $t_i^A > 0$ cannot be an equilibrium. ■

With similar analogy, Aragonès et al (2015) suggests that in a symmetric and three-dimensional policy competition case, each party will spend all of his advertisement time in a single issue, that is perfect issue specialization will be the equilibrium outcome. That is the key factor how the agenda control possibility affects to the policy suggestion decision. However, the optimal advertisement decision could be more complex in this model, because advertisement decision is affected not only by the numerator in equation (4), but also by the denominator in equation (4).[3] To deal with the complexity I will provide numerical simulation results in the following section, and thus the following lemma suggests only some restrictive forecasting on the results.

Lemma 1. *In a symmetric and three-dimensional case in this model, no parties will advertise on issue 3 only when the parties suggest the same policy in issue 3 at stage 1 (i.e.* $x_3^A = x_3^B$*). Then,* $t_3 = t_3^A + 4_3^B = 0$*, and* $\tilde{w_3} \leq w_3$*. Further if* $\beta \neq 0$*,* $\tilde{w_3} < w_3$*.*

Proof. When parties suggest the same policy at the first stage (i.e. $x_3^A = x_3^B$), neither party has electoral advantage in issue 3 ($\gamma_3 = 0$), and further $\lambda_3 = 0$. Thus, advertisement efforts in issue 3 does not change the vote-share, but the total endowment time is fixed for parties, which makes opportunity costs in adversing in issue 3. Thus. parties will not put advertisement effort in issue 3. ■

Remark that *Proposition 6* in Dragu and Fan (2015) also states similar results.

[3] In Aragonès et al (2015), they characterized expected vote-share different from the model in this paper, thus they did not need to consider the denominator effect.

It says that when *Neither party advertises an issue on which there are no ideological differences between parties.* The ideological differences mentioned above has different meaning with this paper, in that it is not chosen by parties, but given by the assumption of the model. However, since policy platforms suggested in stage 1 is fixed by the assumption, the result of Dragu and Fan (2015) can be applied to this paper, too. Even though the optimal advertisement decision of the parties' is not characterized in a analytic form in this section, by the symmetry of the model, we can guess that the eventual optimal advertisement vector will be $t = t^A + t^B = (\frac{1}{2}, \frac{1}{2}, 0)$ in a numerical simulation.

4.3 Policy Suggestion Stage

Now, I have to investigate the effects of agenda control on policy suggestion. The expected effects is following:

- Parties will expect that relative issue salience of issue 3 will decrease at the stage 2, because marginal effect of advertisement is bigger in the issue where parties have bigger electoral advantage.

- When the relative issue salience of issue 3 decreases, the marginal utility of making efforts in issue 3 (that is, deviating from parties' ideological preferences and suggesting policy close to median to increase the expected vote-share) will also decrease.

- Extremely, when $\beta = 1$, and if the parties suggest the same policy in issue 3 at stage 1, $\tilde{w_3} = 0$ will be the result of stage 2, then parties no need to put efforts in issue 3 to maximize their vote-share.

The most important finding is that expectation on the importance of issue 3. As issue gets less important, parties' willingness to devote in the issue 3 decreases, which is the key factor making the divergent result.

Agenda control possibility affects issue 1 and 2 in an opposite direction. As parties put advertisement efforts on issue 1 and 2, relative importance of those issues' will increase. However, the extent of increase will not be severe, because both parties put the same amount of effort in each issue, which off-sets each other. That is, even though party A tries to increase the importance of issue 1 where he has the electoral advantage, party B tries to increase the salience of issue 2 at the same time. Since the sum of salience weight is 1 by definition, each effort off-sets each other. In response to the change of importance, policy suggested in issue 1 and 2 will converge, but slightly.

To check the effect, I conducted a numerical simulation to characterize an equilibrium at the first stage. Parameter values for numerical simulation is $\sigma_{11} = \sigma_{22} = \sigma_{33} = 1,\ |O_1^A| = |O_2^B| = 1,\ |O_2^A| = |O_1^B| = 3, |O_3^A| = |O_3^B| = 2$. Note that the equilibrium in the numerical simulation is Case 3 equilibrium in section 3. Thus, parties will diverge in all issues when there is no agenda setting possibility. The following figures are numerical simulation results in issue 1 (Figure 2) and issue 2 (Figure 3).

The vertical axis shows suggested policy, thus it represents the extent of divergence of party A. The horizontal axis represents the effectiveness of advertisement. Since β represents the effectiveness of agenda control, when $\beta = 0$, we can interpret the result with no agenda control possibility. Initially, the extent of divergence in issue 1 is slightly lesser than that of issue 2.(i.e. $x_1^A \neq 0$, $x_2^A \neq 0$, and $|x_1^A| < |x_2^A|$) It is congruent with the theoretical prediction. The difference of divergence comes

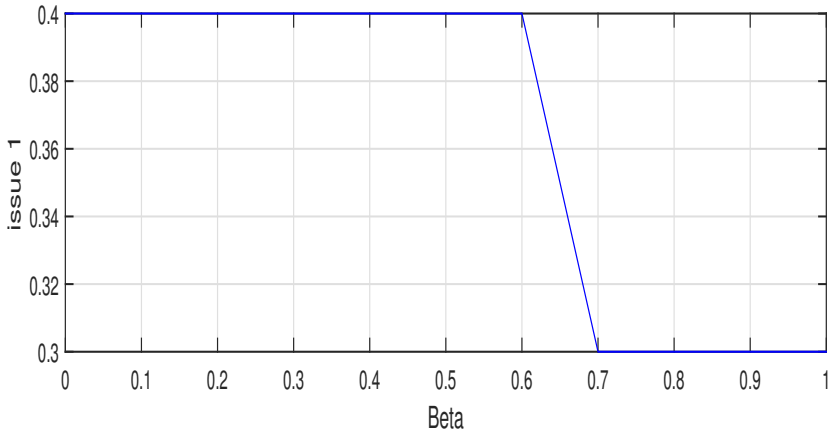

Figure 2: Policy suggestion by Party A in issue 1

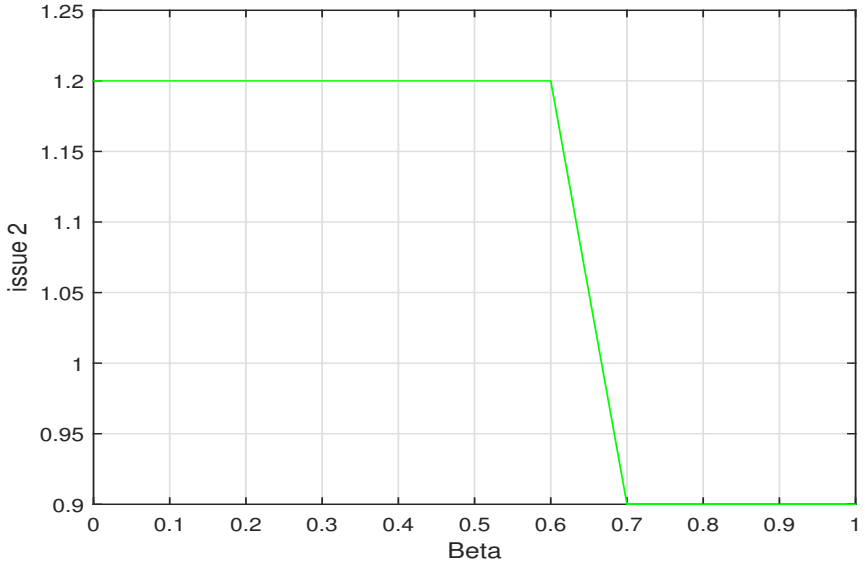

Figure 3: Policy suggestion by Party A in issue 2

from the ideological preference of party A's. In other words, since idealogical preference of party A's in issue 1 is closer to 0 than that in issue 2, party A feels lesser cost in issue 1 to meet the needs of median voter's. The symmetric result comes out from party B. When the effectiveness of advertisement is small enough, the behavior in issue 1 and 2 does not change. However, when the effectiveness of advertisement effort gets higher, parties move to μ. This is the response to the change in relative issue salience due to the agenda control effort. However, as mentioned above, the degree of change in relative issue salience in issue 1 and 2 is not that high, because of the off-set effects. Thus, even though parties try to move closer to 'Generalized median in all directions', μ, the degree of the movement is small.

For issue 3, the result is different. Firstly, I can check that the parties diverge in issue 3. (i.e. when $\beta = 0$, then $x_3^A \neq 0$ and $x_3^B \neq 0$) However, as the advertisement effort is getting more effective, parties diverge more rather than converge to μ as at issue 1 and 2. (i.e. $|x_3^A|$ and $|x_3^B$ get bigger as β increases) Actually, when β closes to 1, parties do not put any efforts, in that they suggest exactly the same policy with their ideological preferences. That is $x_3^A = O_3^A = 2$ and $x_3^B = O_3^B = -2$. The intuitive explanation about the result is following. Which party has electoral advantage in which issue stemming from his own ideological preference is a common knowledge for both parties. Since parties have incentive to increase relative issue salience where they have electoral advantage, parties expect that the weight of issue 3 will decrease at the second stage of the competition game. This in turn makes parties not be willing to put efforts in issue 3, because the degrease of importance of issue 3 means parties cannot increase expected vote-share through the efforts in issue 3. This divergent result suggests that the possibility of agenda

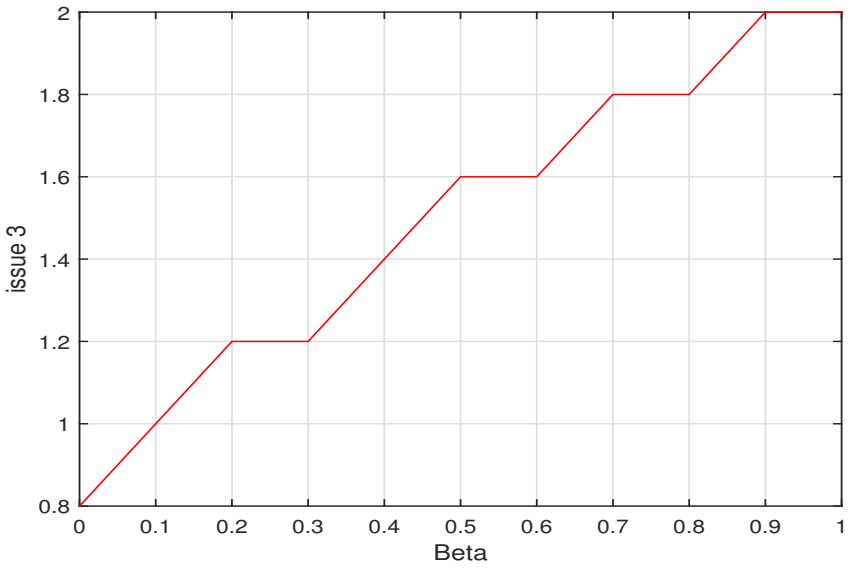

Figure 4: Policy suggestion by Party A in issue 3

control could be a source of political polarization.

The theoretical and numerical simulation result is congruent with the observation in electoral competition in real world. As Aragonès et al (2015) also states, in U.S. presidential campaigns of 1992 and 2008, certain issue was not advertised by both Democratic candidate and Republican candidates : drug issue was muted in 1992 and immigration issue was muted in 2008. Aragonès et al (2015) suggests that the reason for muting in those issues is that none of the candidates have a strong electoral advantage in those issues. In addition, Damore (2004) shows similar empirical results. It suggests that advertisement time spent in neutral issues where no parties have significant electoral advantage take small portion among the total advertisement.

5 Conlclusion

In reality, electoral competition by political parties takes place in two steps : Policy platform suggestion stage, and Advertisement stage. The advertisement behavior by parties is called agenda control. This possibility at the second stage affects to the optimal decision in the first stage, thus it should be incorporated in the analysis on the electoral competition.

The strategic incentive of parties' to manipulate issue salience weight of voters' with an intention to increase expected vote-share is analysed in the model. The main finding in the paper suggests that the optimal advertisement efforts by parties' in the agenda control stage affects to the optimal policy suggestion decision. For the issues whose relative issue salience decreases after agenda control stage, parties put less efforts to maximize expected vote- share, because the marginal utility of putting efforts decreases. As a result, parties will focus on the issues that they have electoral advantage, and it will trigger policy divergence in relatively less important issue. The theoretical and numerical simulation result is consistent with recent empirical results suggesting political polarization and increase of campaign spending as stylized facts.

In the future work, the restrictive assumption in the model could be generalized. The symmetric environment in the model could be extended to asymmetric model, and issue space could be generalized to n dimensional policy spaces. I expect that the theoretic and numerical simulation could be a meaningful starting point for the future work with the above extension.

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국문초록

의제설정 상황 하에서 정책의 비수렴성에 대한 연구

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현실에서 정당 간의 선거는 두 단계의 과정을 통해 이루어진다. 첫 번째는 정당이 정책공약을 발표하는 단계이고, 두 번째 단계는 정당이 공약된 정책 중 의제를 설정하여 홍보하는 단계이다. 두 번째 단계에서 정당이 특정 분야의 정책을 집중적으로 홍보할 수 있는 가능성은 정당이 첫 번째 단계에서 공약할 정책을 설정하는 데에도 영향을 주게된다. 그런 의미에서 의제설정 단계는 선거 경쟁에서 반드시 포함되어야 한다. 본 연구에서는 3차원 정책 공간 하에서 위의 두 단계를 모형에 반영하여 분석을 진행하였다. 분석 결과 정당들은 의제설정 단계에서 기대 득표를 높이기 위하여 자신들에게 유리한 정책을 집중적으로 홍보할 유인이 있음을 밝힐 수 있었고, 이는 정당들이 첫 번째 단계에서 서로 다른 정책을 공약으로 제시하는 공약의 비수렴 결과를 낳았다. 이 결과는 선거에 관한 경험연구와 일치한다는 점에서 본 연구의 의의를 찾을 수 있다.

주제어 : 선거경쟁, 정책경쟁, 다차원 정책공간, 의제설정, 공약의 비수렴성

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