Downsian Positions of Parties and Districts from the Numbers of Votes with Examples of Japanese Congressional Elections 1983 - 2004

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DOWNSIAN POSITIONS OF PARTIES AND DISTRICTS FROM THE NUMBERS OF VOTES WITH EXAMPLES OF JAPANESE CONGRESSIONAL ELECTIONS 1983 – 2004

by

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Abstract

This paper proposes, under assumptions of sincere voters with some additional conditions, to calculate the positions of parties and districts by "solving" a system of equations whose left hand sides are theoretical predictions and the right hand sides are the actual numbers of votes gained by the parties in the districts. The positions of parties and prefectures are calculated for the seats for the proportional representation in the Japanese congressional elections 1983 – 2004. The result reveals that the competition in these elections was *not* between the right and the left, but between the urban and the rural.

1 Introduction

Estimation of positions of parties (or candidates) in the policy space plays a substantial role in empirical researches based on the classic Downsian model [4]. Various approaches are proposed in its long history. Laver and Schofield [15, Appendix B] classified them into four groups: expert judgements, dimensional analysis of legislative behavior, analysis of manifestos and analysis of mass survey data. The third is replaced by the analysis of the actual expenditure flows in Laver and Hunt [14, p.31]. Their development thereafter can be requoted from recent papers such as Burden [2], Kim and Fording [9], etc.

These works define as many policy spaces together with metrics therein. In the classic one-dimensional Downsian framework, there must be only one correct space. We have no a priori reason which one to choose as this correct space.

This paper proposes to determine the positions of parties/candidates directly by solving a system of equations under the classice Downsian assumptions of sincere voters and one-dimensional policy.

We deal with a congressional election (resp. a presidential election) competed by parties (resp. candidates) $P_n (n = 1, 2, \dots, N)$. When we deal with parties of a congressional election of a multi-constituency system, we understand that all the candidates of a party are at a political position, as was formulated in Austen-Smith [1] and Hinich and Ordeshook [5]. Thus, the policy of P_n is denoted by a real number $x_n \in (-\infty, \infty)$. Behavior of a voters is described just as in the classic Downsian words.

Assumption 1 *The policy space is one-dimensional line* $(-\infty, \infty)$. *The voters are sincere, that is, a voter at* ξ *votes for* P_n *which attains* $\min_{1 \le n \le N} |\xi - x_n|$.

In national elections, publicly announced are the numbers of votes gained by a party (resp. a candidate) in suitable subregions such as constituencies, administrative districts, or others. In the present paper, we call such subregions districts, and denote by $D_k (k = 1, 2, \dots, K)$. Our main assumption is as follows.

Assumption 2 *A voter in any $D_k(k = 1, 2, \ldots, K)$ has a chance to vote for any $P_n(n = 1, 2, \ldots, N)$. We know the numbers $J_{n,k}$ of votes which P_n gained in D_k. The densities of the voter's opinions on D_k are given by $\frac{V_k}{\sigma}\phi(\frac{x-\mu_k}{\sigma})$ in terms of a voter's opinion x , where $V_k(= \sum_{n=1}^{N} J_{n,k})$ is the total number of voters in D_K, $\phi(\cdot)$ an a priori determined symmetric probability density function, μ_k the median voters' policies in D_k, and σ a district independent scale parameter.*

Assumption 2 implies that the densities of all regions become identical if they are suitably shifted.

Suppose that parameters $x_1, x_2, \ldots, x_N$, $\mu_1, \mu_2, \ldots, \mu_K$ and σ in Assumption 2 are fixed. We have mathematically rigorous preditions of the numbers of votes which P_n gain in D_k. Then, we have as many equations whose left hand sides are the theoretical predictions and the right hand sides are $J_{n,k}$. By "solving" this system of equations, we have $x_n(n = 1, 2, \ldots, N)$, $\mu_k(k = 1, 2, \ldots, K)$ and σ. The number of these equations is almost always larger than the number $N + K + 1$ of unknows, i.e., the system is overdetermined, but there are many plausible techniques for solving this problem.

Our direct approach is promised to work if all of our assumptions are satisfied. In the presence of strategic voting (e.g., Cox [3]), directional voting (e.g., Merrill III, S. and Grofman [16]), or any other violations of our assumptions, our approach is justified only through empirical experiences. This paper gives a positive example by calculating the political positions of parties and prefectures for the seats for the proportional representation in the Japanese congressional elections 1983 – 2004.

Our result reveals that *not* the conflict between the left and the right but the conflict between the urban and the rural explains the results. This result itself might be of some interest, because it is often believed that the main issue is ideological conflicts between the left and the right. This finding warns that we must carefully choose the policy space among possible electional issues if we want to relate it with the Downsian position.

2 Proposed Method

Let us assume, without loss of generality, that

$$-\infty = x_0 < x_1 \leq x_2 \leq \ldots \leq x_N < x_{N+1} = \infty \tag{1}$$

hold. Here, x_0 and x_{N+1} are formally introduced for the sake of compact description. From Assumptions 1 and 2, we have both the theoretical prediction of the numbers of votes gained by P_n in D_K and their actual values $J_{n,k}$. Since both values should

be equal, we have the following system of $N \times K$ equations with respect to $N+K+1$ unknown variables: $x_1, x_2, \ldots, x_N$, $\mu_1, \mu_2, \ldots, \mu_K$ and σ,

$$V_k \int_{\frac{x_{n-1}+x_n}{2}}^{\frac{x_n+x_{n+1}}{2}} \frac{1}{\sigma}\phi(\frac{\xi-\mu_k}{\sigma})d\xi = J_{n,k}, \quad n = 1, 2, \ldots, N. \tag{2}$$

By solving this equations, we have what we want.

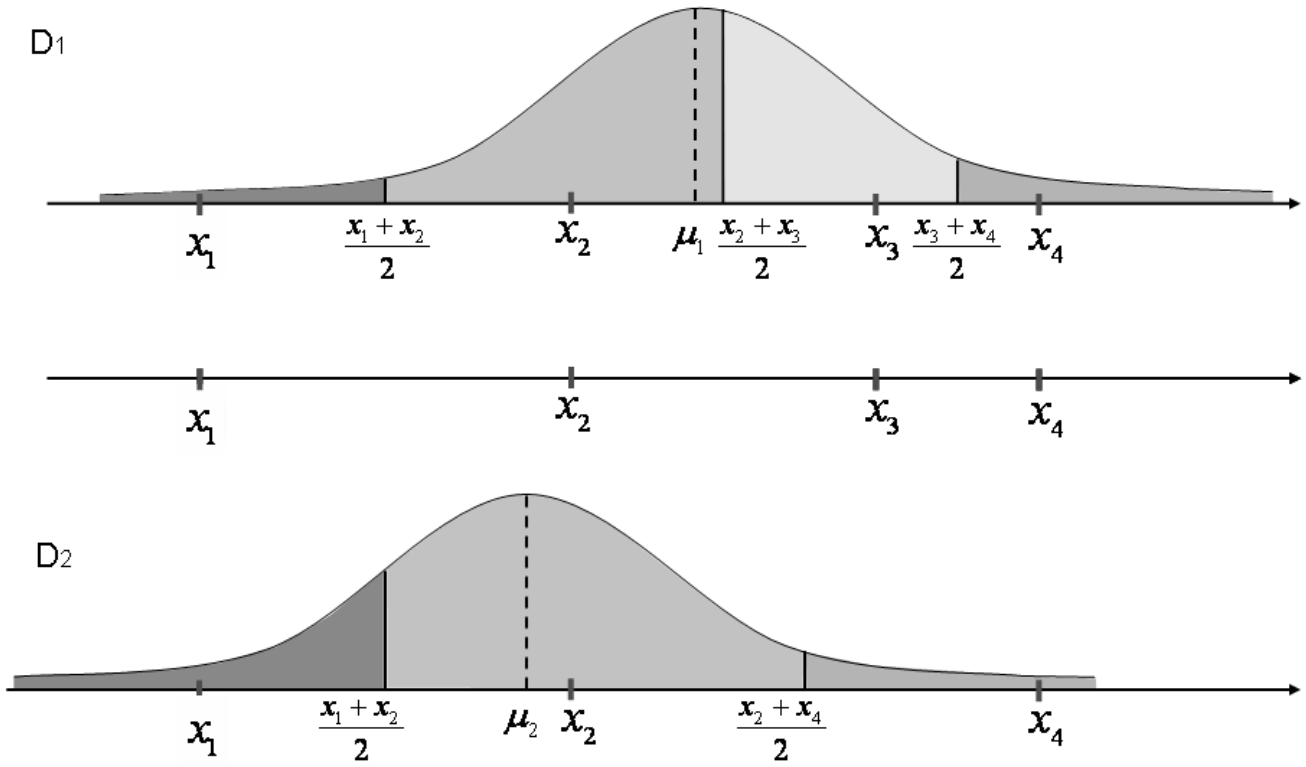

Figure 1: Theoretical shares of votes of $P_k(k = 1, 2, 3, 4)$ in D_1 and D_2 when P_3 does not field its candidate in D_2

The calculated positions depend on the choice of $\phi(x)$. In the empirical work in the next section, we take $\phi(x)$ as the standard normal density:

$$\phi(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}. \tag{3}$$

Here, we have the following theoretical problems to be solved:

1. If $(x_1, x_2, \ldots, x_N, \mu_1, \mu_2, \ldots, \mu_K, \sigma)$ is a solution, $(x_1 + \alpha, x_2 + \alpha, \ldots, x_N + \alpha, \mu_1+\alpha, \mu_2+\alpha, \ldots, \mu_K+\alpha, \sigma)$ and $(\beta x_1, \beta x_2, \ldots, \beta x_N, \beta\mu_1, \beta\mu_2, \ldots, \beta\mu_K, |\beta|\sigma)$ are also solutions to (2) for any real numbers α and β.

2. Since $N \times K$ is usually larger than $N + K + 1$, the equation is usually overdetermined.

3. The result depends on the prefixed ϕ.

We can solve the first problem simply by pre-determining two unknowns arbitrarily. In our empirical work in the next section, we take σ as 1, and take the location of the median voter of the nation at the origin. Thus, the solution of the following equation with respect to x is zero:

$$\sum_{k=1}^{K} V_k \int_{-\infty}^{x} \frac{1}{\sigma}\phi(\frac{\xi - \mu_k}{\sigma})d\xi = \frac{1}{2}\sum_{k=1}^{K} V_k.$$

To fix the freedom of reflection with respect to the origin, we choose the party positions so that the LDP (Liberal Democratic Party) is always located to the right of the CP (Communist Party).

A natural solution to the second problem is to choose the unknowns which minimize a suitably weighted sum of squared discrepancies or any other similar distance between the left hand sides and the right hand sides of (2). In the next section, however, we take another approach, which provides us with a clearer interpretation. Suppose that a voter in D_k chooses his vote independently and randomly according to the theoretical probability appearing in the left hand side of (2). Then we can regard $J_{n,k}$ as a realization of a vector-valued random variable which follows a multinomial distribution. Thus, we use the maximum likelihood estimator in estimating the parameters.

The third problem is an intrinsic shortcoming of our approach, but we can relax it if we carry out the estimation for a large family of densities containing additional parameters other than x_n, μ_k and σ.

We must comment on some technical problems in handling data.

1. If a party P_n does not field a candidate in a district D_k, we must arrange the corresponding equation in (2) by deleting P_n (Fig. 1) .

2. Under the existence of noises, estimated locations of small parties are unreliable. Even in the absence of noises, we cannot determine the loctions of non-partisan candidates or frivolous parties which participate in small number of districts.

3. Reliable computation of solution of (2) becomes rapidly troublesome as N increases.

Finally, the following remarks are required in using and understanding the results.

1. No assumptions are made on the parties' behavior.

2. All we can detect is relative positions among the parties/candidates in an election. It implies the followings.

   (a) We cannot detect any temprocal changes if the locations of voters and the parties shift or expand proportionally with keeping their relative positions intact.

   (b) When $N = 2$, a solution by this approach carries no information on their political position. Positions of districts has some meaning, but our approach is reduced to be a version of Burden [2] who determined the position of states in the sub-presidential election by the ratio of votes which Bush, the winner, gained.

3 Japanese Congressional Elections 1983-2004

In this section, we apply our approach to the seats for the proportional representation in the Japanese congressional elections 1983 – 2004.

Japan is bicameral. In the Lower House (the House of Representatives), from 1996 on, taken is the dual system of single-member constituencies (300 seats) and party-list proportional representation (200 seats in 1996, 180 seats from 2000 on). In the Upper House (the House of Councilors), from 1983 on, the dual system of multi-member districts and proportional representation is used. Until 2000, the number of their seats are 152 and 100, respectively, while from 2001 on, they are 146 and 96. Since we are only interested in the numbers of votes gained by the parties, we do not go into the details of the systems.

Outcome of an election in single-/multi-member districts in Japan is subtantially affected by the characteristics of candidates. Furthermore, even a comparatively large party does not field candidates in all the districts. To minimize such effects, we deals only with the seats of proportional representation. Thus, we have the results of the Lower House 1996 through 2003, and the Upper House from 1983 through 2004. The four general elections (the elections of the Lower House) in 1983, 1986, 1990 and 1993 are simply neglected.

We take up the prefectures as the districts for this calculation. Both in the Lower and the Upper Houses, a prefectures is a subarea of a constituency for the seats for the proportional representation. The prefectures remained as it is throughout this period while other administrative districts such as cities and villages are repeatedly merged everywhere. In this period, complicated changing alignment of parties is observed. Since the results of small parties are unreliable, we must determine the

threshold to cut off small parties. We take the share of 7 percent as this threshold. The following parties filter down.

LDP(1955-) the Liberal Democratic Party

JNP(1992-1994) the Japan New Party

DSP(1969-1994) the Democratic Socialist Party

NFP(1994-1997) the New Frontier Party

LP (1998-2003) the Liberal Party

CGP(1964-1994, 1998-) the Clean government Party

SP(1945-1996) the Socialist Party

SDPJ(1996-) the Social Democratic party of Japan

DP(1996-) the Democratic Party

CP(1922-) the Communist Party

The LDP were a governmental party through most of the period. The LP was merged in the DP just before the election 2003. The Clean Government Party participated in the New Frontier Party between 1994 and 1998.

The calculated coordinates of the parties are given in Figure 2. The governmental parties after the elections are marked. From August 1993 through July 1994, the LDP was an opposition party, but the general election July 1993 is excluded in our data, so that the LDP are marked in all the elections.

We first find that the following.

Observation The SP and the SDPJ (the successor of the SP) are located between the LDP and CGP, DP and others. It means that this axis does not reflect the competition between the left and the right. (For justification through academic references, see, e.g., Kobayashi [11, pp.201] or Kato and Laver [7, p.109].)

What does it mean, then ? The work by Inoguchi [6] seems to be the first research on the political positions, which is based on the analysis of party pledges. From then on, we find three works on the positions of Japanese parties whose target periods overlap with that of ours. The works by Laver and Hunt [14, pp.242-250] and Kato and Laver [7] are based on expert judgements in 14 categories and 11 categories, respectively. Kobayashi [11, pp.32-33] derived two scales based both on

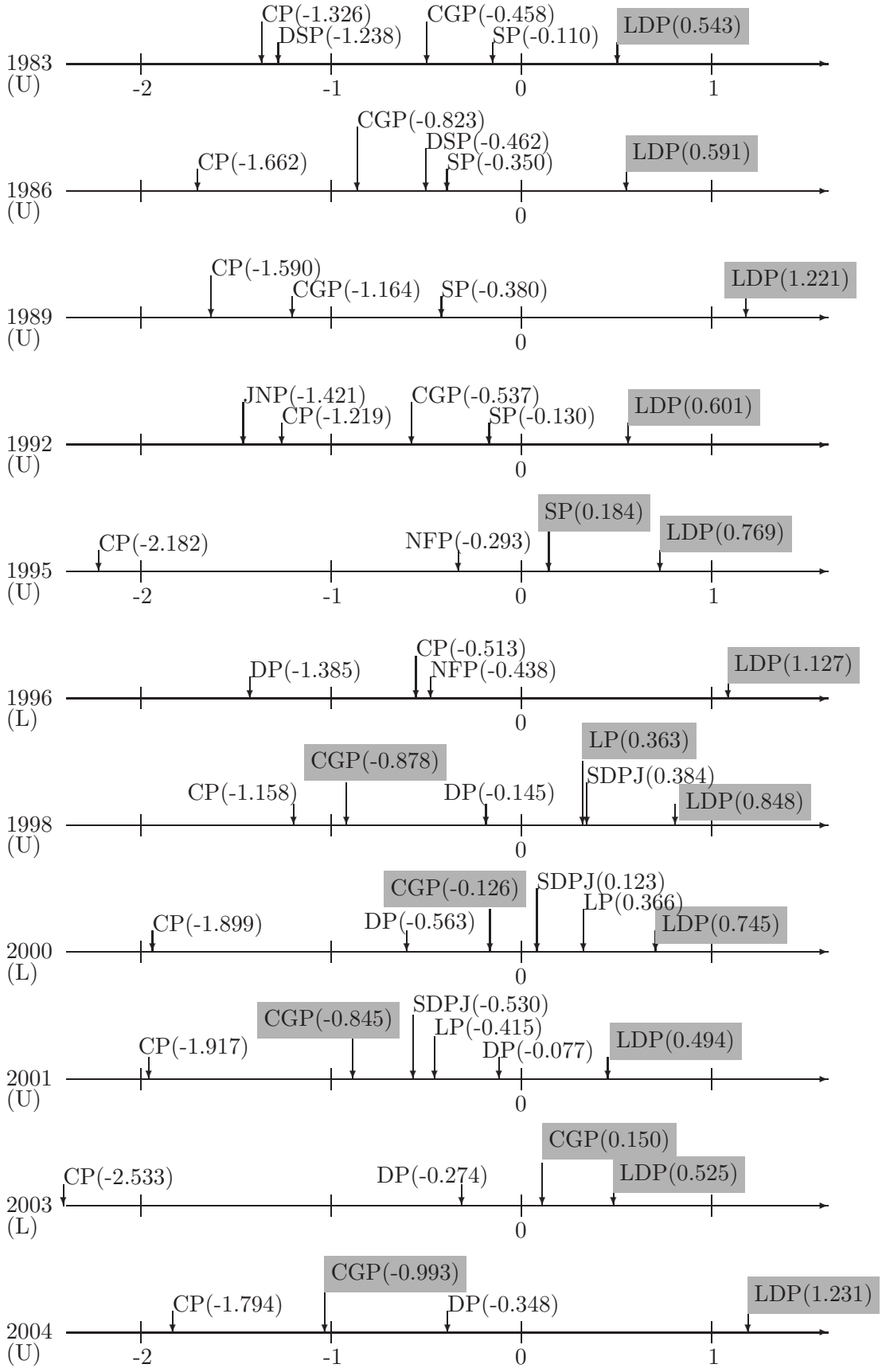

Figure 2: The positions of parties in the elections 1983-2004 ((L) and (U) denote the Lower House and the Upper House, respectively.)

the analysis of party pledges and expenditure flow by a multidimensional scaling method.

Among these 27 scales, we find that only the scale of "Pro urban interests vs. anti" in Laver and Hunt [14, p.245] seems to be consistent with the above observation. A possible approach to check the reliability of this coincidence is to calculated the correlation between our coordinate values and suitable urbanization index of D_k. There are several possible indices for urbanization: population ratios of primary(tertiary) industries, the DID (Densely Inhabited District) population ratios, etc. Here the DID is the concept first introduced in the 1960 Population Census by the Statistics Bureau of the Japanese government. The DID is defined as an area which is group of contiguous Basic Unit Blocks each of which has a population density of 4,000 inhabitants or more per square kilometer, or which has public, industrial, educational and recreational facilities, and whose total population is 5,000 or more within a shi(city), ku, machi(town), or mura(village).

Table 1 gives the correlation coefficients between the median voters' locations of the prefectures and their DID population ratios. We find strong negative correlations, all statistically significant at level 1 percent. This result seems to support our observation above.

Table 1: The correlation coefficients between the median voters' locations and the DID population ratios

1983	1986	1989	1992	1995	1996	1998	2000	2001	2003	2004
-0.758	-0.747	-0.790	-0.597	-0.585	-0.594	-0.738	-0.679	-0.619	-0.464	-0.584

Table 2 gives the median voters' positions of $D_k (k = 1, 2, \dots, 47)$. We can check the stability of the results over time.

Notice that our results are closely related with those in Kobayashi [11, pp.156-167]. Based on the data of the general elections during 1958-1993, he found that the LDP and the SP gained votes mainly in the rural areas through 1958-1993 and 1969-1993, respectively. He also found that the CGP, the CP and the JNP gained votes in the urban areas. Except in the case of the JNP which is calculated for a different election, his results strongly consistent with ours.

Table 2: The median voter locations of the prefectures based on the calculation for the seats for the proportional representation in the national elections 1983-2004

	1983	1986	1989	1992	1995	1996	1998	2000	2001	2003	2004
HOKKAIDO	0.036	−0.032	−0.106	0.016	−0.023	−0.376	−0.099	−0.141	−0.072	−0.111	−0.082
AOMORI	0.252	0.159	0.060	0.216	0.199	0.289	0.267	0.211	0.191	0.126	0.147
IWATE	0.208	0.169	0.124	0.359	−0.156	0.120	0.179	0.293	−0.052	−0.070	0.063
MIYAGI	0.069	0.037	0.011	0.114	0.090	−0.062	0.051	0.032	0.050	0.021	0.027
AKITA	0.107	0.039	0.049	0.227	0.256	0.262	0.213	0.170	0.095	0.133	0.190
YAMAGATA	0.260	0.255	0.259	0.352	0.350	0.333	0.341	0.274	0.221	0.178	0.225
FUKUSHIMA	0.206	0.137	0.127	0.234	0.157	0.110	0.202	0.117	0.116	0.023	0.161
IBARAKI	0.197	0.193	0.143	0.068	0.199	0.171	0.165	0.134	0.143	0.162	0.068
TOCHIGI	0.230	0.210	0.198	0.289	0.227	0.120	0.207	0.195	0.230	0.206	0.152
GUNMA	0.231	0.173	0.141	0.211	0.339	0.084	0.172	0.241	0.207	0.169	0.209
SAITAMA	−0.113	−0.085	−0.088	−0.109	−0.206	−0.142	−0.148	−0.108	−0.100	−0.074	−0.071
CHIBA	0.012	−0.004	0.000	−0.188	−0.031	−0.101	−0.053	−0.041	−0.024	−0.023	−0.009
TOKYO	−0.211	−0.192	−0.172	−0.263	−0.228	−0.267	−0.192	−0.219	−0.118	−0.091	−0.090
KANAGAWA	−0.231	−0.193	−0.118	−0.220	−0.106	−0.238	−0.120	−0.121	−0.002	−0.022	−0.032
NIIGATA	0.289	0.221	0.186	0.260	0.182	0.174	0.215	0.205	0.202	0.020	0.125
TOYAMA	0.265	0.320	0.418	0.485	0.454	0.321	0.337	0.368	0.220	0.336	0.359
ISHIKAWA	0.247	0.243	0.354	0.370	0.297	0.174	0.284	0.366	0.325	0.185	0.283
FUKUI	0.163	0.207	0.354	0.429	0.402	0.171	0.269	0.300	0.304	0.270	0.329
YAMANASHI	0.291	0.164	0.182	0.281	0.214	−0.024	0.038	0.031	0.126	0.011	0.189
NAGANO	−0.067	−0.027	−0.046	0.106	−0.248	−0.045	−0.136	−0.249	−0.074	−0.150	−0.084
GIFU	0.178	0.213	0.180	0.237	0.196	0.126	0.093	0.111	0.157	0.086	0.062
SHIZUOKA	0.102	0.190	0.169	0.067	0.054	0.027	0.026	−0.012	0.120	0.050	0.219
AICHI	−0.162	−0.034	−0.084	−0.046	−0.174	−0.075	−0.046	−0.113	−0.009	−0.082	−0.073
MIE	0.054	0.103	0.149	0.181	0.058	0.097	0.129	0.016	0.070	0.007	0.029
SHIGA	0.014	−0.062	0.270	0.203	0.063	0.081	0.029	−0.042	0.051	−0.059	0.017
KYOTO	−0.335	−0.343	−0.276	−0.160	−0.286	−0.142	−0.225	−0.210	−0.207	−0.220	−0.255
OSAKA	−0.418	−0.382	−0.336	−0.263	−0.349	−0.115	−0.270	−0.227	−0.258	−0.160	−0.245
HYOGO	−0.252	−0.182	−0.167	−0.098	−0.165	−0.078	−0.168	−0.131	−0.138	−0.080	−0.144
NARA	−0.099	−0.056	0.034	0.004	−0.083	0.035	−0.028	−0.071	0.002	−0.013	−0.050
WAKAYAMA	0.008	−0.060	−0.006	0.073	−0.032	0.116	0.031	−0.013	−0.098	−0.001	−0.030
TOTTORI	0.159	0.164	0.144	0.219	0.125	0.209	0.146	0.183	0.048	0.136	0.013
SHIMANE	0.160	0.139	0.289	0.296	0.354	0.267	0.246	0.235	0.198	0.172	0.216
OKAYAMA	−0.031	0.018	0.072	0.069	0.142	0.376	0.156	0.161	0.057	0.085	−0.021
HIROSHIMA	0.020	0.076	0.070	0.105	0.204	0.218	0.159	0.159	0.095	0.070	0.038
YAMAGUCHI	0.024	0.078	0.129	0.153	0.158	0.095	0.093	0.049	0.082	0.108	0.104
TOKUSHIMA	−0.005	0.047	0.050	0.062	0.192	0.007	0.046	0.015	0.071	0.017	0.151
KAGAWA	0.230	0.169	0.157	0.187	0.285	0.209	0.180	0.210	0.129	0.201	0.171
EHIME	0.151	0.149	0.136	0.184	0.323	0.296	0.197	0.205	0.087	0.158	0.066
KOCHI	0.039	−0.077	−0.048	−0.085	0.100	0.133	0.029	−0.025	−0.083	−0.116	−0.140
FUKUOKA	0.023	−0.058	−0.083	−0.139	−0.076	0.006	−0.039	−0.067	−0.090	−0.025	−0.113
SAGA	0.384	0.309	0.284	0.127	0.241	0.353	0.339	0.239	0.193	0.178	0.219
NAGASAKI	0.169	0.229	0.175	0.121	0.186	0.107	0.193	0.178	0.072	0.108	0.134
KUMAMOTO	0.389	0.314	0.265	−0.668	−0.034	0.186	0.190	0.172	0.215	0.133	0.251
OITA	0.245	0.134	0.188	0.232	0.282	0.311	0.282	0.174	0.065	0.201	0.104
MIYAZAKI	0.201	0.186	0.189	0.192	0.358	0.405	0.302	0.286	0.144	0.227	0.176
KAGOSHIMA	0.426	0.285	0.259	0.252	0.384	0.445	0.415	0.410	0.233	0.340	0.291
OKINAWA	0.021	−0.032	−0.054	0.097	−0.035	0.086	0.145	0.093	−0.337	0.040	−0.031

Since the pioneering works of Kyogoku [13, Chap. 4] and Shinohara [17, pp.110-120] in 1968, Kobayashi [10, Chap. 3](the general elections 1960-1980), Takagi [18](the general election 1996) , Kuboya [12] (the four congressional elections during 1995-2000), Kato [8](the general election 2000) analysed the contrast between the urban and the rural in their voting behavior. Their main concerns depend on their works but their results are consistent with ours.

Thus, our finding is new only in the sense that it seats these extablished findings in the classic Downsian framework. This result might warn that the political position of parties should be carefully chosen when we relate it with the Downsian model.

4 Conclusion

We proposed a new approach for determining positions of the policies of parties and the districts simultaneously from the numbers of votes which the parties gained in the districts. We applied this approach to the seats for the proportional representation of the Japanese congressional elections from 1983 throught 2004 to find that the main issue of these elections are not ideology but the urban-rural contest. This outcome warns that the policy space should be carefully chosen when we use it in the Downsian framework.

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