The effect of district magnitude on turnout: Quasi-experimental evidence from nonpartisan elections under SNTV

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Abstract
The relationship between district magnitude and turnout remains hotly debated, and previous studies suggest positive, negative, and nonlinear effects depending on other institutional characteristics. This article contributes to the empirical literature by conducting a quasi-experimental test on the effect of district magnitude in a context of a single nontransferable vote (SNTV) system with weak partisan ties: municipal council elections in Japan. Exploiting a credible source of exogenous variation in district magnitude and using a fuzzy regression discontinuity design, we reveal that a 5-seat increase in an average-magnitude district reduces turnout by 4 percentage points, which accounts for a 6.9% drop in the size of the electorate. We reason that, in the context of SNTV with weak parties, higher district magnitude leads to information overload, which may lower voters’ incentives to turn out.

Keywords
district magnitude, information overload, Japan, turnout

A number of comparative studies argue that electoral institutions are an important determinant of turnout (Blais, 2006; Blais and Aarts, 2006; Franklin, 2004; Geys, 2006; Jackman, 1987; Jackman and Miller, 1995; Powell, 1986). Although many of these studies suggest that district magnitude can explain both cross-national and within-country variations in turnout, the directions of this effect—whether positive or negative—remain unsettled (Brockington, 2004; Huber et al., 2005). To reconcile the mixed evidence, Grofman and Selb (2011) and Taagepera et al. (2014) propose an inverse U-shape relationship between district magnitude and turnout. They argue that, as district magnitude increases, turnout initially climbs because it becomes easier for voters to find candidates close to their preferences. However, when district magnitude surpasses a certain point, turnout starts to decline slowly as information acquisition becomes cognitively more demanding due to the large number of candidates. What is important in the latter mechanism is the way in which district magnitude affects the informational complexity of electoral districts.

Although Grofman and Selb (2011) and Taagepera et al. (2014) provide some evidence to support this argument, their approach cannot isolate the effect of district magnitude because other institutional, social, cultural, and economic factors may confound the relationship. For instance, district magnitude tends to go together with population size, and this pairing makes it difficult to disentangle the unique effect of district magnitude from that of population size. In order to overcome this problem, we turn to a quasi-experimental test on the effect of district magnitude using municipal council elections in Japan. These elections are likely to generate electoral contexts in which informational environments are excessively complex and the acquisition of new information is costly because of the combination of relatively large district magnitude under a single nontransferable vote (SNTV) system and the absence of parties (Horiuchi, 2005; McCubbins and Rosenbluth, 1995).
Hence, Japanese municipal elections offer an interesting case to examine the causal validity of the second half of the argument by Taagepera et al. (2014).

In order to estimate the causal effect of district magnitude on turnout, we exploit exogenous variation around arbitrary population thresholds that determine district magnitude. To the best of our knowledge, this is the first study to implement a quasi-experimental design to predict the effect of district magnitude on voter turnout.\(^1\) Employing a fuzzy regression discontinuity design, we find that district magnitude exerts a negative impact on turnout. Our most conservative estimate suggests that a 5-seat increase in an average-magnitude district leads to a 4 percentage point drop in turnout, which accounts for a 6.9\% reduction in the size of the electorate. Our results therefore provide causal support for the argument by Taagepera et al. (2014) that under certain settings, higher district magnitude leads to lower turnout.

**Theoretical background**

Existing studies suggest that district magnitude may affect turnout either positively or negatively. On the one hand, districts with more seats provide a more proportional vote-seat translation, thereby enhancing citizens’ perception that their votes will not be wasted (Blais, 2006; Blais and Carty, 1990). Districts with larger magnitudes are also more open to the entry of candidates or parties, which allows more heterogeneous views to enter the electoral competition (Jackman, 1987; Powell, 1986). Because of these two reasons, voters may be more likely to find a candidate or party whose political position is close to their preferences in districts with larger magnitude. As a result, higher district magnitude can encourage voters to turn out.

On the other hand, there is also a theoretical reason to expect that district magnitude may have a negative effect on turnout (Lau and Redlawsk, 2006; Selb, 2009). The fact that greater district magnitude increases a chance that any given party obtains representation means that it can lead to the formation of highly complex political systems. This may raise concerns that voters are overwhelmed with the amount of information that voters need to acquire in order to make an appropriate choice also increases. Due to heavy burdens and high costs of acquiring such information, voters may eventually decide to withdraw from the electoral process.

Empirically, one established fact in the literature is that turnout tends to be higher under PR systems than SMD systems (Blais, 2006; Blais and Aarts, 2006). Yet, evidence on the relationship between district magnitude and turnout within PR systems is rather mixed. For instance, while some authors find a positive link (Blais and Dobrzynska, 1998; Boulding and Brown, 2015; Franklin, 2004; Jackman, 1987; Jackman and Miller, 1995), others report a negative association (Jacobs and Spierings, 2010), yet others suggest no systematic relationship between the two (Fornos et al., 2004; Kostadinova and Power, 2007; Pérez-Liñán, 2001).

In an attempt to reconcile the contradictory theories and findings, Taagepera et al. (2014) suggest that the directions of the effect of district magnitude can be characterized as an inverse U-shape relationship. They argue that district magnitude is initially positively associated with turnout (empirically, below 3–4) reflecting the positive forces of district magnitude. However, this effect turns into a negative one as district magnitude increases (above 4–5) and informational environments become more complex. Some observational studies indeed provide empirical support for this nonlinear hypothesis (Grofman and Selb, 2011; Taagepera et al., 2014). Moving forward with the existing empirical evidence, we analyze the impact of district magnitude on turnout using quasi-experimental data in a context where the negative force should dominate due to the nature of SNTV and weak parties. The following section discusses our case and empirical expectation in more detail.

**Theory in context**

Japan is comprised of approximately 1700 municipalities, which are the third-level administrative units below the central and prefecture governments. Municipalities in Japan have the right of self-management and adopt a mayor-council system, in which voters select a mayor and council members through direct election held every 4 years (Fukumoto and Horiiuchi, 2011).\(^2\) The main function of the municipal council is to approve or disapprove budget plans proposed by the mayor and monitor the execution of these plans.

Turnout rate in local elections in Japan is on average very high. It is higher than turnout rate in national elections and often exceeds 80% and 90% in small municipalities. One prominent study suggests that this pattern can be explained by the fact that very small margins of victory and a relatively high importance of a single vote under SNTV provide candidates strong incentives to mobilize voters through solicitation and vote buying, especially in small rural towns and villages (Horiiuchi, 2005; also Fukumoto and Horiiuchi, 2011). What we are interested in is how marginal changes in district magnitude influence voter turnout in this setting. To understand how an increase in district magnitude affects turnout and why the informational argument by Taagepera et al. (2014) matters in the current context, two institutional features of municipal
council elections require special attention: the role of parties and the electoral system.

First, most of the councilors do not belong to parties. According to the Ministry of Internal Affairs and Communications, 75–80% of them are nonpartisan. This figure further increases to 90% if we only take into account council members in villages and towns (Aburakawa, 2005). Therefore, scholars on local politics in Japan agree that parties play only a marginal role at the municipality level (Horiuchi et al., 2015; Muramatsu, 1997). The relative absence of parties suggests that voters are devoid of partisan cues by which they can screen candidates. Since there is no party mechanism that simplifies the set of options as well as the task of obtaining political information, any addition in district magnitude should increase individual voters’ costs to acquire new information for an extra unit of candidates.

Second, under SNTV with relatively large district magnitude, candidates compete for a multimember municipality-wide district, and voters are allowed to cast only one vote for their most favorite candidate. Since a personal vote is valuable in this system, SNTV fosters excessive individualization of electoral competition (Carey and Shugart, 1995; Horiuchi, 2005; McCubbins and Rosenbluth, 1995). Moreover, since voters can cast only one vote, there is always a chance that their votes are “lost” if they vote for losing candidates (unlike PR systems). Given very small margins of victory, this forces voters to make enormous efforts to acquire information and go through a number of strategic scenarios (if one’s preferred candidate is sufficiently unlikely to win a seat). Consequently, all of these features of SNTV should make the informational environments of elections highly complex and demanding as district magnitude increases.

Taken together, the combination of weak parties and SNTV is likely to create electoral environments in which both amount and costs of information that voters need to process can become very high. As district magnitude increases, these factors limit voters’ ability to evaluate individual candidates, which may eventually affect their decisions to vote or not. Importantly, as we describe below, most of the Japanese municipalities have relatively large district magnitude. Given that Taagepera et al. (2014) expect that the positive effect of a marginal increase in district magnitude is concentrated in low to moderately high district magnitude, municipal council elections in Japan may be an example of the institutional settings in which the negative effect of district magnitude is likely to dominate.

Empirical strategy

Japan offers an interesting institutional design to study the impact of district magnitude. Until 2011, the Local Autonomy Law in Japan prescribed a maximum limit of council size in relation to the number of residents in municipality. For example, the law required that, if the number of residents in a municipality was less than or equal to 50,000, council size had to be smaller than or equal to 26. Similarly, if the number of residents in a municipality was less than or equal to 100,000, council size had to be no more than 30. The enforcement of the law was strict, and when population size fell below a certain threshold, municipalities had to reduce their council size by calling a new election.

Figure 1 shows the different upper limits applied to municipalities with different population sizes until 2011. In Japan, the categories of municipality include villages, towns, and cities. The first four cutoffs in Figure 1 were applied to villages and towns, and their maximum limits of council size varied from 12 to 26 depending on their population size. By contrast, the rest of the cutoffs were applied to cities, whose upper limits first ranged from 26 to 56, and once city population surpassed 900,000, they could increase their council size by 8 in every 400,000 increase in population (not shown in Figure 1). In the following analysis, we focus on municipal council elections held between 2006 and 2011. Further, we limit our analysis to those municipalities exposed to the first eight cutoff points because we do not have many observations above the 500,000 population threshold.

Our identification strategy relies on the fact that (1) the maximum size of municipal council was exogenously set by the central government and (2) municipalities in our sample used the municipality-wide district, meaning that district magnitude was set equal to council size. These institutional features allow us to leverage the council-size law as a credible source of exogenous variation in district magnitude and estimate the causal effect of district magnitude on turnout. Since the size of local council was only partly determined by law, we employ a fuzzy regression discontinuity and use the maximum limits of council size as an instrument for district magnitude (Hahn et al., 2001; Imbens and Lemieux, 2008).
To do so, we first use the upper limits of council size to estimate district magnitude and, then, regress turnout on the predicted values of district magnitude. Conceptually, this approach exploits an exogenous source of variation that affects district magnitude but does not predict turnout by itself to remove the spurious correlation between the explanatory variable and unobserved municipality characteristics. This method solves the problem of omitted variable bias using only that portion of the variability in district magnitude that is uncorrelated with omitted variables to estimate the causal relationship between district magnitude and turnout. Using a two-stage least squares regression, our model can be expressed as follows:

$$M_{it} = \delta_0 + \delta_1 L_{it} + g(P_{it}) + X_{it}'\gamma + \eta_{it} \quad (1)$$

$$y_{it} = \beta_0 + \beta_1 M_{it} + g(P_{it}) + X_{it}'\gamma + \varepsilon_{it} \quad (2)$$

where $i$ and $t$ denote municipality and year, respectively. In the first-stage regression in equation (1), district magnitude $M_{it}$ is regressed on the maximum limit of council size $L_{it}$ along with a polynomial (1st, 2nd, 3rd, or 4th) in population size $P_{it}$ and a vector of municipality characteristics $X_{it}$. The second-stage regression in equation (2), turnout $y_{it}$ is regressed on the fitted value of district magnitude $\hat{M}_{it}$ from the first-stage regression, $P_{it}$, and $X_{it}$. Further, $\eta_{it}$ and $\varepsilon_{it}$ represent idiosyncratic error terms in the first- and second-stage regression, respectively. In the analysis, we log-transform $M_{it}$ because the marginal effect of district magnitude may not be constant across the entire range of district magnitude. Besides, since some municipalities had multiple elections in the 2006–2011 period, we cluster standard errors at the municipality level.

In order for $L_{it}$ to be a valid instrument, we require that (1) our instrument should be exogenous once we control for $g(\cdot)$ and (2) the upper limits of council size affect turnout only through determining district magnitude (exclusion restriction). As for the first assumption, it is clear from the discussion above that the upper limits of council size were solely a function of population size in municipality. Therefore, once we control for population size, the exogenous assumption of the instrument will hold. Second, as for exclusion restriction, since our instrument is only setting the upper limits of the potential size of municipal council, it is difficult to imagine that mere upper bounds have any channel through which they affect turnout other than through shaping the actual size of council and district magnitude.

Further, from the perspective of a regression discontinuity design, we require that (1) there was no other policy that uses the same population thresholds (compounding treatment) and (2) municipalities did not manipulate their population size in order to increase or decrease a potential size of council (sorting effect) (Eggers et al. forthcoming). As for the former, our in-depth search for policy subscriptions to local governments does not find any other policies based on the same thresholds. As for the latter, we expect that, precisely because the law only set the upper limits of council size, municipalities would have had little reason to manipulate their population size to move around the thresholds. In fact, many municipalities kept their council size below the maximum size. Therefore, it is safe to expect that the standard assumptions of the regression discontinuity design hold in the current setting.

We test the effect of district magnitude on turnout using a subset of municipalities that are close to the population thresholds, which enables us to obtain unbiased estimates by maximizing the plausibility of the random assignment of council size. In order to determine the size of bandwidth around each population threshold, we rely on a mean squared error optimal procedure (Calonico et al., 2015; Imbens and Kalyanaraman, 2011). For each cutoff point $c_j$ (where $j = 1, 2, \ldots, 8$), we first subset our observations to those municipalities whose population size is greater than the midpoint of the cutoffs $c_{j-1}$ and $c_j$ and less than the midpoint of the cutoffs $c_j$ and $c_{j+1}$. Then, we apply to them the mean squared error optimal procedure to determine the optimal size of bandwidth, which results in keeping 918 council elections around the population thresholds. Figure 2 shows the distribution of district magnitude in our sample. The minimum magnitude is 6, and the maximum is 46, suggesting that all of our observations have relatively large district magnitude, which is greater than the empirical turning points of the curvilinear relation between district magnitude and turnout suggested by Taagepera et al. (2014).

With respect to this approach, it is important to note that the causal effect we identify is local in a double sense. First, our regression discontinuity setting suggests that the effect refers only to municipalities around the population thresholds. Second, because of our instrumental variable setup, we account only for the effect of district magnitude that can...
be captured by changes in the maximum limits of council size set by the national law.

Results

Table 1 presents the results of the two-stage lease squares regressions. Panel A shows the results of the second-stage regressions, and panel B shows the results of the first-stage regressions. In models 1–8, we estimate models with different polynomial orders with or without the controls. At the first-stage in panel B, the coefficient for the upper limit of council size shows a positive association with district magnitude at the conventional level of significance. Further, the first-stage $F$-test is greater than 10 in all the models. Therefore, there is no evidence that our instrument is particularly weak, which validates our identification strategy (Hall et al., 1996; Stock et al., 2012). Turning to the results of the second-stage regressions in panel A, we find that district magnitude is negatively associated with turnout at the statistically significant level in all the models. The evidence therefore points to the argument that district magnitude has a negative causal impact on turnout in the current setting.

Following Gelman and Imbens (2014), we rely on models 2 and 4, which use lower order polynomials with the controls, to provide a substantive interpretation of the findings. Figure 3 presents the estimated effect of a 5-unit increase in district magnitude on turnout at different values of district magnitude. A 5-seat increase in the district with an average magnitude (from 18 to 23 seats) means a reduction in turnout by 4 percentage points. Given that the average turnout rate in the data is 58.3%, this accounts for a 6.9% drop in the size of the electorate, which is a sizable effect. However, the effect is nonlinear: Changes in district magnitude exert a greater effect on turnout in districts with fewer seats compared to districts with more seats. For example, while an increase in district magnitude from 5 to 10 implies a reduction in the expected value of turnout rate by 11.4 percentage points, a similar increase from 35 to 40 decreases turnout rate by 2.2 points.17

Alternative specifications

In order to check the robustness of our findings, we conduct several different tests. First, we implement an alternative instrument variable approach in Table F.1 of the Online Appendix.
Appendix. Instead of the continuous measure of the upper limit of council size, we instrument a set of dummy variables that indicate in which population interval each municipality falls. We find that the different approach yields the same substantive results: higher district magnitude leads to lower turnout. The magnitude of the effect is also comparable. Second, we also test a curvilinear relationship between district magnitude and turnout by adding quadratic terms of district magnitude and the upper limit of council size to equation (1) and (2), respectively. In Table G.1, we find no support for the curvilinear link. Since all of our observations have relatively large district magnitude, which is greater than the turning points of the curvilinear relation suggested by Taagepera et al. (2014), this finding is consistent with their argument.

Conclusion

Our findings indicate that district magnitude has a negative impact on turnout in Japanese municipal elections. In the context of weak parties and SNTV, any addition in district magnitude is likely to increase the amount and costs of information voters need to acquire in order to make voting decisions. This may discourage them to engage in the election process and result in lowering turnout. Focusing on a case in which information overload is an immediate concern and employing a strong identification strategy, our results provide a causally valid support for the informational overloading mechanism pointed out by other studies (Lau and Redlawsk, 2006; Selb, 2009; Taagepera et al., 2014).

Although our design allows us to claim that the effect of district magnitude is causal, it may pose some questions about external validity. On the one hand, some may ask whether the effect we identify is only applicable to a small subset of the municipalities in Japan. However, we argue that a fairly large number of the observations and the presence of the multiple cutoff points partially alleviate this concern. Unlike a typical regression discontinuity design, our inference does not necessarily depend on a unique or “unusual” cluster of observations around a single population threshold. Instead, our approach relies on multiple cutoff points throughout different population sizes of the municipalities (Brollo et al., 2013).

On the other hand, others may suggest that a somewhat peculiar institutional setting in Japan drives the results and therefore that they inform little about the effect of district magnitude in other institutional contexts. Responding to this, we stress that the current setting should be seen as just one of many examples in which electoral institutions have important consequences on the amount and costs of information. We do not expect that information overload is the unique product of the institutions in municipal council elections in Japan. Rather, as the theory proposed by Taagepera et al. (2014) clearly implies, similar effects of district magnitude should be observed under many different institutional configurations that lead to high informational complexity.

For example, we may expect that (1) the nationalization of party systems, (2) the salience of the elections at stake (first- vs. second-order elections, how much individual votes count, etc.), (3) the roles of media, or (4) the prevalence of clientelism will similarly condition the informational environments of elections. Our argument suggests that if these factors heighten informational complexity, we should observe the negative effect of district magnitude on electoral participation. Therefore, the mere fact that our institutional setting is unique does not preclude the generalizability of our findings. Instead of regarding our results as idiosyncratic, future research should explore what other institutional conditions lead to similar effects more systematically and comparatively. By doing so, we can come up not only with a better classification scheme about the informational effect of electoral institutions but also with better institutional designs to facilitate electoral participation.

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Supplemental material

Supplementary material for this article is available online.

Notes

1. Eggers (2015) and Sanz (2017) are the closest research to ours as they use population thresholds to estimate the effects of different electoral formulas and ballot structures on turnout. However, their research designs do not allow them to draw any conclusion about the impact of district magnitude on voter turnout.
2. Council elections take place at different times in different municipalities. The timing of local elections is independent of the timing of national elections.
3. However, in large cities, electoral districts are divided into several subunits.
4. Starting in 2011, municipalities could freely decide their council size. Although the abolishment of the rule may be an interesting case to explore, we do not see any pattern in changes in council size after 2011. Most municipalities keep the pre-2011 number of seats.
5. We do not use elections before 2005 for several reasons. First, the upper limits were changed in 2003 following the Local Autonomy Law reform. We assume that, by 2006, all the municipalities should have adjusted their council size to meet the new rule. Second, more practically, we have limited data on the pre-2005 municipal council elections.

6. We only have 25 observations whose population size is greater than 500,000.

7. There are two exceptions for these rules. First, large cities did not use the municipality-wide district system. Second, municipalities that had experienced municipal mergers were allowed to have council size greater than the upper limits for a certain period of time. Since our identification strategy is not valid for these municipalities, we exclude them from our sample.

8. This approach closely follows identification strategies used by Brollo et al. (2013) and Pettersson-Lidbom (2012). For other studies that use similar population thresholds, see Cattaneo et al. (2016), Eggers et al. (forthcoming), and Sanz (2017).

9. We use income per capita, the proportion of population engaging in the first industry, unemployment rates, and the geographical size of municipality as controls. Although our design does not necessarily require control variables, we include them to improve efficiency. Descriptive statistics are in Table A.1 of the Online Appendix.

10. Specifically, we expect a diminishing marginal effect of district magnitude. For example, an increase in district magnitude from 10 to 15 should have a larger impact on turnout than an increase from 35 to 40 does (e.g. Horiuchi, 2005).

11. If these assumptions are met, our design allows us to retrieve the unbiased causal effect of district magnitude. The underlying assumption is that, among municipalities just above and below the population thresholds, which upper bound is imposed can be seen as “as-if” randomly assigned, and all other confounding factors move smoothly across the thresholds. In Table C.1, we validate this assumption by confirming that there is no systematic difference in observed characteristics between municipalities below and above the thresholds.

12. Figure H.1 of the Online Appendix shows no evidence of observations self-sorting around the population thresholds. This validates our assumption with a formal test (McCrary, 2008).

13. This does not necessarily invalidate our identification strategy. In fact, our design does not hinge on the assumption that municipalities exhibit perfect compliance with the upper limits. Instead, we only require that there is a sufficient difference in council size between municipalities just below and above the arbitrary population cutoffs (Pettersson-Lidbom, 2012).

14. For example, in the case of the 5000 population threshold, we select municipalities whose population size is greater than \((2000 + 5000)/2 = 3500\) and smaller than \((5000 + 10,000)/2 = 7500\) prior to bandwidth selection. In this way, we make sure that any municipality has no chance to be exposed to two different population thresholds. In the case of the first cutoff, municipalities with more than \((0 + 2000)/2 = 1000\) population are included.

15. Table B.1 of the Online Appendix shows the number of observations exposed to each threshold.

16. This is calculated as \((58.3 – 54.3)/58.3\).

17. These figures are estimated using model 2. According to model 4, a 5-seat increase in an average-magnitude district means a reduction in turnout by 3.7 points. At the extreme, an increase in district magnitude from 5 to 10 lowers turnout by 10.6 points. At the other extreme, a similar increase in district magnitude from 35 to 40 decreases an expected turnout rate by 2.0 points.

18. This is the specification used by Pettersson-Lidbom (2012) in a similar setting.

References


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