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Party Effects on Residential Property Tax: Progressivity and Level of Taxation

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PARTY EFFECTS ON RESIDENTIAL PROPERTY TAX: PROGRESSIVITY AND LEVEL OF TAXATION*

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Abstract

Left-wing parties are supposed to favor a large public sector and an equal distribution of income. They are therefore expected to support high and progressive taxes. In this paper we test those hypotheses using data on property taxation in Norwegian municipalities. The Norwegian property tax is well suited for this purpose since the municipalities are free to choose the tax rate for the property tax and to make it more progressive by having a basic deduction. In the empirical analysis we utilize the RDD approach developed by Folke (2014). While earlier applications of this design have emphasized the effects of discontinuity in seat shares, we also emphasize the effects of discontinuity in voting power measured by the Banzhaf index. The results are robust to whether political influence is measured by seat share or the Banzhaf index. The most left-wing parties seem to be in favor of a high property tax. When it comes to the basic deduction, there are no significant party effects. This indicates that the the left-wing parties do not use the basic deduction as an instrument to make the property tax more progressive.

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1. Introduction

In 2015 the Labour Party (the social democrats) and two minor left-wing parties won a socialist majority in the municipal council in Oslo after many years with conservative rule. The property tax was a main issue in the election campaign. The socialists ran on a platform to introduce a property tax to finance better elderly care. The new property tax from 2016 came with a sizeable basic deduction in order to make it more regressive. The basic deduction was set to NOK 4 million (USD 470,000), which implies that the property tax only applies to 20 percent of the residences.

The main purpose of this paper is to investigate party effects on the municipal property tax. In Norway the property tax is an optional tax for the municipalities and the only local tax with real local tax discretion. The first hypothesis we investigate is whether political ideology is an important determinant of the level of taxation. Parties on the left are expected to have stronger preferences for public services than parties on the right. In the Norwegian municipal context, we expect this conflict to lead to higher property taxes in municipalities where parties on the left are strong.

In addition to have stronger preferences for public services, parties on the left tend to be stronger advocates for an equal distribution of income than parties on the right. Borge and Nyhus (2012) have investigated the distributional effects of the property taxation in a sample of Norwegian municipalities. Their main finding is that the residential property tax is either regressive or proportional. In cases where the residential property tax is regressive, parties on the left face a fundamental trade off. A higher property tax supports better services, but may have adverse distributional effects. A basic deduction is a way to make the property tax progressive or less regressive. The second hypothesis we investigate is whether parties on the left prefer a higher basic deduction than parties on the right.

Borge and Rattsø (2004) include party composition as a control in an analysis of how the distribution of income affects the property tax in a test of the Meltzer-Richard hypothesis. They measure party composition by the share of socialists in the local council, i.e. the Labour Party and all parties to its left. Their estimates indicate that socialists favor a high property tax consistent with the first hypothesis. However, it is not clear how to interpret this estimate. Does it reflect increased political power of socialist parties or the preferences of the

electorate? Much of the empirical literature on party effects share the same problem with respect to interpretation.

A causal party effect is understood as the effect of a change in the seat composition in the municipal council keeping voter preferences and factors constant. Petterson-Lidbom (2008) uses a regression-discontinuity design to identify a causal party effect by comparing left and right-wing governments "just below" and "just above" the 50 percent threshold. He finds that left-wing governments have significantly higher taxes and spending than right-wing governments.

Folke (2014) develops a regression-discontinuity design where minority parties are allowed to influence policy outcomes. The basic idea of his design is to use discontinuities created by the electoral rule used to transfer votes into seats. The identifying assumption is that sufficiently close to the thresholds in the seat allocation formula, part of the seat allocation can be considered to be as good as random. Representation of the small "brown" and "green" parties is found to have a large effect on immigration policy and environmental policy.

Fiva, Folke, and Sørensen (2018) combine the regression-discontinuity designs of Petterson-Lidbom (2008) and Folke (2014). Using data from Norway, they jointly estimate effects of the average left-right position of the council and the seat majority. The property tax is one of their policy outcomes, and they find that exogenous increases in both the left-wing seat share and the left-wing majority increase the likelihood that the municipality taxes residential property.

In this paper we use the regression-discontinuity design of Folke (2014) to estimate (individual) party effects on property taxation in Norwegian municipalities. Compared to Fiva, Folke, and Sørensen (2018), we provide a more detailed analysis of the property tax. We analyze both the level of taxation (per house and per capita) and the size of the basic deduction. The rest of the paper is organized as follows. In Sections 2 and 3 we account for the Norwegian property tax and party system. Section 4 discusses the identification strategy based on Folke (2014) and also discusses how we extend it to take account of discontinuities in voting power measured by the Banzhaf index. The estimation results are presented in Section 5. Finally, Section 6 offers some concluding remarks.

2. The Norwegian property tax

As in other Scandinavian countries, Norwegian local governments are important providers of welfare services like child care, primary and lower secondary education, primary health care, and care for the elderly. Other important tasks are culture and infrastructure. Operating and investment expenditures amount to around 15% of mainland GDP. The main revenue sources for the local governments are taxes, grants from the central government, and user charges. Most of the taxes are of the revenue sharing type where effective tax limits have been in place since the late 1970s. The opportunity to influence current revenues is in practice limited to property tax and user charges.

Since the introduction of local democracy in 1837 the property tax has been a source of financing for Norwegian municipalities. Nowadays the property tax is the only local tax with effective local tax discretion that makes it possible for the municipalities to affect their own tax revenues. The municipalities have a high degree of flexibility in the property tax. They can choose whether to have a property tax or not, what type of property to tax (residential, cottages, businesses, hydroelectric power stations and other works), whether to have a basic deduction for residential buildings and cottages, as well as the tax rate. The municipalities can choose a property tax rate between 0.2 and 0.7 percent. The first year the property tax is introduced the rate must be set at the minimum, i.e. 0.2 percent. Then the rate can be increased by no more than 0.2 percentage points per year.

In this paper, we concentrate on two important aspects of the residential property, i.e. the basic deduction and the level of taxation. Table 1 displays the development of residential property tax during the period under study (2007-2015). A first observation is that the number of municipalities with residential property tax has increased sharply, from 123 in 2007 to 251 in 2015. I 2015 nearly 60 percent of the municipalities levied residential property tax.

Table 1 about here

The number of municipalities with a basic deduction has also increased, but not in tandem with the number of municipalities with residential property tax. Among the municipalities with residential property tax, the fraction with a basic deduction dropped from 47 percent in

2007 to 39 percent in 2015. Moreover, the average size of the basic deduction (among the municipalities with a basic deduction) is reduced both in nominal and real terms. This development reflects that municipalities introducing a basic deduction tend to set it at a similar level as those who already have a basic deduction, and also that the basic deduction of individual municipalities tends to be pretty stable in nominal terms. In 2015 the maximum basic deduction was NOK 1.8 million (USD 210,000).

Statistics Norway collects information about property tax for a standard detached house of 120 m^2 located near the center of the municipality. It appears that the property tax for a standard house increased steadily from 2007 to 2015. In 2015 the average property tax for a standard house was NOK 3600 (USD 425), varying from NOK 195 to NOK 8400.

The per capita tax revenues increased even more than the property tax for a standard house. This development reflects that more municipalities levy property tax and that more municipalities levy property tax outside urban areas. As share of current revenues in the municipalities, the residential property tax increased from 0.9 percent in 2007 to 1.4 percent in 2015.

In the bottom row of Table 1 we report the average property tax rate among the municipalities with residential property tax. Despite the increased revenues from residential property tax, the tax rate has been on decline. Because of reassessments of the property tax base, the tax rate is not very informative. We choose to rely on property tax per standard house and per capita as indicators of the level of taxation.

In general the property tax (T) for a house with taxable value V is calculated as

$$T = t(V - B), \tag{1}$$

where t is the property tax and B is the basic deduction. The property tax is progressive in relation to property value if the average property tax ($\tilde{t} = \frac{T}{V}$) is increasing in property value. It is straightforward to show that the average property tax rate increases with the value of the property when there is a basic deduction in the property tax. More important for the empirical analysis is it that the degree of progressivity, measured as the elasticity of the average tax rate

with respect to property value, depends on the ratio between the basic deduction and property value:

$$\frac{\partial \tilde{t}}{\partial V}\frac{V}{\tilde{t}} = \frac{\frac{B}{V}}{1-\frac{B}{V}} \tag{2}$$

It follows from (2) that the degree of progressivity is higher the higher the basic deduction as share of the property value. In the empirical analysis we therefore use the basic deduction as share of the average property value in the municipality as dependent variable.

Tax progressivity is usually defined in relation to income (*I*), and a tax is progressive if tax payment as share of income, in this case $\hat{t} = \frac{T}{I}$, increases with income. The elasticity of $\hat{t}$ with respect to income is given by:

$$\frac{\partial \hat{t}}{\partial V}\frac{V}{\hat{t}} = \frac{\frac{\partial V}{\partial I}\frac{I}{V}}{1-\frac{B}{V}} - 1 \tag{3}$$

It follows from (3) that, without a basic deduction, the property tax is regressive (progressive) if housing demand is inelastic (elastic). Irrespective of the housing demand, a higher basic deduction as share of property value makes the property tax more progressive or less regressive in relation to income.

3. The party system in Norwegian municipalities

The political system at the local government level is a representative democracy where the members of the local council are elected every fourth year. Compared to national politics, a main difference is that the majority coalition does not form a cabinet. The typical organization is an alderman model with an executive board with proportional representation from all major parties.[1] The executive board is led by the mayor, and the members of the executive board,

[1] A few larger cities have adopted a parliamentary system.

including the mayor and the deputy mayor, are in most cases elected among the members of the local council.[2] The mayor does not have veto power.

Table 2 about here

As can be seen from Table 2, national parties dominate local politics in Norway. More than 95 percent of the representatives are from parties that participate in parliamentary elections at the national level. The Labour Party and the Conservative Party are two main parties of the left and right-wing blocs. The Red Party and the Socialist Left Party are minor parties to the left of the Labour Party, while the Progress Party to the right of the Conservative Party is the third largest party. The Centre Party, the Christian Democratic Party, and the Liberal Party are labeled center parties and are considered to be between the Labour Party and the Conservative Party on the left-right scale. At the national level the Centre Party formed a government with the Labour Party and the Socialist Left Party during 2005-2013, while the Liberal Party and the Christian Democratic Party support the current government comprising the Conservative Party and the Progress Party. In local politics there is substantial variation in party coalitions across municipalities.

Joint Left and Joint Right are party lists comprising two or more of respectively left-wing and right-wing parties. This is a strategy to increase the chances of representation compared to running on individual lists. Since these joint lists are represented in very few municipalities, we leave out observations where a joint list is close to winning or losing a representative.

4. The identification strategy

Without randomizing the allocation of political parties in to the municipal council there is no way that we will find the causal effects of political parties on property taxes by using a simple OLS regression. The problem arises because the voter preference is the main thing deciding the party distribution, and therefore also the policy. For example, in liberal districts the liberal parties will get more votes and hence more seat shares than in the conservative districts. Since the districts tend to differ in many respects such as income, education, social status etc. - so it

[2] In the local elections in 1999 and 2003 the mayor was directly elected in a few local governments.

becomes a problem to separate between the policy effects and the effect of characteristics. Another problem by finding the causal link between political parties and property tax may be the fact that policy changes the voter's behavior. For instance, increasing property taxes are rarely a popular policy amongst those the property tax hits the hardest, this could positively affect the voter's preferences for a party that is strictly against property taxes.

To solve the identification problem, we will follow the base line model of Folke (2014), where we compare the policy outcomes when a party barely gets an extra seat with the outcome when a party barely loses a seat in the municipality council. This is a regression-discontinuity approach. The idea is that the seats are, as good as, randomly assigned when we get close enough to a threshold for a seat change.

We need two sets of indicator variables to implement the regression-discontinuity design. The first set of variables indicates whether the party is close to the threshold, $c_{pit} = 0.5$ if close to the threshold and 0 if not. p defines the party, i the municipality and t the year. The second set of variables indicates whether the party is close to *and* above or below, $t_{pit} = 0.5$ if close and above, $t_{pit} = 0$ if not close, $t_{pit} = -0.5$ if close and below. c_{pit} is the control variable, while t_{pit} is the treatment variable. If the distance to a threshold is within the distance of λ, it is regarded as being close to the threshold. The choice of bandwidth, λ, is a tradeoff between precision and exogeneity.[3] We will report our main findings with 0.25 percent points of vote share bandwidth. In the appendix we also report results with 0.1 percent point bandwidth.

We assume that the effect of an additional seat in the municipality council depends on the total numbers of seats in the council, thus we divide the control and treatment variables by the total number of seats in the legislature.

$$Y_{it} = \alpha_0 + \sum_p \alpha_1 \frac{c_{pit}}{S_{it}} + \sum_p \alpha_2 \frac{t_{pit}}{S_{it}} + f(V)_{pit} + \varepsilon_{it} \quad (4)$$

Y_{it} denotes the dependent variable, more on the dependent variables in the next chapter. $f(V)_{pit}$ is a third order polynomial function of the vote share of all parties, p denotes the party, i the municipality and t the year. S_{it} is the total number of seats in the legislature.

[3] With shorter bandwidth we include the observations that are closer to the cut-off point, giving higher probability of exogenous variation, while wider bandwidths includes more observation, but then also less probability of exogeneous variation.

$\frac{c_{pit}}{S_{it}}$ is a vector of control variables, while $\frac{t_{pit}}{S_{it}}$ is a vector of treatment variables, one variable for all political parties. It is important to exclude one party from the specification; this party becomes the reference party. α_2 is the coefficient of interest, leaving out a party as reference means that β_2 for party p actually means: $\alpha_{2p} - \alpha_{2Referenc\ \ party}$. So, if we are interested in finding the effect of party r receiving an extra seat at the expense of party p we need to calculate: $(\alpha_{2r} - \alpha_{2p})$. In this paper, we will refer to SP (the Center Party) as the reference party.[4] As Folke (2014) points out, $f(V)_{pit}$ is only needed to reduce residual variation, not to get consistent estimates. Since the variation in both the control- and treatment variable is exogenous, we do not need to worry about the residual ε_{it} being correlated to omitted variables. This baseline model from Folke (2014) uses a change in seat share as a measure for the power of parties. Seat share gives a clear indication, but is not a precise measure of party power in a legislature with multiple political parties. Banzhaf (1965) proved that the Nassau County board's voting system was unfair by creating an index for voting power, later known as Banzhaf-index.[5] Even though the index is most often used to measure the voting power, as in Nurmi (1997), the index can easily also be used to calculate a more precise measure for party power than seat share. The idea of the Banzhaf power index is to list all the possible winning coalitions[6], then to count the critical parties in the coalitions. A critical party is the party that the coalitions depends on to be a winning coalition. The power index for parties is measured as the fraction of all swing coalitions that they could cast. For instance, if a party receives more than 50% of the seat share in a municipality they will be the only critical party to a *coalition,* hence they will have a Banzhaf power index of 1. In other words, the Banzhaf index can be seen as the relative amount of times a party is decisive for creating a majority coalition.

With n different parties, there are $2^{(n-1)}$ possible coalitions, the absolute party power for party A is then given by

$$B'_A = \frac{\mu_A}{2^{(n-1)}} \tag{5}$$

[4] We choose a party we believe has no extreme politics on property taxation, something the results later on also implies. The results holds when we use other parties as reference as well.

[5] As explained in *Game Theory and strategy:* Votes in Nassau Coutny were allocated like this: Hempstead 1: 9, Hempstead 2: 9, North Hempstead: 7, Oyster Bay: 2, Glen Cove: 1, Long Beach: 1. There is a total of 30 votes, 16 votes are requried for a measure to pass. There is a total of 32 winning coalitions and 48 swing votes. None of the swing votes belong to Oyster Bay, Glen Cove or Long Beach, in reality giving them no political power, since none of the three cities will ever be critical to change the outcome of the majority.

[6] In our case this would mean to count all possible party compositions that would create a majority.

Where μ_A is the amount of times party A is a critical party. The party power measured in this way does not always ad up to one. So instead of dividing μ_A with $2^{(n-1)}$, Banzhaf (1965) divides with the sums of the $\mu_j s$.

$$B_A = \frac{\mu_A}{\sum_{j\in} N^{\mu} j} \tag{6}$$

This measure is also known as the normalized Banzhaf index.

Our baseline model will therefore be a modified model of Folke's (2014).

$$Y_{it} = \beta_0 + \sum_p \beta_{1p} \frac{c_{pit}}{S_{it}} + \sum_p \beta_{2p} \Delta B_{pit} w_{pit} + f(V)_{pit} + \varepsilon_{it} \tag{7}$$

The adjustment from (1) is that the interest variable now is ΔB. This is the change in the Banzhaf power index. Of course, we still use the Regression Discountinity model, so we multiply the change in Banzhaf power index with w_{pit} which is 1 if party p is close to the threshold and 0 otherwise.

Table 3 about here

We use the local election in a medium sized municipality Vefsn in 2011 to demonstrate how the distance is measured and how the seats are distributed when using the Sainte-Laguë method. Table 3 illustrates how distance is measured. Here we see that DNA are "unlucky" to lose a seat to the "lucky" party SP. Total votes in Refsn in 2011 was 6123, hence 0.22% means that DNA was about 13 votes away from winning an extra seat on the expense of SP. Folke (2009) argues that there is more than one way to gain or lose a seat in the council when there are more than two parties in the election. In this example, we have set the bandwidth (λ) to be 0.25%, only SP and DNA fulfills the criteria to be close enough to the threshold. SP is close and above the cut-off point, thus the treatment variable becomes 0.5, while DNA is close and below and therefore the treatment variable becomes -0.5.
Table 3 also shows the Banzhaf power index for the parties, we see that the index somewhat favorizes the big party DNA compared to the seat share measure. This comes from the fact that there is low possibility of avoiding DNA to enter a winning coalition when they receive 15 out of the 35 seats in the council.
Interesting we also see that there would be a change in all parties Banzhaf power index if DNA had won an extra seat in the council. As DNA ended up having 15 seats instead of 16,

there are more ways for the other "medium sized" parties (RV, SP, H, FRP) to be a critical party when joining a coalition.

The seats in the municipal councils are distributed between parties using the modified Sainte-Laguë method. Each municipality has a given number of seats in the local council which is primarily based on its population. The average size of a municipality council is 25, varying from 11 to 85 representatives.

After all the votes have been counted, successive quotients are calculated for each party. The formula for the quotient is

$$quotient = \frac{V}{2s+1} \tag{8}$$

where V is the number of votes each party receive and s the number of seats already distributed to the party. Whichever party has the highest quotient gets the next seat to be allocated. The process is repeated until all seats have been allocated. The modified Sainte-Laguë method divides the first set of quotients by 1.4. After a party gets its first seat, the quotients follow the standard Sainte-Laguë method strictly.[7]

Table 4 about here

Table 4 shows how the Sainte-Laguë method allocates the mandates in a municipality. Again, we use the election in Vefsn in 2011 as an example. The table shows how the first five and last five mandates are assigned by the size of the quotients. Even though FRP is the party that won the "last" seat, the 35. mandate, by quotient, they are not the party that is closest to losing a seat. We can easily find this by deducting 13 votes from both SP an FRP. SP's quotient will fall below the DNA quotient of 87,[8] while FRP's last quotient will still be higher than DNA's, this proves that SP is closer to losing a seat even though FRP got the last mandate.

[7] By dividing the first set of **quotients** 1.4 it gets tougher for the smallest parties to get a mandate in the council. As we see from Table 4 this would imply that a party would need to conceive 124 (88x1.4) votes instead of 88 votes in Vefsn to receive their first mandate.

[8] More precisely, the quotient is 86.58.

5. Estimation results

Treatment effects on seat share

Table 5 shows the effect of the treatment variable on the seat share for the respective political party. When we control for being close to the threshold (with dummy variable, c_{it}) the treatment variable, t_{it}, should be the only thing deciding whether the party wins or loses a seat, hence we should expect the effect to be close to 1. We estimate the model (3) for each individual party.

$$SeatShare_{it} = \alpha_0 + \alpha_1 t_{it} + \alpha_2 c_{it} + \alpha_3 VoteShare_{it}^3 \quad (9)$$

We only use observations that are close to the thresholds, that is observations where $t_{it} \neq 0$.[9]

Table 5 reports the estimation of β_1 with two different bandwidths around the cut-off point, 0.25% and 0.1%, as expected the estimations are more precise with the narrowest bandwidth, but we also loose observations making the results less significant. The larger parties have a higher probability of being close to a threshold, hence they have more observations.

Table 5 about here

The total number of observations when we use the 0.25%-point bandwidth are approximately 2.5 times higher than the number of observations when we use the 0.1%-point bandwidth. This indicates that voters do not manipulate the results around the cut-offs, an important assumption for RD-design to hold. When we use the control variable all results are significantly close to one, which proves that the treatment variable is the only thing that effects the seat share when we are close to the threshold. This gives us a solid indication of exogenous variation in the seat share in municipal council. Now we can go on to exploit the exogenous variation in seat share to find the causal effects of political parties on property tax determination.

Basic deduction

Table 6 reports the results for equation (1) and (2) using the basic deduction as dependent variable. The Centre Party is left out of the equation and it thus the reference party. We present results using both seat share and Banzhaf index as measure for change in party power.

[9] Figure 1 in the Appendix shows the amount of times each party is close to the treshold, and the cross-observation between each party.

We chose to use the 0.25%-point bandwidth because of the lack of observations, although the numerical estimates with 0.1%-point bandwidth are quite similar. We also include the third order polynomial vote share, $f(V)_{pit}$. The models are estimated with both fixed effects (FE) and random effects (RE), since the results are similar we chose the random effects model as the baseline for creating table 7, since the random effects model exploits both cross sectional and time series data.

Because of the large differences in housing prices across municipalities we divide the basic deduction size with average house price in the respective municipality. The left-hand side variable is hence, $(\frac{\text{Basic deduction size}}{\text{Average house price}})_{it}$.

Tables 6 and 7 about here

Comparing policy outcomes to the Centre party does not generate any significant coefficients. In general, the effect of changes in party composition depends on which party "wins" a seat and which party "lose" a seat. Table 7 reports these effects. Take the estimate of 0.33 as an example. It is the effect on the basic deduction if the Red Party wins 100% of the political power at the expense of the Liberal Party. Correspondingly, -0.33 is the effect on the basic deduction when the Red Party loses total political power to the Liberal Party. It appears that there are no significant effects of political parties on the basic deduction size. This could also be a result of few observations, since there still is relatively few municipalities that have implemented a basic deduction in the property taxes.

According to the estimates in Table 7, the quantitative effects of changes in party composition is substantial. If the party power of Red Party increases by one percentage point on the behalf of Liberal Party, the basic deduction is predicted to be increased by 0.3% of the average residential property value.[10] But as mentioned earlies none of the effects we find in table 7 are significant.

Property tax per standard house

[10] The figures in Table 7 must be divided by 100 in order to be interpreted as a one percentage point change in party power.

The estimation results with property tax per standard house as dependent variable are reported in Tables 8 and 9. In Table 8 the Christian Democratic Party and the Conservative Party come out as significantly different from the Center Party when we use Folke's (2014) baseline model (equation (1) and (2)). While when we use the Banzhaf power index as measure only Conservative party is slightly significant (10% significance level). The estimates reveal that all three parties prefer a somewhat lower property tax than the Center Party.

Tables 8 and 9 about here

Table 9 provides more details of the effects of changes in party composition. It appears that increased party power for Red Party and Socialist Left Party leads to a significant increase in the property tax per standardized house when they increase their power on the expense of Labour Party, Liberal Party, Christian Democratic Party, Conservative Party and Progress Party. Moreover, the property tax per standard house is reduced when the Conservative Party increases its party power at the expense of the Labour Party. In all these cases a one percentage point shift in party composition is predicted to change the property tax by NOK 50-80.

Property tax per capita

The estimation results with property tax per capita as dependent variable are reported in Tables 10 and 11. From these tables it is evident that the left-wing parties (the Red Party, the Socialist Left Party and the Labour Party) prefer a higher property tax than the Conservative Party and the Christian Democrats. Moreover, Other parties seem to prefer a high property tax. The statistically significant estimates indicate that a one percentage point shift in party power will change the property tax by NOK 15-40.

Tables 10 and 11 about here

6. Concluding remarks

Left-wing parties are supposed to favor a large public sector and an equal distribution of income. They are therefor expected to support high and progressive taxes. In this paper we test these hypotheses using data on property taxation in Norwegian municipalities. The

Norwegian property tax is well suited for this purpose since the municipalities are free to choose the tax rate for the property tax and to make it more progressive by having a basic deduction. In the empirical analysis we utilized the RDD-design developed by Folke (2014). While earlier applications of this design have emphasized the effects of discontinuity in seat shares, we also emphasized the effects of discontinuity in voting power measured by the Banzhaf index. The results are robust to whether political influence is measured by seat share or the Banzhaf index. The most left-wing parties seem to be in favor of a high property tax. When it comes to the basic deduction, there are no significant party effects. This indicates that the left-wing parties do not use the basic deduction as an instrument to make the property tax more progressive.

Table 1: Residential property tax 2007-2015

	2007	2011	2015
# of municipalities with residential property tax	123(29%)	189(44%)	251(59%)
# of municipalities with basic deduction	58	84	98
Average size of basic deduction (NOK)[1]	330 802	265 995	270 797
Tax on standard house (NOK)[2]	2 376	2 874	3 609
Tax revenues per capita (NOK)[2]	937	1 329	1 899
Tax revenues per capita, all (NOK)[3]	262	580	1 119
Tax revenues as share of current revenues (%)	0.9	1.0	1.4
Tax rate (%)	0.513	0.421	0.406

[1]Fixed 2015 prices, only includes municipalities with a basic deduction.
[2]Fixed 2015 prices, only includes municipalities with residential property tax.
[3]Fixed 2015 prices, all municipalities.

Table 2: Party representation in municipal councils, 2011

	Seat share weighted (%)	Represented (%)
RV (Red Party)	1.28	8.07
SV (Socialist Left Party)	4.08	66.17
DNA (Labour Party)	32.10	98.28
Joint Left	0.14	1.41
V (Liberal Party)	6.44	60.92
SP (Centre Party)	6.49	87.39
KRF (Christian Democratic Party)	5.41	69.62
H (Conservative Party)	28.58	86.45
FRP (Progress Party)	11.36	76.90
Joint Right	0.36	5.25
Other parties and local lists	3.76	41.97

Table 3: Measuring distance to threshold, Vefsn 2011

	RV	SV	DNA	V	SP	KRF	H	FRP	Sum
Vote Share	9.38 %	3.52 %	43.70 %	5.49 %	7.27 %	2.82 %	11.97 %	15.85 %	1
Seats	3	1	15	2	3	1	4	6	35
Seat Share	8.57 %	2.86 %	42.86 %	5.71 %	8.57 %	2.86 %	11.43 %	17.14 %	1
Banzhaf Index	5.96%	1.19%	70.24%	3.57%	5.95%	1.19%	5.96%	5.96%	
Distance to win	0.70 %	0.80 %	**0.22 %**	1.72 %	2.81 %	1.50 %	0.94 %	2.70 %	
Distance to lose	2.34 %	1.55 %	1.99 %	1.26 %	**0.22 %**	0.84 %	2.10 %	0.34 %	
Control variable	0	0	0.5	0	0.5	0	0	0	
Treatment variable	0	0	-0.5	0	0.5	0	0	0	
Change in Banzhaf	2.11%	-0.09%	-7.97%	-0.27%	2.11%	-0.09%	2.11%	2.11%	

- Joint Left, Joint Right and Other parties and local lists have been left out of the table since none of them received a single vote.
- Distance to win/lose is the distance to the threshold measured in percentage points of votes.
- The change in Banzhaf that comes from the fact that SP won a “lucky” seat on the expense of DNA.

Table 4: The distribution of seats, Vefsn 2011

Party:	RV	SV	DNA	V	SP	KRF	H	FRP	
Total votes	568	214	2684	338	444	172	732	971	
quotient	406	153	1917	241	317	123	523	694	1. mandate
quotient	406	153	895	241	317	123	523	694	2. mandate
quotient	406	153	537	241	317	123	523	694	3. mandate
quotient	406	153	537	241	317	123	523	324	4.mandate
quotient	406	153	383	241	317	123	523	324	5. mandate
…	…	…	…	…	…	…	…	…	…
quotient	81	71	99	68	89	57	105	88	31. mandate
quotient	81	71	99	68	89	57	81	88	32. mandate
quotient	81	71	93	68	89	57	81	88	33. mandate
quotient	81	71	87	68	89	57	81	88	34. mandate
quotient	81	71	87	68	63	57	81	88	35. mandate

The highest quotient is highlighted in red.

Table 5: Treatment effects on seat share

Seat share of party	(1)	Obs	(2)	(3)	Obs	(4)
RV	1.053	44	1.023	0.997	16	0.706
	(3.87)***		(5.80)***	(1.96)**		(2.84)***
SV	0 .867	197	0.931	0.669	66	1.018
	(3.49)***		(6.84)***	(1.71)*		(4.16)***
DNA	-0.086	377	0.873	-0.343	155	0.968
	(-0.28)		(5.18)***	(-0.61)		(3.70)***
V	1.493	170	1.065	1.816	70	1.299
	(4.63)***		(7.00)***	(4.05)***		(4.51)***
SP	0.693	234	0.697	0.397	97	0.794
	(1.75)*		(3.77)***	(0.56)		(2.39)**
KRF	1.014	199	0.932	0.235	77	0.696
	(3.49)***		(5.96)***	(0.44)		(2.78)***
H	1.179	268	0.787	0.337	114	0.809
	(3.21)***		(5.04)***	(0.58)		(4.25)***
FRP	0.466	200	0.823	0.772	79	1.210
	(1.74)*		(5.48)***	(1.65)*		(5.95)***
Various	2.092	168	1.058	2.72	69	1.058
	(3.20)***		(2.94)***	(1.69)*		(1.63)
Bandwidth	0.25%		0.25%	0.1%		0.1%
Control	No		Yes	No		Yes

- The control variable is the third order polynomials of the vote share.

Table 6: Estimation results with basic deduction as dependent variable

	1	2	3	4
Red Party	-0.31	0.94	0.54	0.62
	(-0.29)	(0.99)	(1.25)	(1.66)*
Socialist Left Party	-1.27	-0.71	-0.24	-0.11
	(-1.20)	(-0.66)	(-0.75)	(-0.33)
Labour Party	-0.27	-0.32	0.07	0.06
	(-0.38)	(-0.44)	(0.43)	(0.47)
Liberal Party	0.36	0.68	0.20	0.25
	(0.40)	(0.75)	(0.61)	(0.84)
Christian Democratic Party	-0.73	-0.26	-0.14	0.08
	(-0.94)	(-0.36)	(-0.31)	(0.18)
Conservative Party	-0.41	-0.21	0.01	0.10
	(-0.63)	(-0.31)	(0.03)	(0.37)
Progress Party	-0.53	-0.51	-0.04	-0.06
	(-0.90)	(-0.85)	(-0.13)	(-0.22)
Other parties	0.27	0.20	0.13	0.12
	(0.35)	(0.27)	(0.71)	(0.60)
Bandwith	0.25 %	0.25 %	0.25 %	0.25 %
Controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Model	RE	FE	RE	FE
Measure	Seat Share	Seat Share	Banzhaf	Banzhaf
Observations	317	317	317	317

Robust standard errors, clustered municipality, t-values in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1%. Controls are third-order seat share polynomials for the parties. All values are measured in 2015 NOK, deflated by CPI. The Centre Party is the reference party, hence; all reported values are treatment values compared to The Centre Party.

Table 7: The effects of gaining and losing political power, basic deduction

	Gains								
	RV	**SV**	**DNA**	**V**	**SP**	**KRF**	**H**	**FRP**	**Other**
Loses:									
Red Party (RV)		-0.78	-0.47	-0.33	-0.54	-0.68	-0.53	-0.57	-0.40
		(0.15)	(0.21)	(0.41)	(0.21)	(0.20)	(0.21)	(0.17)	(0.35)
Socialist Left Party (SV)	0.78		0.31	0.44	0.24	0.61	0.25	0.20	0.37
	(0.15)		(0.33)	(0.35)	(0.45)	(0.83)	(0.35)	(0.57)	(0.23)
Labour Party (DNA)	0.47	-0.31		0.14	-0.07	-0.21	-0.06	-0.10	0.07
	(0.21)	(0.33)		(0.63)	(0.66)	(0.59)	(0.75)	(0.59)	(0.61)
Liberal Party (V)	0.33	-0.44	-0.14		-0.20	-0.34	-0.19	-0.24	-0.07
	(0.41)	(0.35)	(0.63)		(0.54)	(0.44)	(0.52)	(0.47)	(0.84)
Centre Party (SP)	0.54	-0.24	0.07	0.20		-0.14	0.01	-0.04	0.13
	(0.21)	(0.45)	(0.66)	(0.54)		(0.75)	(0.98)	(0.90)	(0.48)
Christian Democratic Party (KRF)	0.68	-0.10	0.21	0.34	0.14		0.15	0.10	0.27
	(0.20)	(0.83)	(0.59)	(0.44)	(0.75)		(0.66)	(0.81)	(0.45)
Conservative Party (H)	0.53	-0.25	0.06	0.19	-0.01	-0.15		-0.05	0.13
	(0.21)	(0.35)	(0.75)	(0.52)	(0.98)	(0.66)		(0.82)	(0.51)
Progress Party (FRP)	0.57	-0.20	0.10	0.24	0.04	-0.10	0.05		0.17
	(0.17)	(0.57)	(0.59)	(0.47)	(0.90)	(0.81)	(0.82)		(0.46)
Other parties (Other)	0.40	-0.37	-0.07	0.07	-0.13	-0.27	-0.13	-0.17	
	(0.35)	(0.23)	(0.61)	(0.84)	(0.48)	(0.45)	(0.51)	(0.46)	

The results from equation 3 (our baseline model) from table 6 are used to construct the table. P-values for the F-tests for difference in effects between pair of parties are shown in parentheses. Significant p-values are highlighted(none in this table). The effect of each party gaining a seat relative to each other party Is shown in the columns, while the effect of losing a seat is shown in the rows.

Table 8: Estimation results with property tax per standard house as dependent variable

Property tax standard house				
Party:	1	2	3	4
Red Party	-88	4 620	5 271	8 583
	(-0.01)	(0.51)	(1.53)	(2.23)**
Socialist Left Party	2 852	395	3 157	3 119
	(0.42)	(0.06)	(1.27)	(1.19)
Labour Party	-1 911	-655	-764	-554
	(-0.42)	(-0.14)	(-0.51)	(-0.36)
Liberal Party	5 551	1 597	-2 611	-3 640
	(0.84)	(0.22)	(-0.96)	(-1.29)
Christian Democratic Party	-12 646	-14 421	-2 799	-3 230
	(-2.12)**	(-2.40)**	(-1.27)	(-1.45)
Conservative Party	-11 419	-9 380	-3 332	-3 053
	(-2.13)**	(-1.70)*	(-1.65)*	(-1.49)
Progress Party	-2 419	-5 437	-2 771	-3 330
	(-0.39)	(-0.84)	(-1.15)	(-1.30)
Other parties	-5 294	1 647	-32	1 299
	(-0.69)	(0.21)	(-0.01)	(0.49)
Bandwith	0.25 %	0.25 %	0.25 %	0.25 %
Controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Model	RE	FE	RE	FE
Measure	Seat Share	Seat Share	Banzhaf	Banzhaf
Observations	1 710	1 710	1 710	1 710

Robust standard errors, clustered municipality, t-values in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1%. Controls are third-order seat share polynomials for the parties. All values are measured in 2015 NOK, deflated by CPI. The Centre Party is the reference party, hence; all reported values are treatment values compared to The Centre Party.

Table 9: The effects of gaining and losing political power, property tax per standard house

	Gains								
	RV	**SV**	**DNA**	**V**	**SP**	**KRF**	**H**	**FRP**	**Other**
Loses:									
Red Party (RV)		-2 114	**-6 035**	**-7 883**	-5 271	**-8 071**	**-8 603**	**-8 043**	-5 303
		(0.51)	**(0.04)**	**(0.03)**	(0.13)	**(0.02)**	**(0.01)**	**(0.01)**	(0.18)
Socialist Left Party (SV)	2 114		**-3 921**	**-5 768**	-3 157	**-2 800**	**-6 489**	**-5 928**	-3 189
	(0.51)		**(0.03)**	**(0.03)**	(0.20)	**(0.03)**	**(0.00)**	**(0.02)**	(0.26)
Labour Party (DNA)	**6 035**	**3 921**		-1 847	764	-2 036	**-2 568**	-2 008	732
	(0.04)	**(0.03)**		(0.38)	(0.61)	(0.16)	**(0.03)**	(0.23)	(0.70)
Liberal Party (V)	**7 883**	**5 768**	1 847		2 611	-188	-721	-160	2 579
	(0.03)	**(0.03)**	(0.38)		(0.34)	(0.93)	(0.73)	(0.95)	(0.39)
Centre Party (SP)	5 271	3 157	-764	-2 611		-2 799	**-3 332**	-2 771	-32
	(0.13)	(0.20)	(0.61)	(0.34)		(0.20)	**(0.10)**	(0.25)	(0.99)
Christian Democratic Party (KRF)	**8 071**	**5 956**	2 036	188	2 799		-532	28	2 768
	(0.02)	**(0.03)**	(0.16)	(0.93)	(0.20)		(0.73)	(0.99)	(0.24)
Conservative Party (H)	**8 603**	**6 489**	**2 568**	721	**3 332**	532		560	3 300
	(0.01)	**(0.00)**	**(0.03)**	(0.73)	**(0.10)**	(0.73)		(0.78)	(0.15)
Progress Party (FRP)	**8 043**	**5 928**	2 008	160	2 771	-28	-560		2 740
	(0.01)	**(0.02)**	(0.23)	(0.95)	(0.25)	(0.99)	(0.78)		(0.27)
Other parties (Other)	5 303	3 189	-732	-2 579	32	-2 768	-3 300	-2 740	
	(0.18)	(0.26)	(0.70)	(0.39)	(0.99)	(0.24)	(0.15)	(0.27)	

The results from equation 3 (our baseline model) from table 8 are used to construct the table. P-values for the F-tests for difference in effects between pair of parties are shown in parentheses. Significant p-values are highlighted. The effect of each party gaining a seat relative to each other party is shown in the columns, while the effect of losing a seat is shown in the rows.

Table 10: Estimation results with property tax per capita as dependent variable

Property tax per capita				
Party:	1	2	3	4
Red Party	13 374	13 718	1 627	1 388
	(1.71)*	(1.68)*	(0.92)	(0.77)
Socialist Left Party	1 443	1 992	1 647	720
	(0.45)	(0.67)	(1.60)	(0.66)
Labour Party	564	1 861	849	427
	(0.24)	(0.79)	(1.52)	(0.70)
Liberal Party	-727	-1 044	-325	-1 182
	(-0.25)	(-0.36)	(-0.29)	(-1.03)
Christian Democratic Party	-11 741	-12 015	-1 652	-2 305
	(-3.30)***	(-3.38)***	(-1.97)*	(-2.76)***
Conservative Party	-4 840	-3 572	-219	-566
	(-1.64)	(-1.27)	(-0.27)	(-0.66)
Progress Party	-2 086	-2 458	187	-540
	(-0.60)	(-0.71)	(0.17)	(-0.47)
Other parties	-678	1 425	2 153	1 787
	(-0.16)	(0.34)	(1.97)*	(1.56)
Bandwith	0.25 %	0.25 %	0.25 %	0.25 %
Controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Model	RE	FE	RE	FE
Measure	Seat Share	Seat Share	Banzhaf	Banzhaf
Observations	1 710	1 710	1 710	1 710

Robust standard errors, clustered municipality, t-values in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1%. Controls are third-order seat share polynomials for the parties. All values are measured in 2015 NOK, deflated by CPI. The Centre Party is the reference party, hence; all reported values are treatment values compared to The Centre Party.

Table 11: The effects of gaining and losing political power, property tax per capita

	Gains								
	RV	**SV**	**DNA**	**V**	**SP**	**KRF**	**H**	**FRP**	**Other**
Loses:									
Red Party (RV)		20	-778	-1 953	-1 627	**-3 280**	-1 847	-1 440	526
		(0.99)	(0.61)	(0.31)	(0.36)	**(0.09)**	(0.29)	(0.41)	(0.78)
Socialist Left Party (SV)	-20		-797	-1 973	-1 647	**-3 299**	**-1 866**	-1 460	506
	(0.99)		(0.39)	(0.17)	(0.11)	**(0.01)**	**(0.09)**	(0.28)	(0.71)
Labour Party (DNA)	778	797		-1 176	-850	**-2 502**	**-1 069**	-663	1 304
	(0.61)	(0.39)		(0.23)	(0.13)	**(0.00)**	**(0.10)**	(0.44)	(0.15)
Liberal Party (V)	1 953	1 973	1 176		326	-1 326	107	513	**2 479**
	(0.31)	(0.17)	(0.23)		(0.77)	(0.30)	(0.92)	(0.70)	**(0.06)**
Centre Party (SP)	1 627	1 647	850	-326		**-1 652**	-219	187	**2 153**
	(0.36)	(0.11)	(0.13)	(0.77)		**(0.05)**	(0.78)	(0.87)	**(0.05)**
Christian Democratic Party (KRF)	**3 280**	**3 299**	**2 502**	1 326	**1 652**		1 433	1 840	**3 806**
	(0.09)	**(0.01)**	**(0.00)**	(0.30)	**(0.05)**		(0.12)	(0.15)	**(0.00)**
Conservative Party (H)	1 847	**1 866**	**1 069**	-107	219	-1 433		407	**2 373**
	(0.29)	**(0.09)**	**(0.10)**	(0.92)	(0.78)	(0.12)		(0.68)	**(0.02)**
Progress Party (FRP)	1 440	1 460	663	-513	-187	-1 840	-407		**1 966**
	(0.41)	(0.28)	(0.44)	(0.70)	(0.87)	(0.15)	(0.68)		**(0.09)**
Other parties (Other)	-526	-506	-1 304	**-2 479**	**-2 153**	**-3 806**	**-2 373**	**-1 966**	
	(0.78)	(0.71)	(0.15)	**(0.06)**	**(0.05)**	**(0.00)**	**(0.02)**	**(0.09)**	

The results from equation 3 (our baseline model) from table 10 are used to construct the table. P-values for the F-tests for difference in effects between pair of parties are shown in parentheses. Significant p-values are highlighted. The effect of each party gaining a seat relative to each other party Is shown in the columns, while the effect of losing a seat is shown in the rows.

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Figure 1: Observations and cross-observations

	RV	SV	DNA	V	SP	KRF	H	FRP	Various
RV	-								
SV	6	-							
DNA	19	74	-						
V	5	29	53	-					
SP	11	34	81	34	-				
KRF	9	35	73	30	36	-			
H	16	49	80	42	53	43	-		
FRP	11	45	73	35	49	43	41	-	
Various	6	21	45	21	36	22	45	30	-
Total	83	293	498	249	334	291	369	327	226

Figure 1 shows the amount of times each party is being close to the threshold, with a 0.25%-point bandwidth. i.e.: we have a total of 83 observations of RV being close to the threshold, 6 of this times SV is the party closest to either gain or lose a seat on the expense of RV.