Public Choice (2006) **127:** 469–491
DOI: 10.1007/s11127-005-9004-x

The impact of closeness on turnout: An empirical relation based on a study of a two-round ballot

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Accepted: 19 October 2005

Abstract. Several methodological difficulties emerge from the empirical evaluation of the impact of closeness on turnout. The most critical resides in the use of the actual electoral results to assess the impact of closeness. Important doubt therefore remains with respect to the empirical validity of the relationship between turnout and closeness. This article intends to explore this ambiguity by an econometric analysis of the two-round French legislative elections. The first ballot gives excellent information to the voters on the expected closeness of the upcoming second ballot. The results show that closeness, whatever its measure, has an important and meaningful impact on electoral participation.

1. Introduction

Following the Downsian Closeness Hypothesis (DCH, Masusaka & Palda, 1993), many studies deal with the relation between the expected closeness of the ballot and the actual turnout. Theoretically, this relation seems well-founded and is based on two distinct effects: the direct impact of closeness on the probability to be a decisive voter, and the indirect influence via the mobilization efforts of the parties and candidates. On the contrary, the empirical assessment of this hypothesis encounters more difficulties. The first difficulty lies in measuring the closeness of an electoral race, and in the data used to evaluate it. The next difficulty is linked to the econometric method used to estimate the influence of closeness and to the choice of the data (individual or aggregated data). Due to these limits, the empirical confirmation of the relation between closeness and turnout is not attested and remains doubtful (Masusaka & Palda, 1993). The aim of this paper is to clarify this empirical ambiguity.

The French legislative election provides an interesting empirical support for that purpose. Indeed, it is a two-round single-member district voting system. In the first ballot, the candidates are elected if they receive absolute majority of the votes cast. When it is not the case, a second round is organized one week after with the candidates holding more than 12.5% of the overall of the registered voters on the first round. The results of the first round give numerous and accurate information to the electorate on the closeness of the second round. And the empirical study of the relationship between

participation on the second round and the vote results of the first round is based on a non ambiguous measure of the expected closeness. Then, after controlling for the other explanatory variables and especially for the mobilization efforts of the parties and candidates, the impact of closeness on turnout may be demonstrated without suspicion. For that purpose, we use various measures of closeness and of the votes' concentration.

Our results clearly show that closeness, whatever the way it is measured, has a significant and positive effect on turnout: the closer is the ballot on the first round, the more the registered voters decide to participate in the second round. Therefore, we offer an unambiguous empirical validation of the relation between closeness and turnout.

The next section presents the theoretical foundations of the relation between closeness and participation and the main results of the previous empirical analyses. Section 3 deals with the measure and the approximation of closeness, especially in the case of a multiparty system. Section 4 presents our econometric analysis, discusses the empirical results and their robustness. Section 5 studies the question of the efficient measure of closeness and concludes.

2. The Impacts of Election Closeness on Turnout

The expected closeness of the ballot may have two kinds of effect on turnout. Firstly, it influences the individual decision to participate. And secondly, it modifies the effort of mobilization and the behavior of the parties and candidates.

2.1. *The theoretical impacts of closeness: The direct effect and the mobilization effect*

Following Downs' (1957) seminal work and the extensive literature on rational turnout,[1] the decision to cast a ballot on election day is based on a simple and well-known calculus. The individual expected benefit (R) depends on four elements.

$$R = B\pi + D - C$$

The first term (B) represents the benefit derived from the elections result, that is to say the utility associated with the victory of the voter's favorite candidate. This gain is multiplied by the probability to be the decisive voter (π), that is to be the voter who switches the ballot result. This expected benefit is increased by D, the utility that an individual voter receives from his/her act of voting independently of the outcome. This satisfaction is usually assimilated to the voter's accomplishment of his civic duty (Riker & Odershook, 1968) or to the voter's taste of vote. This satisfaction may also come from the expression

of the voter own political preferences (Fiorina, 1976; Brennan & Lomasky, 1993). Finally, the expected benefit decreases with the cost of participation (C). This cost includes the cost of going to the poll station, which is basically small (Niemi, 1976), and the cost to be informed in order to decide. Both costs are mainly opportunity costs (Tollison & Willett, 1973).

In this calculus of participation, the expected closeness of the election influences the probability to be a decisive voter. The closer is the ballot; the more important is the clout of each voice on the final result. This effect is the direct impact of closeness on turnout.

The anticipation concerning the closeness of the ballot has also an indirect effect on turnout. Indeed, if the race is expected to be close, the political parties and the candidates will try to increase their efforts to mobilize the voters (Cox & Munger, 1989; Matsusaka, 1993). The increase of mobilization of the political leaders towards the electorate can lead to an increase in electoral participation (Shachar & Nalebuff, 1999; Aldrich 1993). In order to distinguish the direct effect of closeness on turnout from this indirect effect[2], it is necessary to control empirically for the level of mobilization of the candidates and political parties.

2.2. *The empirical studies*

Two groups of empirical analyses can be distinguished. Some studies explain the individual decision to participate by using opinion poll that they confront to the characteristics of the individuals and of their electoral district. These studies remain rare because, generally, the poll data do not contain any information concerning the characteristics of the territories where the polled is located. Therefore, this limits the possibilities to assess the influence of the ballot closeness. Furthermore, study based on individual data may suffer of sincerity bias (Matsusaka & Palda, 1999) and of sample biases.

The second group of studies is more voluminous. They use aggregated data on election results. As the probability to be a decisive voter is not directly observable, the empirical analyses of the *DCH* use two measurable characteristics which influence this probability: the degree of uncertainty of the elections results, which is a measure of the ballot closeness, and a measure of the size of the district.

Indeed, if the probability to be decisive (π) depends on the size (S) and on the margin of victory (M), one has

$$\pi = \pi(S, M) \quad \text{where } \partial\pi/\partial S < 0 \quad \text{and} \quad \partial\pi/\partial M < 0$$

and if individual participation depends on the probability to be decisive (among other factors), that is:

$$\text{Partic} = f(\pi) \quad \text{where } \mathrm{d}f/\mathrm{d}\pi > 0$$

Then the participation of the voter should depend on the size of the electoral district, and on the expected victory margin:

$$\text{Partic} = f(\pi(\text{S}, \text{M})) \quad \text{where } \partial f \big/ \partial S < 0 \quad \text{and} \quad \partial f / \partial M < 0$$

The econometric specification generally used is the following (Grant (1998)):

$$\text{Partic}_\text{j} = \text{const.} + \tau_1 M_j + \tau_2 S_j + \beta E_j + \lambda W_j + \varepsilon$$

where turnout is explained by the margin of victory of the winning candidate (M_j), by the size of the district (S_j), by the mobilization efforts (E_j) and by a set of control variables (W_j).

The more the ballot is expected to be close, the more likely the voter will be decisive. The more the district is small and the higher is the probability that a voter's vote will be decisive. That implies that $\tau_1 < 0$ and $\tau_2 < 0$.

Mobilization efforts are generally measured by electoral expenditures (Cox & Munger, 1989; Kirchgässner & Schulz, 2004). The more the candidates (or the political parties) try to mobilize the electorate the more they will spend resources in the electoral campaign. Among these resources are the electoral expenditures. Therefore, the increase of the campaign expenditures leads to an increase of turnout (François, 2003; Fauvelle-Aymar & François, 2005; Denver & Hands, 1985; Seidle & Miller, 1976; Chapman & Palda, 1981, 1983; Patterson & Caldeira, 1983; Caldeira & Patterson, 1985).

The empirical studies deal with different kind of elections, countries and different types of scrutiny, notably the referenda (Matsusaka & Palda, 1993; Kirchgässner & Schulz, 2004). The main results concern plurality system with one ballot (the first past the post) in bipartite system.[3] The comparison of the empirical results concerning the effect of closeness on turnout (Blais, 2000; Matsusaka & Palda, 1993; Endersby et al., 2002) shows that, in general, the empirical studies have mixed results.

The empirical results are ambiguous concerning the validity of the DCH. One of the variables (the size of the electorate) used to assess the DCH has almost never the expected negative sign. The other one (the expected margin of victory) has the expected sign but the estimations present two limits. The estimation results depend heavily on the methods used to measure the margin of victory. Moreover, the comparative study made by Palda and Matsusaka (1993) concerning the estimations based on individual data and the estimations on aggregate data leads them to conclude that the results on aggregate data are subject to an ecological fallacy.

3. Proxy and Measurement of Electoral Closeness

Two kinds of problems arise from the empirical evaluation of the influence of closeness on turnout: first there is the choice of the data used to evaluate the degree of closeness and second, the problem of the accuracy of the closeness measures.

3.1. *What data to use?*

The opinion polls on vote intention represent an interesting and non ambiguous measure of the degree of closeness of the upcoming ballot (Kunce, 2001). But it is rare to have opinion poll results at the district level. Therefore, this limits the possibility to make a cross-section empirical analysis. The opinion poll results at the national level may be used in a time-series empirical analysis. But this implies to have opinion poll data on a very long period. Moreover, the closeness of the ballot measured at the national level is probably really different from the one experienced by the voters in each different district. These reasons explain why the use of the elections results to measure closeness is generally favored by the researchers.

Nevertheless, one major problem is that expected closeness is basically not known. Therefore, one has to find proxy for it. Two methods are used in the literature.

The most usual method consists in taking the ex post closeness, that is the actual closeness (which corresponds to the actual vote results) instead of the unknown expected closeness. It amounts to making the strong hypothesis that electors anticipate accurately the future electoral results. In addition to this conceptual limit, this approach raises a methodological issue. The use of ex post closeness in empirical studies of turnout leads to biased results. Indeed, if expected closeness influences participation (as suggested by the theory), ex post closeness is a function of the dependant variable, namely participation. Therefore, these econometric studies encounter a serious problem of endogeneity.

These limits are not present in the second approach of closeness used in the literature which consists in taking the results of the previous elections of the same type to measure the degree of closeness (notably Kirchgässner & Meyer zu Himmern, 1997). The idea is that the voters built their anticipations on the previous electoral results. But, given the span of time since the last similar election, the information brought by these previous results is probably no longer really accurate. In particular, it does not allow to take account of the events that occurred since the last election and that explain the results of the election studied, i.e. the influence of the contextual variables. For example, in the case of France, this approach of closeness will lead to use the results of the 1993 legislative elections to built measures of closeness for the 1997

legislative elections. In 1993, the elections have been a historical success for the right-wing parties whose candidates won with a large margin in numerous districts. On the contrary, the 1997 elections signed the defeat of the right-wing coalitions. Therefore, using the 1993 results to measure closeness will not carry the correct information concerning the expected closeness in the different districts for the 1997 elections. Using the result of the previous election, whatever its type, raises other sort of problems. They are linked, in particular, to the fact that the different elections do not have the same aim (to elect a national assembly, a president or a mayor of a city...) and therefore do not induce the same electoral behavior of the voters. Moreover, these elections have not the same territorial dimension. For instance, using the presidential election results to estimate the closeness of the legislative election may lead to several mistakes of interpretation, since one totally nationalized election is used to explain the result of elections that still have a strong local dimension.

These various problems may explain the disappointing results of the empirical literature on the relation between closeness and turnout. As noted, the French electoral system offers a way to avoid these limits concerning the evaluation of the closeness of the race. For the legislative elections, France uses a two-round majority single-member district system. Therefore, whereas the empirical analysis of the turnout in the first round encounters the former limits, it is not the case when one studies the level of participation in the second-round. The first round results provide a simple and accurate way to assess the expected closeness of the second round race. Before examining this point in detail, we present the various ways to calculate closeness.

3.2. *How to calculate the closeness of the race?*

The empirical literature offers various operational definitions of electoral closeness. The choice of an accurate measure is very important because it influences the estimated relation between closeness and turnout (Grofman, Collet & Griffin, 1998). Among the various definitions are measures of electoral margin, entropy and competitiveness. Most of these indicators have been developed in the context of bipartisan political systems. After presenting them, we will examine how these indicators should be modified to take into account the particular characteristics of multiparty systems and of other electoral systems, and in particular two-ballot systems.

The different measures of closeness are presented in the Table 1.[4] The most simple calculus of closeness is the two party ratio that only takes into account the balance of power between the two leading candidates, that is tpr_j the ratio v1 on v2 (Table 1). The most used definition of closeness is probably the two party margins. It is the difference between votes between the two leading candidates (v1 and v2) divided by the sum of the votes for them, that

Table 1. Measure of closeness, competition and votes' concentration

Vote margin	
Two party margin	Multiparty margin
$tpm_j = \frac{(v_1 - v_2)}{(v_1 + v_2)}, 0 < tpm_j < 1$	$mpm_j = \frac{(v_1 - v_2)}{\sum_{i=1}^{c} v_{ij}}, 0 < mpm_j < 1$
Two party ratio	Raw vote margin
$tpr_j = \frac{v_1}{v_2}, 1 < tpr_j < v_1$	$rvm_j = (v_1 - v_2), 0 < rvm_j < v_1$
Entropy index	
$\text{entrop}_j = \sum_{i=1}^{c} -\frac{v_{ij}}{\sum_{i=1}^{c} v_{ij}} \times \ln(\frac{v_{ij}}{\sum_{i=1}^{c} v_{ij}}), 0 < \text{entrop}_j < 2$	
Competition index	
$\text{compet}_j = c^c \prod_{i=1}^{c} \frac{v_{ij}}{\sum_{i=1}^{c} v_{ij}}, 0 < \text{compet}_j < 1$	
Fractionalization index	
$F_j = 1 - \sum_{i=1}^{c} \frac{v_{ij}}{\sum_{i=1}^{c} v_{ij}} \times [\frac{v_{ij} - 1}{\sum_{i=1}^{c} v_{ij} - 1}], 0 < F_j < 1$	

i: candidate/party's rank on the first ballot; j: constituency; c: number of candidates/parties on the first ballot; v_{ij}: votes obtained by the candidate/party i in the constituency j.

is tpm_j equals $((v1 - v2)/(v1 + v2))$. The problem is that, in a bipartisan system, $v1 + v2$ is equivalent to the total vote cast. Then, as Cox (1988) argued, the use of this definition of closeness may lead to empirical biases since the denominator of the explanatory variables (the sum of the votes) is the nominator of the dependant variables (the turnout rate). Therefore, he suggested using the raw vote margin (rvm_j) that is the absolute difference between the total numbers of vote for the two candidates, $(v1 - v2)$.[5]

Nevertheless, one main limitation of this definition is that it does not take into account the potential influence of the size of the district on closeness. More precisely, it is not the same thing for the first candidates to be in advance of 3% of the ballot in a district where there are only about 26000 registered voters than in a district where there are more than 100,000 registered voters.[6]

In addition to these simple indicators, other measures of closeness have been developed that try to evaluate the degree of competitiveness or the degree of concentration of the political arena. As these indicators are more suited for multiparty systems, they are presented in the following section.

3.3. *Closeness in two rounds ballot and multiparty system*

Elections with two rounds offer an easy way to measure closeness. The use of the results of the first round allows us to avoid the limits due to the use of ex post indicator of closeness.[7] Moreover, as the time between the two rounds is usually very short (one week in France), these results represent a

non ambiguous information for the voters about the closeness of the oncoming second round.

Nevertheless, two-ballot elections pose another problem. This type of election occurs in a multiparty electoral system where the two leading candidates on the first round qualify for the second round. More precisely, in France, all the candidates whose score on the first round represents at minimum 12.5% of the registered voters in the district are allowed to compete on the second round. Then, depending on the results of the first round, more than two candidates may be present on the second round. That was the case in 79 districts in 1997. Therefore, the various definitions of closeness studied in the previous section need to be amended to take into account the presence of multiple candidates on the first round.

For example, to use the two-party margin definition (tpm_j) in a multiparty system amounts to considering that one has a bipartisan electoral system. This leads to ignore the influence that the political parties present on the first round but not on the second, may have on the second round ballot. One way to take account for the influence of these parties is to calculate a multiparty margin indicator (mpm_j), that is, the difference between the score of the two first candidates divided by the total number of vote cast that is mpm_j equals $((v1 - v2)/\sum vij.))$

Whatever the definition, the calculus of the margin between the two leading parties in multiparty systems does not reflect the competition intensity. It should be completed by a measure of political competition or by a concentration index.

The first index, suggested by Kirchgässner and other (Kirchgässner & Schimmelpfennig, 1992 & Kirchgässner & Meyer Zu Himmer, 1997), is a measure of entropy ($entrop_j$). This measure, which comes from the theory of information, is the expression of the degree of randomness in the occurrence of an event, and more accurately of the instability within the election.

The calculus depends on the number of parties and candidates taken into account which has to be chosen with discretion. For instance, one may take into account all the candidates or only the two leading candidates of the first round. But the number of candidates chosen must be the same for each district.

Another measure is given by the index of competitiveness ($compet_j$) developed by Endersby et al. (2002). Like the entropy measure, the number of party is chosen with discretion. However, it does not have to be the same for each district. Thus, this index allows comparing constituencies that do not have the same number of candidates.

In addition, Capron and Kruseman (1988) propose a fractionalization index (F_j) that "measures the probability that any two voters randomly chosen from the electorate have voted for different party". The less concentrated is the vote, the more the index tends to 1. And this measure depends both on the inequality of the vote share and on the number of candidates.

4. Empirical Study of a Two-Round Ballot: The 1997 French Legislative Elections

The French electoral system used to choose the deputies of the National Assembly is a two-ballot system. On the first ballot, the candidates are elected if they receive absolute majority of the votes cast. When it is not the case, a second round is organized one week after. The candidates must receive at least 12.5% of the registered voters' votes to be present on the second round. Most of the second round races are two-candidate race, generally between a right-wing and a left-wing candidate but, sometimes, a third candidate is present (usually from the far-right party, the National Front).

4.1. *The 1997 French legislative elections*

The empirical study concerns the participation in the French constituencies; it is therefore based on aggregate electoral district data. More precisely, the dependent variable is the rate of turnout in the different legislative districts in the second round of the 1997 legislative elections.

The choice of the legislative elections of 1997 is due to considerations of data availability, in particular concerning electoral expenditures. Since the electoral finance law deeply changed before 1997[8], we choose to make an empirical study based on cross-sectional data and to use only the 1997 legislative elections.

There are 555 electoral districts in France.[9] We only choose to retain the districts where in the second round, the duel was between a left-wing candidate and a traditional right-wing candidate. This amounts to 398 electoral districts (Table 2). Among the excluded districts, logically there are the districts that do not have any second round (because a candidate has received an absolute majority on the first round), this occurred in 7 districts in 1997 and the 12 districts where there was only one candidate on the second round contest. This situation occurs when the two candidates able to stay on the second round are from the same political wing and one of them decides to withdraw from the contest. We also excluded the districts where the second round was a triangular contest (with 3 candidates) and the districts where on the second round, the

Table 2. Turnout and electoral competition on the second round

	One candidate	Two candidates	Three candidates	Overall
Constituencies	12	456	79	547
Turnout				
Mean	52.81	71.52	72.87	71.3
sd	5.61	4.55	2.74	5.18

Table 3. Turnout for the second rounds opposing left and right candidates

	Mean	sd	Min	Max
398 constituencies	72.35	4.02	62.07	84.9

duel was between either two right-wing candidates[10] or a National Front candidate and another candidate. The presence of a National Front candidate on the second round modifies the issue of the elections and the participation motivation. It becomes a sort of referendum in favor of the democracy, and therefore it leads to an increase in participation level. But this increasing participation is against the Le Pen movement and not exactly in favor of the other candidates. Therefore, it does not concern our study whose aim is to study the influence of the closeness of the race.

The rate of turnout is defined as the number of voters (including the blank and null votes) as a percentage of total registered voters in the district.

The average turnout rate for the 398 districts is about 72.35% on the second ballot (Table 3) which is similar to the figures for the first round.[11] Although the levels of turnout are relatively homogeneous on the whole territory (low variance), some districts experienced a very high rate of turnout (84.9% on the second ballot) while in others the abstention reached more than 47.93% of the electorate.

4.2. *The econometric estimation*

The expression to test is the following:

$$\text{Parti}_j = \beta + \alpha_1 \text{Close}_j + \alpha_2 \text{Size}_j + \alpha_3 \text{Mobi}_j + \alpha_4 W_j + \varepsilon_j$$

The rate of participation at the second round in the j district (Parti_j) is explained by the actual closeness of the race (Close_i) calculated with the first round results, the level of electoral expenditures in the district (Mobi_j), the human size of the district (Size_j) and some socio-economic indicators (W_j) used as control variables.[12]

The simplest variable is the size of the constituency (Size_j) which is equal to the number of voters registered in the district. Regarding the *DCH*, we expect the coefficient associated to this variable to be negative.

4.2.1. *The closeness measures*

Concerning the closeness indicators, we use nine alternative measures (regression 1 to 9). The forth first are the indicators described before that measure

Table 4. Measurement of closeness (398 constituencies) on the first round

	Mean	sd	Min	Max
*Mpm*12	0.886	0.689	0.001	0.303
*Rvm*12	3,996	3,306	44	19,702
*Tpm*2	0.143	0.107	0.001	0.469
*Tpr*12	1.376	0.338	1.002	2.766
*Entrop*12	0.633	0.034	0.526	0.723
*Entrop*123	1.398	0.108	1.065	1.748
Entroptot	1.408	0.096	1.098	1.698
*Comp*12	0.158	0.046	0.065	0.416
F	0.769	0.037	0.653	0.866

the margin between the two leading candidates on the first round (namely $mpm12_j$, $rvm12_j$, $tpm12_j$ and $tpr12_j$). All these measures are expected to have a negative coefficient in the turnout regression (Table 4).

Concerning the entropy, we use three different measures depending on the number of candidates taken into account. The first ($entrop12_j$) is based on the two leading candidates score, the second ($entrop123_j$) on the candidates that exceed the legal threshold of 12.5% of the registered voters, and the third ($entroptot_j$) on all the candidates present on the first ballot. If on average the two latter do not differ significantly from one another (Table 4), the first entropy indicator has on average a lower value (that means less competition) and a lower variance.

Finally, we test two other measures, the competition index ($comp12_j$) defined by Endersby et al. and the fractionalization index (F_j) proposed by Capron and Kruseman. The first is calculated on the two leading candidates at the first round, and the second on all the first round candidates. Except for the coefficient associated with the fractionalization variable, whose theoretical sign is negative, the expected sign of the coefficient associated to the three other indicators of closeness is positive: the more competitive the race is, the higher the level of turnout is.

4.2.2. *The mobilization and the campaign expenditure ($Mobi_i$)*

The mobilization efforts engaged by the candidates and the parties are approximated by the campaign expenditure allocated to the electoral activities. The more politicians make efforts to mobilize the electorate, the more they engage monetary resources in the campaign.

The data used are the aggregate campaign spending, at the district level, of all the candidates present at the contest. These expenditures correspond to the

total amount of the electoral campaign spending since it is impossible to know their date of implementation. It means that only a part of these expenditures concerns the second ballot. Nevertheless, since the time between the two rounds (one week) corresponds to a given and short length of time of the official campaign, it is sufficient to assume that the spending done between the first and the second round represents a constant fraction in each district. Moreover, these data are the total campaign expenditure at the district level. That means that they include the resources spend by candidates that are not present on the second round. Nevertheless, one can notice that most of the first round losing candidates continue to be active during the second round campaign, in particular to tell their partisan to whose second round candidates they should give their ballot. However, in order to test the robustness of this hypothesis, we also run regressions where we only included the campaign spending of the second round candidates. Finally, in order to avoid potential biases induced by the size of the district, we divided the district expenditures by the number of registered voters.

The amount of the campaign spending in the different districts fluctuates widely. The average level of spending (12.28 FF by registered voters) corresponds to less than half of the maximal authorized amount.

The empirical studies cited before suggest that the relation between aggregate electoral spending and turnout is not linear. Therefore, we choose to consider a third order polynomial specification, that is to introduce the expenditure level, its square value and its cubed value to estimate a nonlinear function.

4.2.3. *The socio-economic variables (W_i)*

Concerning the socioeconomic determinants of turnout, the objective is not to renew the analysis on these factors but to introduce them to control for the characteristics of the districts.[13] Indeed, for econometric reasons, and in particular to avoid the bias due to omitted variables, it is necessary to control for the influence of these structural factors to accurately assess the impact of the other factors. We introduce 5 socio-economic determinants. Firstly, the level of education of the electorate is approximated by the percentage of the population in the district that has no diploma (variable $NoDiploma_j$). Following the literature (see Freeman, 2003), one must expect that voters without a diploma participate less. Secondly, it appears that abstention is more frequent among young populations (Highton & Wolfinger, 2001) and decreases with age. To control for the influence of the structure by age of the district, we introduced the percentage of the population between 18 and 20 years old, the percentage of the population between 20 and 24 years old, and the percentage of the population over 40 years old. Given the voluntary demand to registration at 18 years, the first population has to participate

more than the second and the third. The last socioeconomic variable taken into account is the occupation status of the voters since it is generally recognized that it influences turnout in French electoral studies (Fauvelle-Aymar & François, 2005). We consider two variables, the percentage of the active population in the agricultural sector (*Farmer*) and the percentage of workers (*Worker*).[14]

4.3. *Estimation results*

Tables 5 and 6 present the results concerning the estimations of the rate of turnout in the 398 legislative districts. The estimation method is ordinary least squares with robust estimated standard error (White's method). The results of our estimations are generally satisfactory. Our different explanatory variables account for about 50% of the variance (the adjusted R^2 is between 0.53 and 0.65 in all the regressions). Concerning the socio-economic variables, the results are globally conform to those expected and for a discussion of these factors, see Fauvelle-Aymar and François (2005).

First, we consider the spending variable. As explained before, we introduced a polynomial functional form for the electoral spending variable in order to fit an increasing and concave function (since the literature suggests that the marginal return of the electoral expenditure is decreasing). The estimation that we obtain is really significant. We also estimated other functional forms but it turns out that this polynomial form is the most significant (measured in terms of the value of the adjusted R^2). The increase in electoral spending leads to an increase in electoral participation but this influence is less and less important as the expenditure in the district increases.

Consistent with the empirical literature (Blais, 2000) but at the opposite of the theoretical literature (seminally Downs, 1957), the constituency size ($Size_j$) has a positive impact on turnout. And the value and the significance of the coefficients associated to this size variable are not constant. It depends on the closeness measure. When we exclude from the regression the closeness variable, the constituency size coefficient stays positive and is more significant (the value is 0.052 with a t student of 2.942). Indeed, in the case of France, there are good raisons to think that the variable "number of voters registered in the district", is not accurate to test the theory of the decisive voter. The legislative districts have not been modified since 1987. Since then, some districts have experienced a high population growth whereas the migratory balance is negative in other districts. Therefore, the variable "size of the electorate" is, at the same time, a measure of the human size of the district and an indicator of its demographic and economic situation. It is not possible to distinguish between these two effects. Nevertheless, as the sign of the coefficient is positive, one can think that the demographic and economic effect dominates the "size of the electorate" effect.

Table 5. Estimation of turnout on the second round

Dependent variable: Turnout on the second round				
Independent variables	Regression (1)	Regression (2)	Regression (3)	Regression (4)
Constant	40.580*** (7.77)	37.369*** (6.87)	40.855*** (8.06)	42.805*** (7.71)
Spend	1.212** (2.20)	1.229** (2.11)	1.212** (2.24)	1.241** (2.26)
$Spend^2$	−0.067* (−1.94)	−0.065* (−2.93)	−0.066** (−1.98)	−0.067** (−1.98)
$Spend^3$	0.001* (1.78)	0.001 (1.60)	0.001* (1.84)	0.001* (1.81)
ConstSize	0.031 (1.65)	0.051*** (2.83)	0.032* (1.75)	0.035* (1.81)
*Mpm*12	−0.141*** (−5.99)	–	–	–
*Rvm*12 ($\times 10^{-3}$)	–	−0.239*** (−3.98)	–	–
*Tpm*12	–	–	−0.987*** (−6.48)	–
*Tpr*12	–	–	–	−2.920*** (−5.22)
Worker	0.072** (2.13)	0.077** (2.27)	0.071** (2.16)	0.070** (2.10)
Farmer	0.383*** (5.33)	0.385*** (5.30)	0.367*** (5.34)	0.363*** (5.21)
NoDiploma	−0.073 (−1.36)	−0.072 (−1.33)	−0.071 (−1.75)	−0.068 (−1.29)
PopAge1820	0.843*** (3.10)	0.865*** (3.08)	0.868*** (3.26)	0.861*** (3.20)
PopAge2124	−0.135 (−0.80)	−0.120 (−0.70)	−0.161 (−0.96)	−0.157 (−0.93)
PopAge > 40	0.310*** (4.50)	0.323*** (4.60)	0.307*** (4.62)	0.312*** (−5.22)
Adjusted R^2	0.568	0.551	0.580	0.573
F	64.14***	57.75***	66.81***	63.55***
N	398	398	398	398

Estimation with ordinary least squares.
The *t*-ratios are given between parentheses. ***Means that the coefficient is statistically significant at the 1 percent level; **at the 5 percent level; and *at the 10 percent level.
The *t*-ratios are corrected by the White method (White (1980)).

Table 6. Estimation of turnout on the second round (continuation)

Dependent variable: Turnout on the second round					
Independent variables	Regression (5)	Regression (6)	Regression (7)	Regression (8)	Regression (9)
Constant	1.793 (0.37)	26.487*** (4.80)	25.649*** (4.66)	24.684*** (5.93)	38.511*** (6.51)
Spend	1.572*** (3.15)	1.586*** (2.83)	1.514*** (2.72)	1.771*** (3.81)	1.893*** (3.25)
$Spend^2$	−0.068** (−2.09)	−0.078** (−2.18)	−0.075** (−2.11)	−0.078** (−2.56)	−0.090** (−2.41)
$Spend^3$	0.001* (1.73)	0.001* (1.81)	0.001* (1.74)	0.001** (2.03)	0.002** (2.01)
ConstSize	0.071*** (4.44)	0.043** (2.38)	0.038** (2.10)	0.071*** (4.48)	0.064*** (3.58)
*Entrop*12	51.727*** (11.18)	–	–	–	–
*Entrop*123	–	3.047* (1.93)	–	–	–
Entroptot	–	–	4.210** (2.28)	–	–
*Comp*12	–	–	–	38.930*** (11.68)	–
F	–	–	–	–	−13.382** (−2.53)
Worker	0.025 (0.86)	0.082** (2.43)	0.085** (2.54)	0.018 (0.63)	0.056 (1.63)
Farmer	0.223*** (3.78)	0.380*** (4.88)	0.391*** (4.94)	0.160*** (2.68)	0.347*** (4.69)
NoDiploma	0.025 (0.53)	−0.056 (−1.04)	−0.066 (−1.22)	0.040 (0.86)	−0.035 (−0.64)
Pop1820	1.130*** (4.75)	0.900*** (3.07)	0.870*** (2.98)	1.130*** (4.59)	1.090*** (3.57)
Pop2124	−0.356** (−2.45)	−0.054 (−0.31)	−0.036 (−0.21)	−0.301** (−2.05)	−0.175 (−0.98)
PopAge>40	0.274*** (4.85)	0.367*** (5.04)	0.368*** (5.06)	0.312*** (5.65)	0.349*** (4.94)
Adjusted R^2	0.651	0.526	0.528	0.653	0.530
F	75.18***	49.08***	49.72***	73.14***	47.20***
N	398	398	398	398	398

Estimation with ordinary least squares.
The *t*-ratios are given between parentheses. ***Means that the coefficient is statistically significant at the 1 percent level; **At the 5 percent level; and *at the 10 percent level.
The *t*-ratios are corrected by the White method (White (1980)).

4.4. *The influence of closeness*

As a general comment, one can notice that all our measures of closeness lead to significant results and have coefficient with the right sign. The closer is the race, the more the voters participate. Moreover, whatever the measure of closeness used, the estimated coefficients converge. For instance, when the margin between the two leading candidates on the first round ($rvm12_j$) increases of one thousand votes[15], it induces a decrease of 0.2 points of percentage of the turnout on the second round. If the ratio of the difference of ballot between the two leading candidates on the total vote ($mpm12_j$) increases of 1%, the turnout on the second round decreases of 0.14 points of percentage.

It could be possible to observe some relationship between our measures of closeness and the number of registered voters which induces variation in the level of significance of the coefficients associated with these closeness indicators. Indeed, some of these indicators, such as the multiparty margin, are calculated as a percent of the number of registered voters. Nevertheless, if we exclude from the regression the variable indicating the number of registered voters the estimated coefficients do not vary notably and their level of significance increases, except for the fractionalisation index.[16] Thus, in order to avoid a bias due to variable omission, we choose to keep the size of the district variable in our estimations.

Our results cast some new light concerning the measure of closeness in multiparty systems. According to the value of the adjusted R^2 of the nine regressions, one may notice that the best results are obtained with closeness measures calculated on the score of the two leading candidates, and thus, with measures that ignore the impact of the number of candidates.[17] Concerning the indicators of margin, the regression with the two parties' margin measure (tpm_j) is better than all the others and especially better than the regression with the multiparty margin indicator (mpm_j). Concerning the concentration indexes, which are more appropriate to multiparty systems, the same conclusion may be drawn since the best estimation is based on the entropy index calculated on the two leading candidates score. Moreover, it is not only the regressions which are more significant (the value of the R^2 is higher) but also the estimated coefficients associated with the closeness measures. The coefficients associated with the more general indicators ($entrop123_j$, $entroptot_j$ and F_j) are less significant even if one excludes the size of the district variable.

As a conclusion, one may argue that closeness measures based on the results of the two leading candidates on the first round are better than other measures of closeness. This result may attest that when voters form their anticipations concerning the closeness of the second round the score of the two first candidates of the first round is more important than the whole result of the first ballot.

Finally, to assess the robustness of our results concerning the influence of closeness on turnout, we rerun the same regression but using a different dependant variable. Instead of taking the turnout rate as before, we use the variation of turnout between the first and the second round (that is turnout rate on the second round minus turnout rate on the first round). Logically, a close race should lead to an increase in participation. Even if the quality of the estimations is less good [18], the results largely confirm this proposition. The four coefficients associated with the margin indicators are all highly significant and their values are strongly convergent with the former ones. Concerning the concentration indexes, the sole significant coefficients are those associated with the closeness indicators based on the two first candidates results ($entrop12_j$ and $comp12_j$). These results strengthen the preceding conclusions which are that 1) the closeness of the race influences turnout (since the first round race that end close lead to a growth of the turnout rate on the second round), 2) the voters base their anticipation more on the results of the two leading candidates of the first round than on the first round general results.

5. Conclusive Discussion: The Efficient Measure of Closeness

It appears that the closeness of the race, whatever its measure, has an impact on turnout. What conclusion can be drawn from our study concerning the one-ballot race? To answer this question, we rerun our estimations using closeness measures based on the second round actual results.

First of all, one can notice that the correlation between these two different measures of closeness is not very high, but nevertheless the coefficient is always significant (see Appendix 3). The highest correlation is between the raw vote margin (*rvm*) on the first round and on the second round ($r = 0.58$) and the lowest is for the competition index (*compet*) with a coefficient of correlation equals to 0.09 (only significant at the 10% level).

When the estimations using the second round closeness measures are compared to the former ones, it appears that globally similar results are obtained. However, the adjusted R^2 are lower and the coefficients associated with the closeness measures are less significant. Concerning the fractionalization index, the coefficient has the wrong signs.[19]

These differences in the results may be explained by a potential problem of endogeneity. Therefore, one can argue that the lower explanatory power of the second round closeness measures leads to choose the first round closeness indicators in order to estimate accurately the influence of the closeness of the race on electoral turnout. Nevertheless, in a single round election, the use of the actual result to estimate the closeness seems to be a good approximation of this influence.

Furthermore, our estimations show that the best measure is either the two-party ratio (*tpr*) or the two-party margin (*tpm*). Indeed, the estimations using

these two measures of closeness based on the second round data present the most significant results.

Then, our study shows that when one uses appropriate indicators, the influence of the closeness of the race on turnout, on aggregate data, is clearly attested. Moreover, even in the case of multiparty systems, the best efficient measure of closeness is based only on the gap (or on the concentration of the ballot) between the two first candidates in competition.

The doubts that could subsist concerning the empirical impact of closeness on turnout are not due to some ecological fallacies (Matsusaka & Palda, 1993) but only to problems linked to the measure of closeness and to the choice of the data used to calculate the degree of closeness of the race as well as to the fact that the empirical studies concerning one-ballot elections may encounter problem of endogoneity.

Acknowledgments

The authors thank Bernard Grofman for his helpful and fruitfully comments. All errors and omissions are, of course, the sole responsibility of the authors.

Appendix

A.1. Variables' statistical description

Variable	Mean	Standard deviation	Min	Max
ConstSize	68,483	10,992	30,331	104,87
Farmer	3.549	0.598	0	18.419
NoDiploma	19.253	4.890	7.804	32.239
Pop1820	5.131	1.094	2.779	9.047
Pop2124	6.385	2.356	3.546	17.144
PopAge>40	60.920	5.866	42.170	72.168
Spend	12.281	3.498	3.560	31.131
Worker	25.542	8.346	3.716	44.334

A.2. Estimations of the turnout variation between the two rounds

Dependent variable: Variation of the turnout between the two rounds									
Independent variables	Regression (1)	Regression (2)	Regression (3)	Regression (4)	Regression (5)	Regression (6)	Regression (7)	Regression (8)	Regression (9)
Constant	−4.695** (−2.14)	−5.912*** (−2.67)	−5.501** (−2.49)	−3.043 (−1.28)	−20.440*** (−6.70)	−14.868*** (−5.26)	−13.580** (−4.71)	−15.245*** (−5.84)	−17.656** (−5.59)
Spend	0.521** (2.31)	0.412* (1.89)	0.570** (2.56)	0.568** (2.48)	0.969*** (3.62)	0.991** (3.64)	1.043*** (3.81)	1.001** (3.73)	0.928*** (3.46)
$Spend^2$	−0.024* (−1.68)	−0.017 (−1.22)	−0.026* (−1.81)	−0.025* (−1.75)	−0.0373** (−2.15)	−0.040** (−2.30)	−0.043** (−2.42)	−0.040** (−2.29)	−0.038** (−2.21)
$Spend^3$	0.000 (1.08)	0.000 (0.62)	0.000 (1.17)	0.000 (1.12)	0.000 (1.32)	0.000 (1.44)	0.000 (1.57)	0.000 (1.43)	0.000 (1.37)
ConstSize	−0.012 (−1.27)	0.008 (0.84)	−0.008 (−0.96)	−0.007 (−0.84)	0.012 (1.18)	−0.008 (0.76)	0.012 (1.12)	0.010 (0.96)	0.004 (0.40)
*Mpm*12	−0.136*** (−10.70)	–	–	–	–	–	–	–	–
*Rvm*12 ($\times 10^{-3}$)	–	−0.294*** (−10.28)	–	–	–	–	–	–	–
*Tpm*12	–	–	−8.553*** (−11.01)	–	–	–	–	–	–
*Tpr*12	–	–	–	−2.708*** (−10.24)	–	–	–	–	–
*Entrop*12	–	–	–	–	10.383*** (4.05)	–	–	–	–
*Entrop*123	–	–	–	–	–	0.105 (0.11)	–	–	–
Entroptot	–	–	–	–	–	–	−1.073 (−0.99)	–	–

(*Continued on next page*)

A.2. (*Continued*)

Dependent variable: Variation of the turnout between the two rounds									
Independent variables	Regression (1)	Regression (2)	Regression (3)	Regression (4)	Regression (5)	Regression (6)	Regression (7)	Regression (8)	Regression (9)
*Comp*12	–	–	–	–	–	–	–	3.573*	–
								(1.81)	
F	–	–	–	–	–	–	–	–	4.693
									(1.58)
Worker	−0.056***	−0.050***	−0.058***	−0.059***	−0.068***	−0.058**	−0.062***	−0.063***	−0.054***
	(−2.63)	(−2.64)	(−3.02)	(−3.10)	(−2.88)	(−2.45)	(−2.59)	(−2.66)	(−2.25)
Farmer	−0.022	−0.019	−0.035	−0.040	−0.056	−0.024	−0.027	−0.044	−0.012
	(−0.65)	(−0.56)	(−1.06)	(−1.20)	(−1.38)	(−0.59)	(−0.66)	(−1.07)	(−0.28)
NoDiploma	0.019	0.015	0.023	0.025	0.052	0.036	0.039	0.045	0.029
	(0.61)	(0.55)	(0.80)	(0.86)	(1.56)	(1.07)	(1.15)	(1.32)	(0.84)
PopAge1820	−0.098	−0.105	−0.063	−0.076	0.060	0.026	0.055	0.043	−0.012
	(−0.79)	(−0.87)	(−0.52)	(−0.63)	(0.39)	(0.16)	(0.34)	(0.27)	(−0.08)
PopAge2124	0.163**	0.173**	0.144**	0.144**	0.143*	0.195**	0.176**	0.175**	0.218**
	(2.21)	(2.43)	(2.00)	(2.04)	(1.72)	(2.29)	(2.04)	(2.11)	(2.56)
PopAge>40	0.126***	0.129***	0.128***	0.129***	0.154***	0.171***	0.167***	0.167***	0.173***
	(4.33)	(4.33)	(4.31)	(4.45)	(4.25)	(4.52)	(4.45)	(4.49)	(4.61)
Adjusted R^2	0.469	0.477	0.470	0.471	0.257	0.229	0.231	0.235	0.235
F	29.57***	30.19***	27.77***	25.85***	12.60***	11.70***	11.52***	11.46***	12.48***
N	398	398	398	398	398	398	398	398	398

Estimation with ordinary least squares.

The *t*-ratios are given between parentheses. ***Means that the coefficient is statistically significant at the 1 percent level, **at the 5 percent level and *at the 10 percent level.

The *t*-ratios are corrected by the White method (White (1980)).

A.3. Correlation between the measures of closeness on the first and on the second round

	First round						
	mpm	tpm	rvm	tpr	entrop	compet	*F*
Second round							
mpm	0.55						
tpm		0.56					
rvm			0.58				
tpr				0.56			
entrop					0.15		
compet						0.09^{NS}	
F							0.13

The first round closeness is calculated using only the score of the two first candidates. NS: non significant at the 5% level.

Notes

1. For a presentation of this huge literature, see Aldrich (1997), Blais (2000), Dhillon and Peralta (2002), Feddersen (2004), Grofman (1993), Mueller (2003), and Struthers and Young (1989).
2. Kirchgässner & Schulz (2004) distinguish the "decision hypothesis" from the "mobilization hypothesis".
3. Only one study analyzes the participation at elections with two rounds (Rosenthal & Sen, 1973). It concerns the French elections from 1958 to 1968.
4. Endersby et al. (2002) offers a presentation of the various measures of margin and of their advantages and limits.
5. Nevertheless, as Grofman (1993, 1998) argues, one can also get an ecological fallacy using the raw vote margin as the level of turnout can be linked to the electoral results.
6. In France, the smallest district has, in 1997, 26,593 registered voters and the biggest has 117,961 registered voters. The average value is 68,523 registered voters.
7. When the election has only one round, the primary may be used as an ex ante measure of the degree of closeness, see Hanks and Grofman (1998).
8. The main modifications have been an important reduction of the expenditure ceilings by district whose amount depends on the number of inhabitants in the district; an interdiction of private financing, and the institution of a public financing (which takes the form of a reimbursement of campaign spending under certain conditions).
9. The explanation of turnout in the DOM-TOM (overseas territories) has been excluded from the analysis because one can think that it is influenced by particular determinants.
10. There was no district where two left-wing candidates were present at the second round.
11. It was on average 72.43% at the first round for the 398 district, and 68% for all the districts.
12. A statistical description of the dependant and independent variables is given in the Appendix 1.
13. For a more detailed analysis of the impact of the socio-economic variables on turnout, see Fauvelle-Aymar and François (2005).

14. This nomenclature is the one used in the 1999 French census. We assume that the occupation structure was the same in 1997. See Fauvelle-Aymar and François (2005) for a more detailed presentation of these variables.
15. As the average district size is about 68,483 registered voters, an increase of 1,000 votes corresponds to an increase of 1.5%.
16. Moreover, the coefficient of correlation between our closeness indicators and the district size are very low and non significant (expect for the raw vote margin, $r = 0.23$). Concerning the relations between competitiveness and constituency size, see Geldam et al. (2004).
17. We obtain the same results when we exclude the number of registered voters from the estimations.
18. The results of the estimations are given in the Appendix 2.
19. All these results may be given on request to the authors.

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