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Vote, popularity, economic conditions and French legislative elections

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Abstract

The purpose of this article is to build a model that explains and forecasts the result of the first-round vote of the French legislative elections and the results in seats after the second round per department and at the national level. This model highlights the influence of a popularity rating between the Left and the Right; and the economic conditions (the unemployment rate, the GDP growth rate, the inflation rate with more ambiguous results) to account for the first-round vote for the Left in the French legislative elections. Its forecasts for the elections of the past (1986-2007) are satisfactory and we make *ex ante* forecasts in vote and seats for the 2012 French legislative elections. We make some preliminary *ex ante* forecast in vote and in seats for the 2017 French legislative election.

Keywords: vote functions; legislative elections; election forecasting; popularity functions; panel data

JEL Classification: C23; C53; D72

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1. Introduction

Since the end of the 1970s, numerous econometric vote models have been developed in France to explain and forecast the results of the French national and local elections.¹ For the French legislative elections, the first models used national data (see e.g. Lewis-Beck, 1985, 1991). With national data, the forecast in seats is difficult and it is one of the explanations for which national and regional or local data are used (« pooled data »). Compared to national models, the number of observations is larger and we can use more independent variables (see e.g. Auberger and Dubois, 2005; Jérôme et al. 1999, 2003; Foucault, 2012 for the French legislative elections). Using pooled data enables us to take into account the influence of local independent variables.² Jérôme et al. (1999, 2003) built a vote-function which explains the vote for the ruling majority at the first round of six legislative elections between 1978 and 1997 at the regional level and a seat-function which explains the percentage of seats obtained by the ruling majority. In April 2012, Jérôme and Jérôme forecast 48.31% for the whole left, 3.72% for the Modem, 33.63% for the moderate right and 14.33% for the National Front. The estimated average number of seats is 274 seats (metropolitan France).³ Foucault (2012a, 2012b) sums up and completes the vote-function of Auberger and Dubois (2005) and gives four scenarii for the vote for the ruling parliamentary majority (right) according to the vote at the second round of the 2012 French presidential election but Foucault (2012a, 2012b) does not build a seat-function.

Our purpose is to build and present a vote function enabling us to study the influence of the economic situation on the first-round vote received by the Left in the French legislative elections over the period 1986-2012. We are taking into account a filtered popularity variable for the effects of the economic situation. It is also a simple economic voting model enabling us to make forecasts in vote for the Left (*ex ante* for the 2012 French legislative elections and *ex post* over the 1986-2012 period) and forecasts in seats with a seats function (*ex ante* for the 2012 French legislative elections and *ex post* over the 1988-2012 period). Second, we use other independent variables as the age and the population. It is also a more complete economic voting model. It is interesting to compare the estimations with those of the previous economic voting model (statistical indicators and the influence of the economic situation) and to present some forecasts in vote and in seats. These models, which uses data at the national and local level, enables us to make *ex ante* forecasts for the first round-vote obtained by the Left and seats after the second round obtained by the Left at the local level and at the national level for the 2012 French legislative election. We show the positive influence of a popularity rating between the Left and the Right, the negative influence of the annual change in the national unemployment rate, and the positive influence of the GDP growth rate over one year on the vote for the Left.⁴ We study the hypothesis developed by Nadeau et al. (2010, 2012) not to take among the independent variables the national economic situation (the unemployment rate) if it is taken into account by the popularity variable. In the selected model, the influence of the economic situation (the annual change in the national unemployment rate, the GDP growth rate over one year, and voters only take into account the recent economic situation (the degree of myopia of

¹ We find in Mueller (2003) a synoptic table concerning the influence of various economic variables on the results of elections for various countries and in Dubois (2007) a very complete survey of the models developed for all elections in France.

² For example, Holbrook (1991) for US presidential elections and Veiga and Veiga (2010) for Portuguese legislative elections.

³ There are 539 seats in metropolitan France.

⁴ An estimation with the national unemployment rate has better statistical indicators than an estimation with the local unemployment rate.

voters is high). For some estimates, the popularity variable is then filtered for the effects of the economic situation (the quarterly change in the national unemployment rate).^{5,6}

Section II presents the vote-function for the Left (first-round), the seat-function and the variables used. Section III analyzes the estimations obtained. Section IV presents some estimations for the vote function over the 1986-2012 period and for the seat function over the 1988-2012 period and *ex post* forecasts for the French legislative elections of the past. It explains *ex ante* forecasts for the 2012 French legislative election. Section V presents some preliminary forecast in vote for the 2017 French legislative election. Section VI presents other forecasts in vote for the 2017 French legislative election. Section VII concludes.

2. Vote, popularity and the economy

In economic voting models, voters are often supposed to have a retrospective behavior. Fiorina (1981) distinguish three retrospective voting models: the model of Downs (1957), the model of Key (1966) and the model of Fiorina (1981).⁷ Downs (1957) assumes that voters are rational, that is they have a retrospective behavior and compare the expected utility for each party but as voters are poor informed in the political programmes and their effects on the economic situation, past economic performance are a relevant indicator for the future economic performance and voters have, therefore, a retrospective behavior.⁸ In the model of Downs (1957), voters are « rationally ignorant »^{9,10} because it is costly to obtain information compared to the expected benefits. The second model is that of reward / punishment of Key (1966) : voters are rational and reward (resp. punish) the outgoing government for good (resp. bad) economic results.¹¹ Fiorina (1981) develops a general model expected utility model of voting that notably includes voters' evaluations of economic conditions. We think that two other articles are specially important: Kramer (1971) and Fair (1978). The model used by Kramer (1971) for the elections for the U.S. Congress is a simplified version of the model of Downs (1957) and in this second voting model, voters are supposed to be naïve (they do not know well how economy works) and myopic (voters only take into account the recent economic results); Kramer (1971) uses the reward / punishment hypothesis of Key (1966): it is a « satisficing » behavior (support to the outgoing government if the economic results are satisfactory evaluated and vote for the opposition in the opposite case.^{12,13} Fair (1978) uses a more general model of voting behavior than of Kramer (1971). Fair (1978) evaluates utility functions incorporating past economic performances and specific variables to voters.

⁵ The influence of the economic situation is studied with an estimate of the popularity function for the Left.

⁶ To our knowledge, Lebo (1988) is the only article in which the popularity was filtered for the effects of the economy.

⁷ Besley (2006) p. 81 recalls this distinction between these three retrospective voting models.

⁸ Voters are often supposed to judge economic performance with the objective general economic situation (“sociotropic” behavior). Both types of behavior: “sociotropic” and “egotropic” (voters support the government according to their future personal condition) can however be difficult to be distinguished because good (resp. bad) economic performance often have some positive (resp. negative) consequences on every voter. Lewis-Beck and Paldam (2000) noticed that, generally, voters have “sociotropic” behavior.

⁹ Besley (2007) present some elements of political agency models and writes p. 80 that « the notion of asymmetric information is at the center of the notion that voters are rationally ignorant as suggested in Downs (1957). In reality they are ways of informing voters about policy such as think tanks, pressure groups and the media ».

¹⁰ Caplan presents a model of rational irrationality more than a model of rational ignorance.

¹¹ Paldam (1981) concludes that the responsibility pattern is the most commonly result found.

¹² Barro (1973) and Ferejohn (1986) have formalized retrospective voting and the reward / punishment behavior. In the language of political agency models, « voters (principals) are attempting to reduce moral hazard on the part of elected representatives (agents) », see Healy and Malotra (2013).

¹³ Stigler (1973) criticised the article of Kramer (1971) and contested the significative influence of past economic results on the outcomes of the U.S. Congress elections. Stigler (1973) believed that well-informed voters would look back more than a year.

Other models of voters' behavior can be viewed. Hibbs (2000) built a voting model for the American presidential elections. Hibbs included a decline parameter (or decline of the memory parameter) because voters are not only influenced by the current or recent economic conditions but attach more importance to the recent economic results. The model of asymmetric behavior was originally developed for the vote function in the elections of the American Congress by Bloom and Price (1975). Voters were supposed to have asymmetric behavior: they rewarded a government for good economic performances less than they punished it for bad economic results. Usually, unfavorable or mixed results are found for the asymmetric behavior for Great Britain: Nannestad and Paldam (1994), Lewis-Beck and Stegmaier (2013). There are also some economic voting models which supposed that voters have a more sophisticated behavior: voters are rationally retrospective and efficiently use all the available information, know how economy works and vote for the most competent candidate (party) : voter try to distinguish the effects of competence from the effects of competence. Fearon (1999), Alesina et Rosenthal (1995), Duch and Stevenson (2008, 2010) use this type of model.¹⁴ Alesina and Rosenthal (1995) find unfavorable empirical results for their model for the American elections (presidential and Congress).

Since the beginning of the 2000's, some articles and books have studied the influence of economic conditions in globalized economies and the main result is that voters reward / punish less when the economies are highly globalized: see notably Hellwig (2001), Hellwig et Samuels (2007), Duch and Stevenson (2008, 2010), Kayser et Peress (2012, 2016), Maloney et Pickering (2015). Maloney and Pickering (2015) have taken into account the influence of the global economy and have found favorable results for sophisticated voters.

The popularity functions have an economic part and a political part.¹⁵ It is interesting to present the various vote functions used (with or without the popularity variable) and to clarify the hypotheses made for voters' behaviour.

The vote functions with a popularity variable are often as follows:

(1) Vote function = f (economic variables, political variables) without the popularity variable
In these vote functions, popularity is not used as an independent variable: see notably Hibbs (2008, 2010), Fair (2009).

The voters can have a high (or infinite) degree of myopia as in Fair (2009) for some economic variables or instead, a lower degree of myopia as in Hibbs (2008, 2010).¹⁶

(2) Vote function = f (popularity)

In these vote functions, the influence of the economic situation on the vote is only taken into account by the popularity variable: see notably Lebo and Norpoth (2006, 2011, 2012) for British general elections, Bélanger et al. (2010), Nadeau et al. (2010, 2012) for French presidential elections. If we show that popularity is satisfactorily estimated with a first order autoregressive model then, we suppose that the degree of myopia of voters is low. If the estimated coefficient by a lagged popularity variable is approximately equal to 0.8; this means that approximately 50% of the influence of the economic situation is still taken into account after one year and approximately 20% after two years ($0,8^3 \approx 0,51$ and $0,8^7 \approx 0,21$).

(3) Vote function = f (popularity, the other political variables)

In these vote functions, the influence of the economic situation on the vote is only taken into account by the popularity independent variable: see notably Norpoth and Gschwend (2010,

¹⁴ Alesina et al. (1997) explain the the compatibility between the rational expectations hypothesis and a retrospective behavior.

¹⁵ As the popularity variable is not simply a political one but has an economic part, we shall mention it explicitly when it is used.

¹⁶ In Fair (2009), the degree of myopia of the voters varies according to the economic independent variables used.

2013) for German federal elections. Voters' behaviour is the same as with the previous vote functions (2).

The vote functions with a popularity variable are often as follows:

$$(4) \text{ Vote function} = f(\text{economic variables, political variables including the popularity variable})$$

In these vote functions, the influence of the economic situation on the vote is taken into account by the economic variables and by the popularity variable: Abramowitz (2012) for the American presidential elections and Abramowitz (2010) for the American midterm (House and Senate) elections, Foucault and Nadeau (2012a, 2012b), Jérôme and Jérôme (2012a, 2012b) for the French presidential elections, Auberger and Dubois (2005), Foucault (2012a, 2012b) for the French legislative elections. The main inconvenience of this modelling is that the influence of the economic situation is taking account in two different ways: usually, a high degree of myopia with one or more economic variables and a low degree of myopia with the economic situation taken into account by the popularity variable: an autoregressive model of order one is often used to construct and estimate the popularity function.¹⁷

The vote functions that we built are as follows:

$$(5) \text{ Vote function} = f(\text{economic variables, political variables, filtered popularity})$$

This is what is discussed in this article and in Auberger (2014) for the French presidential elections. It enables us to avoid the criticisms made when we use the vote functions (4).

For the study of the influence of the economic situation on the vote, we think that it is better not to use simultaneously a popularity variable and an economic variable except when we correct the popularity variable by removing the influence of the economic situation.¹⁸ The use of a variable as the result of the previous elections makes the analysis of the influence of the economic situation on the vote more difficult because in this variable, the influence of the economic situation can be included if these elections took place shortly before the elections studied.¹⁹

3. The popularity function

We find in table 1 data for the first round-vote received by the Left²⁰ at the French legislative elections and for the popularity of the Left and the Right:^{21,22}

¹⁷ Furthermore, the economic situation in the period t-1 (quarter for example) can have a direct influence on the vote ; and if the popularity variable is lagged by two quarters, the economic situation in the period t-3 has an (indirect) influence on the vote, thus there is no influence of the economic situation in the period t-2.

¹⁸ There is a correlation between the popularity variable and some economic variables.

¹⁹ For example, the 2007 and 2012 French presidential elections took place only a few weeks (a month or a month and a half) before the French legislative elections.

²⁰ We retain the vote received by the Left as the dependent variable because the vote received by the Right (moderate Right and extreme Right) is more difficult to be explained. In France, the vote for the extreme Right (National Front) is quite high in the legislative elections.

²¹ We retain the POPLR1 popularity variable because with the POPR popularity variable it wasn't possible to make satisfactory forecast for the 2012 French presidential and legislative elections (second-round vote for Left in the 2012 French presidential elections). The best forecasts were obtained with the POPLR1 independent variable for the French legislative elections of the past (1986-2007).

²² We find in appendix C correlations between the vote for the Left and the popularity (1986-2007).

Table 1 Vote and popularity

	VOTEL1	POPL	POPR	POPLR	POPLR1
1986	45.29	49	45.50	3.50	26.25
1988	49.46	64	42.50	21.50	42.75
1993	38.88	35	46.50	-11.50	11.75
1997	46.94	44	40.50	3.50	23.75
2002	40.94	47	43	4	25.50
2007	39.42	42	52	-10	16
2012	48.81	54	36	18	36

VOTEL1: first round-vote for the Left (Left, the Greens and various ecologist parties)
in the French legislative elections

POPL: popularity of the Left; POPR: popularity of the Right

$$\text{POPLR} = \text{POPL} - \text{POPR}; \text{POPLR1}_t = \frac{\text{POPLR}_t + \text{POPL}_t}{2}$$

We build the following popularity-function for the Left (Socialist party):²³

$$\text{POPLR1}_t = \alpha_0 + \alpha_1 \text{POPLR1}_{t-1} + \alpha_2 \Delta 4 \text{UNEMNL}_{t-1} + \alpha_3 \Delta 4 \text{GDPL}_{t-1} + \alpha_4 \Delta 4 \text{INFLL}_{t-1} + \alpha_5 \text{HMLR2} + \alpha_6 \text{ELEC} + \alpha_7 \text{CONG} + \varepsilon_t (1)^{24,25,26,27}$$

We have: $\Delta 4 \text{UNEMNL}_{t-1} = \text{UNEMNL}_{t-1} - \text{UNEMNL}_{t-5}$.²⁸

We expect the following signs:

$\alpha_1 > 0$, $\beta_1 > 0$ (lagged popularity variable); $\alpha_2 < 0$, $\beta_2 < 0$, $\alpha_3 > 0$, $\beta_3 > 0$, $\alpha_4 < 0$, $\beta_4 < 0$ (responsibility hypothesis of the government with regard to the economic situation; the parliamentary majority is rewarded for good economic performances and punished for bad economic performances with inverse consequences for the parliamentary opposition); $\alpha_5 > 0$, $\beta_5 > 0$ (positive effects of the honeymoon on the popularity of the party in power); $\alpha_6 > 0$, $\beta_6 > 0$ (effects of the outcomes of the second-order elections), $\alpha_7 < 0$, $\beta_7 < 0$ (negative consequences of some congresses of the Socialist party on its popularity).

²³ We explain in section 4 the choice to study the dependent variable vote for the Left. This choice leads to study the Left popularity dependent variable. The popularity for the Left is approximately equal to the popularity of the Socialist party. We also have calculated weighted popularity variable for the Left by using the various left-wing parties but these popularity variables lead to estimations for the first-round vote which are less satisfactory.

²⁴ We use *OCDE* data for the unemployment rate because, with *INSEE* data, the unemployment rate may not be known until two months after the end of the semester.

²⁵ Unit root tests for the popularity dependent variable POPLR1 have given ambiguous results: with the ADF test (augmented Dickey-Fuller) for a model with a significative constant at the statistical level of 5% and with the lag length $p = 0$ (SIC criterion), we accept the null hypothesis: the series POPLR1 has a unit root at the statistical level of 5% (critical probability $\approx 5.9\%$) but we reject the null hypothesis at the statistical level of 10% ; we reject the null hypothesis at the statistical level of 5% with the lag length $p = 7$ (AIC criterion) but we accept it at the statistical level of 5% with the lag length $p = 12$ (modified AIC criterion). We reject the null hypothesis at the statistical level of 5% with the test KPSS (Kwiatkowski-Phillips-Schmidt-Shin) and we also reject the null hypothesis at the statistical level of 5% with the endogenous break unit root test of Perron-Vogelsang in 1996:4 (innovational outlier with a change in the intercept).

²⁶ We have tested other independent economic variables: GDPL with $\text{GDPL} = \text{GDP}$ when the Left is the parliamentary majority and $\text{GDPL} = -\text{GDP}$ when the Left is the parliamentary opposition and $\Delta 4 \text{INFLL}$ with $\text{INFLL} = \text{INFL}$ when the Left is the parliamentary majority and $\text{INFLL} = -\text{INFL}$ when the Left is the parliamentary opposition but the estimated coefficients of these two economic variables are not significant at the statistical level of 10%.

²⁷ We have also tried to take into account the influence of the word economy by using for unemployment independent variable: $\Delta \text{UNEMNL} - \Delta \text{UNEMNLW}$; UNEMNLW is the weighted average for unemployment rate of the six majors countries without France (*OCDE* data) but the statistical indicators of the estimation are slightly less satisfactory than those obtained without the influence of the word economy.

²⁸ We use the 4th difference lagged one quarter, and then we filter the dependent popularity variable of the independent economic variables links to the vote function and the independent economic variables used.

We obtained the following estimation over the period 1983:1-2012:2 (table 2):²⁹

Table 2 Estimate of the popularity-function for the Left 1983:1-2012:2

Variable	(1a)	(1b)
Constant	4.17 (3.00)***	5.51 (4.37)***
POPLR1 _{t-1}	0.85 (18.26)***	0.81 (19.27)***
Δ UNEMNL _{t-1}	-1.13 (-2.04)***	-0.91 (-1.85)*
HMLR2		2.36 (3.81)***
ELEC		7.53 (4.02)***
CONG		-5.09 (-2.33)**
N	118	118
Ad. R ²	0.75	0.81
SEE	4.23	3.73
h	-0.97	-1.00

*** significant at the statistical level of 1%, ** significant at the statistical level of 5%,
N: Number of observations; Ad. R²: adjusted R-squared;
SER: standard error of the estimate; h: test of Durbin

We obtained slightly more satisfactory results when the economic situation is only taken into account when the Left is the parliamentary majority (Δ UNEMNLGOV_{t-1} variable). Using some political variables improved the statistical indicators of the estimations. We showed that the real GDP annual growth rate and the annual inflation rate are not significant at the statistical level of 5%. According to the estimations (1a) and (1b), a quarterly change in the national unemployment rate of 0.10 point leads to a decrease in the POPLR1 popularity rating by about 0.35 point a quarter later and leads to a decrease (resp. increase) in the POPLR1 popularity rating of 1.48 points over two years. Then, we filter the popularity variable by removing this influence (POPLR1CB is the filtered popularity variable).³⁰ According to the estimations (2a) and (2b), a quarterly change in the national unemployment rate of 0.10 point leads to a decrease in the POPLR1 popularity rating by about 0.73 / 0.84 point a quarter later and leads to a decrease (resp. increase) in the POPLR1 popularity rating by 3.08 / 3.00 points over two years. Then, we filter the popularity variable by removing this influence (POPLR1CC and POPLR1CD are the filtered popularity variable).³¹

4. The vote function

We choose the vote for the Left in the first round variable of the French legislative elections for the dependent variable because the vote for the Left is easier to study than the vote for the Right. The electorate of the Left appears as being more homogeneous than that of the Right: it is

²⁹ With *INSEE* data for the unemployment rate, the coefficient of the Δ UNEMNL_{t-2} independent variable are respectively equal to 3.54 (-1.69), -1.93 (-1.03) but we do not use these variables lagged by two quarters.

³⁰ In order to filter the popularity variable (POPLR1) for the effects of the unemployment (economy), we calculate: POPLR1CA=POPLR1_t+1.13 Δ UNEMNL_{t-1}+0.85 \times 1.13 Δ UNEMNL_{t-2}+...+0.85ⁿ⁻² \times 1.13 Δ UNEMNL_{t-n} and POPLR1CB=POPLR1_t+0.91 Δ UNEMNL_{t-1}+0.81 \times 0.91 Δ UNEMNL_{t-2}+...+0.81ⁿ⁻² \times 0.91 Δ UNEMNL_{t-n}. We choose n=12 (it makes it a satisfactory approximation possible).

³¹ We find in appendix A the estimated values for the POPLR1CA and POPLR1CB filtered popularity variables.

notably connected to the important weight of the National Front vote in the Right-wing vote with voters of the National Front who are for approximately 25 % of the former voters of the Left.

We study the vote for the Left in connection with the popularity of the Left (partisan vote) and the economic performances (economic vote).

Our vote-function is as follows:

Left Vote = f(Left popularity, economic variables)

We suppose that voters behave according to the hypothesis of reward-punishment of Key (1966) and have retrospective behaviour, that is they reward (resp. punish) the ruling majority (parliamentary) for good (resp. bad) past economic performances (the responsibility hypothesis). Voters are rational in the sense of Downs (1957) but they are little informed about the economic situation and (voters ignorance). In this article, we suppose that voters are naïve (voters don't know well the working of the economy) and they only take into account the national economic situation (retrospective voting behavior).³² The degree of myopia of voters depends on the way the influence of the economic situation is taken into account; in our main model: equations (3) and (4), we suppose that the voters are myopic and take into account the economic situation two quarters and for one year before le French legislative elections with a memory of one year (the variable is the difference between the economic situation of two quarters before the French legislative elections and that of six quarters before the elections).

Our model consists in a vote-function and in a seat-function.^{33,34}

If we suppose that the influence of the economic situation is taken into account by the popularity variable and that the estimation of the popularity-function is a first-order autoregressive model (a popularity variable lagged by one quarter in the independent variables), then the degree of myopia is rather low. A national economic independent variable calculated over a recent period (the annual change in the national unemployment rate) with a popularity independent variable³⁵ in the vote-function does not seem to be adapted: see vote functions (2). If we take an economic variable among the independent variables (the annual change in the national unemployment rate³⁶), we then correct the popularity variable (POPLRCA, POPLRCB) by clearing the influence of the economic situation: see vote functions (3) and (4).

Our study is made in every department of metropolitan France (i varies from 1 to 96)³⁷ over the period 1986-2007 (six French legislative elections at date t: 1986, 1988, 1993, 1997, 2002 and 2007).³⁸

For the vote functions, we made a Fisher test to choose between a model with fixed effects (FE) and a model without effects (WE): for all the models over the 1986-2007 period, the results were favourable for the model with fixed effects at the statistical level of 5%. To choose between a model with random effects (RE) and a model without any effects, we used the Breusch and Pagan test; for all the models, the results were favorable for the model with random effects at the statistical level of 5%. To choose between a model with fixed effects (FE) and a

³² It is possible to study if we obtain better results when we take into account the word economy.

³³ Precise definition of the variables and sources of the data are shown in Appendix A.

³⁴ Descriptive statistics of the variables are shown in Appendix C.

³⁵ We suppose that the quarterly change of the national unemployment rate has a significant influence on the popularity variable.

³⁶ We have also tested the local unemployment rate (*INSEE* data) but the obtained results (statistical indicators) are less satisfactory.

³⁷ We do not take into account departments and overseas territories.

³⁸ The electoral data come from the data base of *CIDSP* (Grenoble) then that of *CDSP* (Paris).

model with random effects (RE), we applied a Hausman (1978) test³⁹ and for all the models, we chose the model with random effects at the statistical level of 5% (table 1).⁴⁰

To explain the first-round vote received by the Left (Left and ecologists)^{41,42}, we use the following equations (2) to (4) with random effects over the 1986-2007 period:

$$\begin{aligned} \text{VOTEL1}_{it} &= \alpha_0 + \alpha_1 \text{POPLR}_t + \alpha_2 \text{D4UNEMNL}_t + \alpha_3 \text{D4GDPL}_t + u_i + \varepsilon_{1it} \quad (2) \\ \text{VOTEL1}_{it} &= \beta_0 + \beta_1 \text{POPLR1CA}_t + \beta_2 \text{D4UNEMNL}_t + \beta_3 \text{D4GDPL}_t + v_i + \varepsilon_{2it} \quad (3) \\ \text{VOTEL1}_{it} &= \gamma_0 + \gamma_1 \text{POPLR1CB}_t + \gamma_2 \text{D4UNEMNL}_t + \gamma_3 \text{D4GDPL}_t + w_i + \varepsilon_{3it} \quad (4) \end{aligned}$$

The equations (2), (3) and (4) enable us to compare the influence of the different popularity variables on the vote for the Left. In the equation (2), the popularity variable (POPLR) is not filtered and thus the influence of the unemployment rate is accounted for by the popularity variable (indirect influence on the vote) and by the DUNEMNL variable. In equations (3) and (4), the influence of the unemployment rate is accounted for by the DUNEMNL variable and the degree of myopia of voters is high.

In equations (2) to (4), the first independent variable is a popularity rating between the Left and the Right. It is the variable which enables us to take into account economic factors (if this variable is not filtered) and political factors. We expect the following signs: $\alpha_1 > 0$, $\beta_1 > 0$, and $\gamma_1 > 0$. For the economic independent variables, we expect the following signs: $\alpha_2 < 0$, $\beta_2 < 0$, and $\gamma_2 < 0$ because an increase (resp. decrease) in the annual unemployment rate leads to a decrease (resp. increase) in the vote for the Left when the Left (resp. the Right) is the parliamentary majority, $\alpha_3 > 0$, $\beta_3 > 0$ and $\gamma_3 > 0$ because an increase (resp. decrease) of the annual economic growth rate leads to an increase (resp. decrease) in the vote for the Left when the Left (resp. the Right) is the parliamentary majority.

We also have the following seat-function:

$$\text{Seats} = f(\text{vote}, \text{political factors})$$

We chose the model without effects at the statistical level of 5% (table 3).⁴³

To explain the percentage of seats obtained by the left-wing parties after the second round, we use the following equation (5) with random effects over the period 1988-2007 (five French legislative elections at date t: 1988, 1993, 1997, 2002 and 2007):⁴⁴

$$\text{SEATL}_{it} = \lambda_0 + \lambda_1 \text{VOTEL1}_{it} + \lambda_2 \text{TRI}_{it} + \lambda_3 \text{MODEM}_{it} + \varepsilon_{10it} \quad (10)$$

³⁹ Another possibility would consist in choosing the model with fixed effects because our sample is composed of 96 departments of metropolitan France. This is what Hsiao seems to suggest (Hsiao, 2003, p. 43).

⁴⁰ See appendix B for the tests (table A1).

⁴¹ With the party *the clover* and the associated parties or previously created parties (since the 1993 French legislative election) which are closer to the Right than the Left. The party *the clover* and the associated parties are perhaps closer to the Right than the Left but they are at first ecologists and usually ecologists are closer to the Left than the Right. We also have made estimations with the dependent variable Left and ecologists without the *clover* and the associated parties but the statistical indicators of the estimations are less satisfactory (the *clover* and the associated parties are perhaps closer to the Right than the Left but they are first and foremost ecologists parties).

⁴² A list of the main French political parties is given in the appendix B.

⁴³ See appendix A for the tests (table A2).

⁴⁴ The period of estimation begins with the 1988 French legislative election because for the 1986 French legislative election, the voting system had been changed: the calculation of seats per department with one round (proportional calculation with the strongest average).

We are expecting the following signs: $\lambda_1 > 0$, $\lambda_2 > 0$ because these triangular contests with a candidate of the National Front favour the candidates of the Left and $\lambda_3 > 0$ because part of the voters of the Modem are closer to the Left than to the Right.

We made some estimations after the 2012 French legislative elections.⁴⁵

To explain the vote obtained by the left parties and the ecologists in the first round,⁴⁶ we obtained the following estimations with random effects⁴⁷ over the 1986-2012 period with correction of the heteroscedasticity, and first-order autocorrelation of the errors with Newey-West's method for the (3a) and (4a) estimates (table 10):

Table 3 gives estimations for the first-round vote for the Left (metropolitan France):

Table 3 Estimates of vote (left, first round) 1986-2012

Variable	(1)	(2)	(3)	(4)
Constant	44.29 (63.10)***	37.16 (51.20)***	37.44 (48.94)***	37.15 (49.14)***
POPLR _t	0.30 (24.47)***			
POPLR1 _t		0.34 (25.83)***		
POPLRCA _t			0.33 (27.25)***	
POPLRCB _t				0.34 (27.22)***
DUNEMNL _t	-1.44 (-4.43)***	-2.39 (-8.26)***	-4.52 (-17.79)***	-3.69 (-13.98)***
DGDPL _t	1.22 (9.63)***	1.56 (12.64)***	1.25 (10.71)***	1.29 (10.95)***
N	672	672	672	672
Ad. R ²	0.87	0.88	0.89	0.89
MAEN	1.07	0.82	0.52	0.54
MAEL	2.25	2.16	2.03	2.05

Common notes to tables:

*** significant at 1% level, ** significant at 5% level.

N: Number of observations; Ad. R²: adjusted R-squared

MAEN: mean absolute error averages at the national level

MAEL: mean absolute error averages at the local level

We noticed that the estimation (3) has the best statistical indicators.⁴⁸ According to the estimation (4), the coefficient of the POPLR1CA variable showed that an increase by 1 point of the POPLR1CA popularity variable leads to an increase by 0.33 point in the first-round vote for the Left. An annual change in the national unemployment rate by 0.10 point leads to a decrease (resp. increase) by 0.39 point and an annual change in the GDP growth rate by 0.10

⁴⁵ Descriptive statistics of the variables are shown in Appendix C.

⁴⁶ Without the clover party and the parties associated or created previously (since the 1993 French legislative election) which are close to the Right but with the *Independent Environmentalist Alliance (AEI)* which is classified neither to the Left nor to the Right but the independent ecologists are rather closer to the Left than to the Right (if we do not classify the *AEI* to the Left, we obtain a very close estimation with very slightly lower Ad. R²).

⁴⁷ See appendix A for the tests (table A3).

⁴⁸ The statistical indicators of the (3) and (4) estimations are very similar.

point leads to a decrease (resp. increase) by about 0.125 point of the first-round vote for the Left when the Left is the parliamentary majority (resp. the Right).

To explain the percentage of seats obtained after the second round by the Left (with the Greens), we used the following estimation with random effects⁴⁹ over the 1988-2012 period with correction of the heteroscedasticity, and first-order autocorrelation of the errors with Newey-West's method for the (5a) estimate (table 11):

Table 4 Estimates of seats (Left) 1988-2012

Variable	(9)
Constant	-120.79 (-17.47)***
VOTEL1 _{it}	3.58 (24.37)***
TRI _{it}	0.32 (4.11)***
MODEM _{it}	2.13 (9.44)***
N	576
Ad. R ²	0.72
MAEN	16.00
MAEL	0.58

Common notes to tables 7 and 15:

*** significant at 1% level, ** significant at 5% level.

MAEN: mean absolute error averages at the national level (number of seats)

MAEL: mean absolute error averages at the local level (number of seats)

The coefficient of the TRI variable suggests that an increase by 10 points of the percentage of triangular contests with a candidate of the National Front in every department leads to an increase by 3.2 points of the percentage of seats obtained by the Left. The coefficient of the Modem variable shows that an increase by 1 point in the vote for the Modem in every department leads to an increase by 2.13 points in the percentage of seats obtained by the Left. We noticed that the estimated coefficients of the estimations (5) and (5a) are very close. We also noticed that the statistical indicators (Ad. R² and MAEL) of the estimation (5a) are slightly more satisfactory than those of estimation (5).

Forecasts for the 2012 French legislative elections: we made *ex ante* forecast for the first-round vote obtained by the Left in metropolitan France.⁵⁰ The first *ex ante* forecast was made in March 2012.⁵¹ We also made *ex ante* forecasts in June 2012 before the French legislative election. For the difference in popularity between the Left and Right (POPLR⁵²), we use the following data of TNS-SOFRES: POPLR = 51% - 29% = 22%, POPLR1 = 36.5%, POPLR1CA

⁴⁹ See appendix A for the tests (table A4).

⁵⁰ A forecast had been published on-line before the first round of the 2012 French legislative election for the vote for the Left with ecologists without the *clover* party.

⁵¹ We can make the forecasts at the beginning of the third month of every quarter when the popularity data is known (TNS-SOFRES).

⁵² POPLR = POPL - POPR with POPL: the popularity of the Socialist party and POPR: the popularity of the *UMP* (or *LR*).

= 34.71%, POPLR1CB = 35.55%, in March 2012; POPLR = 54% - 36% = 18%, POPLR1 = 36%, POPLR1CA = 34.06%, POPLR1CB = 35.02% in June 2012.⁵³

Subsequently, we made *ex ante* forecasts in the number of seats obtained by the Left in metropolitan France. Before the first round, we use as hypotheses: turnout = 60%, FN = 14%, which leads to 23 triangular contests with a candidate of the National Front,⁵⁴ Modem = 2%.⁵⁵ After the first round, we made *ex ante* national forecasts in the vote for the Left (with the ecologists), 28 triangular contests with a candidate of the National Front, a left-wing candidate and a right-wing candidate and Modem = 1.65%.

Table 5 gives *ex ante* national forecasts in the first-round vote for the Left (metropolitan France):

Table 5 Ex ante national forecast in vote (Left, first round)

Month	(3)	(4)	(5)	(6)	(7)	(8)
mar-12	49.40	50.11	50.08	49.43	50.69	50.06
jun-12	50.46	51.04	51.82	51.47	52.69	50.88
EN	1.61	2.20	2.97	2.62	3.84	2.03
EL	3.74	3.97	6.62	6.48	6.83	3.76

The Left (whole Left and various ecologists) has obtained 48.85% (metropolitan France)

Table 6 gives *ex ante* national forecast in the number of seats for the Left (metropolitan France):

Table 6 Ex ante national forecast in seats (Left)

Month	(3) and (9)	(4) and (9)	(5) and (9)	(6) and (9)	(7) and (9)	(8) and (9)
before the first round ^a						
mar-12	298	312	312	300	327	312
jun-12	322	331	346	342	361	332
after the first round	316	316	316	316	316	316

The Left has obtained 316 seats (metropolitan France)

There are 539 seats in metropolitan France and 38 seats for the overseas departments and territories and French citizens living abroad (absolute majority = 289 seats)

^aThese forecasts are made with: turnout = 60% ; FN = 14% ; 23 triangular contests ; Modem = 2%

Table 7 gives *ex ante* national forecasts in the first-round vote for the Left (whole of France):⁵⁶

⁵³ For the D4UNEMNL variable, we use D4UNEMNL = 0.1% in March 2012 (D4UNEMN = 9.7% - 9.8% = -0.1%, data from September 2011 and 2010) and D4UNEMNL = -0.1% for June 2012 (D4UNEMN = 9.8% - 9.7% = 0.1%, data from December 2011 and 2010); for the D4GDPL variable, we use D4GDPL = 0.3% in March 2012 (D4GDP = 1.8% - 2.1% = -0.3%, data from September 2011 and 2010) and D4GDPL = 0.4% for June 2012 (D4GDP = 1.5% - 1.9% = -0.4%, data from December 2011 and 2010).

⁵⁴ We use the results of the first round of the 2012 French presidential election.

⁵⁵ *IPSOS* (8 June) estimates the turnout between 57% and 60% and *Opinion Way* (7 June) estimates it at 61%. For the *Modem*, the polls institutes give a voting intention between 2% and 5%.

⁵⁶ The Left has obtained 49.28% (whole of France) and 49.09% (metropolitan France).

Table 7 *Ex ante* national forecast in vote (Left, first round)

	<i>TNS Sofres</i>	<i>opinion way</i>	<i>IPSOS</i>	<i>BVA</i>	<i>IFOP fiducial</i>
before the first round	46	46.5	47	47	46.5

Table 8 gives *ex ante* national forecast in the number of seats for the Left (whole of France):

Table 8 *Ex ante* national forecast in seats (Left)

	<i>TNS Sofres</i>	<i>opinion way</i>	<i>IPSOS</i>	<i>BVA</i>
before the first round		326-368	292-346	
after the first round	324-360	315-360	324-364	324-357

We note that *ex ante* forecasts for the 2012 French legislative elections announce a high percentage for the first-round vote for the Left and a majority in seats even without counting the seats of the overseas departments and territories and French citizens living abroad.⁵⁷ We must bear in mind that Jérôme and Jérôme (2012c) forecast 48.31% for the whole Left. The average number of seats estimated by Jérôme and Jérôme (2012c) is 274 seats (metropolitan France). These forecasts are to be compared with the voting intentions in vote⁵⁸ before the first round and the projections in seats of the poll institutes (before and after the first round). Our forecast in seats is better than those of Jérôme and Jérôme (2012c) and those of the polls institutes.

The *ex post* forecast error in vote for the 2012 legislative election is the largest of the sample (3.27 / 3.15 points)⁵⁹; but the *ex post* performances in seats are satisfactory.⁶⁰

5. The vote function. First estimations and forecasts

We can use our economic voting model for the 2017 French legislative elections after the Macron's victory at the 2017 French presidential election

It is interesting, however, to make *ex ante* forecasts in vote with the previous vote function.

Table 9 gives *ex ante* national forecasts in the first-round vote for the Left (metropolitan France):

Table 9 *Ex ante* national forecast in vote (Left, first round)

Month	(3a)	(4a)
Mar-17	36.10	34.32
Jun-17	33.82	33.52

The Left (whole Left and various ecologists, without the Center) has obtained 28.23% (metropolitan France)

⁵⁷ After the first round, we can forecast 25 seats or a little more for the Left in the overseas departments and territories and French citizens living abroad (the Left has obtained 28 seats for a total of 38 seats).

⁵⁸ These voting intentions for the total of the Left do not include the voting intentions for the *Independent Ecologist Alliance (AEI)*; *BVA* and *opinionway* estimates 1% for the *AEI*.

⁵⁹ The *ex post* performances in vote are better than those of Auberger and Dubois (2005) with MAEL = 2.24 for 6 elections (1981-2002) and than those of Foucault (2012a, 2012b) with MAE = 2.71 or 2.75 for 5 elections (1988-2007).

⁶⁰ We noticed that big forecasts errors were made in the two departments of Corsica for the vote over the 1986-2012 period.

We forecast a defeat for the Left in vote but there is the movement *En Marche !* (Macron).⁶¹ The *ex ante* error forecast is quite high: 5.60 point in June 2017 and it is explained by the high vote for the LREM party (Forward) with its original political position: at the Center. An important part of the voters of the LREM party were before the 2017 French elections left-wing voters.

Forecasts it seats are made. It is necessary to make an hypothesis on the percentage of triangular contests in every department.⁶² We forecast 201 / 156 seats in March 2017 and 147 / 137 seats in June 2017 (absolute majority = 289 seats).

We can not make satisficing *ex ante* forecasts in votes with three vote functions for the 2017 French legislative elections because the vote for the Center was low before the 2017 French legislative elections.

After the 2017 French legislative elections, we present estimations in vote for the French legislative elections over the 2002-2017 period with three vote functions: vote for the Left (moderate and extreme), vote for the Center (LREM and MODEM), vote for the Right (moderate and extreme).

Table 10 gives *ex ante* national forecasts in the first-round vote for the Left (metropolitan France):

Table 10 Estimates of vote (first round) 2002-2017

Variable	VoteLL	VoteC	VoteLR	VoteVA
Constant	35.06 (22.87) ^{***}	9.44 (3.47) ^{***}	60.24 (24.31) ^{***}	
POPML	0.46 (50.47) ^{***}			
POPC		0.73 (46.81) ^{***}		
POPMR			0.48 (32.27) ^{***}	
N	384	384	384	384
Ad. R ²	0.85	0.74	0.59	0.58
MAEN	1.73	4.16	3.65	1.05
MAEL	2.74	4.76	4.65	1.60

6. Other forecasts for the 2017 French legislative elections

Graefe (2016a, 2017) presents other forecasting methods: polls, prediction markets, expert judgment. Graefe (2017) calculates the combined PollyVote forecast: « it is the simple average of the forecasts from four component methods: polls, prediction markets, expert judgment, and models ». The Pollyvote has been calculated for the 2016 American presidential election.

We can also notice the forecasts in vote of Silver⁶³: National forecasts (polls) and State forecasts (polls) with just before the election 28.6 % chance of winning for Trump (and 71.4 % chance of winning for Clinton).

We can also notice the prediction markets: see notably Graefe (2016b).

⁶¹ It could be envisaged to study a distribution for the vote between the Left and the Right of the share of vote received by the candidates of the movement *En Marche !*.

⁶² A vote function for the National Front could be estimated and give an help to take into account the National Front vote and its power of nuisance for the moderate Right.

⁶³ <https://projects.fivethirtyeight.com/2016-election-forecast/>

We calculate the mean of polls with 7 poll institutes⁶⁴ by using the last polls published before the 2017 French legislative elections.

Table 11 gives *ex ante* national forecasts in the first-round vote for the Left (metropolitan France):

Table 11 Polls (last poll published before the first round) for 2017

	Mean	Actual Value	Error
EL	0.86	0.77	0.09
RL	14.29	13.74	0.55
ML	11.71	13.81	2.10
C	29.93	32.33	2.40
MR	23.43	22.74	0.69
ER	17.57	13.5	4.07
other	2.21	3.11	0.90

We note that this mean gives a very closed result to the first-round vote for each grouping of political parties (or for each political party).

7. The vote function. Other estimations

It is interesting to make forecasts in vote with a popularity variable for every political party. Our study is made over the 2002–2012 period (three French legislative elections: 2002, 2007 and 2012). Our model uses the popularity of every political party (or grouping of political parties). We make estimates of vote for every political party (or for grouping of political parties).⁶⁵

Table 12 gives the following estimates (with the SUR technique and fixed effects) for VoteLL, VoteC, VoteMR, VoteER and VoteVA variables and table *** for the VoteELRL, VoteML, VoteC, VoteMR, VoteER and VoteVA variables gives the following estimates (with the SUR technique and fixed effects):

⁶⁴ Ifop, Ipsos, TNS Sofres (KANTAR TNS), opinionway, Harris Interactive France, ELABE and BVA.

⁶⁵ The unemployment is taken into account with the popularity variables. It is also possible to use the unemployment as an independent variable; we would calculate filtered popularity variables by removing this influence of the DUNEMNL variable.

Table 12 Estimates of vote (first round) 2002-2012

Variable	VoteLL	VoteC	VoteMR	VoteER	VoteVA
Constant	5.67 (3.63)	-17.94 (-9.38)	13.73 (6.57)		
POPML	0.68 (27.38)				
POPC		0.55 (22.88)			
POPMP			0.76 (36.75)		
POPER				0.67 (25.18)	
N	288	288	288	288	288
Ad. R ²	0.89	0.52	0.83	0.94	0.68

Note a: For the estimate of the variable VoteVA, there only are fixed effects in every department (2 à 95) which are significative at the 10% level.

Table 13 Estimates of vote (first round) 2002-2012

Variable	VoteELRL	VoteML	VoteC	VoteMR	VoteER	VoteVA
Constant	4.77 (6.74)		-17.64 (-9.60)	13.94 (6.77)		
POPRL	0.04 (2.25)					
POPML		0.67 (38.13)				
POPC			0.55 (27.13)			
POPMP				0.77 (42.48)		
POPER					0.66 (25.05)	
N	288	288	288	288	288	288
Ad. R ²	0.86	0.99	0.52	0.83	0.94	0.68

In the tables 12 and 13, the adjusted R-squared are high (higher than 0.80) except for the estimations for the VoteC and VoteVA variables.

We calculate the *ex ante* national forecasts in vote (first round) for every political party (or for grouping of political parties) by using the *ex ante* forecasts by department.

Table 14 presents the *ex ante* national forecasts for the 2017 French legislative elections:

Table 14 Ex ante national forecast in vote (first round) for 2017

	Predicted Value (2)	Predicted Value (1)	Actual Value	Error (1)	Error (2)
VoteELRL		7.5	14.83		7.33
VoteML		18.3	13.39		4.91
VoteELRLML	23.54			4.68	
VoteC	10.64	10.59	32.68	22.04	22.09
VoteMR	25.79	25.63	22.39	3.4	3.24
VoteER	12.76	12.74	13.87	1.11	1.13
VoteVA	2.39	2.39	2.82	0.43	0.43
MAEN				6.33	6.52

Note a: $\text{VoteLL} = \text{VoteELRL} + \text{VoteML}$

The *ex ante* forecasts are satisfactory except for VoteC and for VoteELRL. As the forecast for the variable VoteC is very low in relation to what was expected, we could make the *ex ante* forecast by calculating the difference: $100 - (\text{VoteELRL} + \text{VoteML} + \text{VoteMR} + \text{VoteER} + \text{VoteVA}) = 33.44$ (error = 0.76).

We will make some estimations for the 2002-2017 period and ex post forecasts.

We can also explain and forecast the vote for every political party (or for grouping of political parties) by using polls for every political party (or for grouping of political parties) as independent variables. Our study is made over the 2002–2012 period (three French legislative elections: 2002, 2007 and 2012). Our model uses polls (vote intentions) for every political party (or grouping of political parties).⁶⁶ We make estimates for every political party (or for grouping of political parties).

Table 15 gives the following estimates (with the SUR technique and fixed effects) for the VoteEL, VOTERL, VoteML, VoteC, VoteMR, VoteER and VoteVA variables:

⁶⁶ Erikson and Wlezien

Table 15 Estimates of vote (first round) 2002-2012

Variable	VoteEL	VoteRL	VoteML	VoteC	VoteMR	VoteER	VoteVA
Constant			-19.98 (-9.69)			2.47 (2.77)	
VIEL	1.07 (32.17)						
VIRL		0.59 (14.83)					
VIML			1.52 (32.53)				
VIC				0.90 (19.54)			
VIMR					1.16 (43.49)		
VIER						0.93 (44.91)	
VIVA							
N	288	288	288	288	288	288	288
Ad. R ²	0.95	0.96	0.88	0.78	0.99	0.91	0.68

In the table 15, the adjusted R-squared are high (higher than 0.75) except for the estimations for the VoteVA variable.

We calculate the *ex ante* national forecasts in vote (first round) for every political party (or for grouping of political parties) by using the *ex ante* forecasts by department. Table 16 presents the *ex ante* national forecasts for the 2017 French legislative elections.

Table 16 Ex ante national forecast in vote (first round) for 2017

	Predicted Value (1)	Actual Value	Error (1)
VoteEL	0.92	0.78	0.14
VoteRL	10.46	14.05	3.59
VoteML	3.09	13.39	10.30
VoteC	27.01	32.68	5.67
VoteMR	24.49	22.39	2.10
VoteER	18.78	13.87	4.91
VoteVA	2.39	2.82	0.43
MAEN			3.88

The *ex ante* forecasts are satisfactory except for VoteML. As the forecast for the variable VoteML is very low in relation to what was expected, we could make the *ex ante* forecast by calculating the difference: $100 - (\text{VoteEL} + \text{VoteRL} + \text{VoteC} + \text{VoteMR} + \text{VoteER} + \text{VoteVA}) = 15.95$ (error = 2.56).

We make some estimations for the 2002-2017 period and ex post forecasts.

Table 17 Estimates of vote (first round) 2002-2017

Variable	VoteLL	VoteC	VoteMR	VoteER	VoteVA
Constant	8.06 (6.20)	-67.37 (-17.47)	12.90 (6.82)		
POPML	0.61 (58.46)				
POPC		1.92 (35.71)			
POPMP			0.73 (41.03)		
POPER				0.80 (32.68)	
N	384	288	288	288	288
Ad. R ²	0.88	0.61	0.83	0.93	0.58

Table 18 Estimates of vote (first round) 2002-2017

Variable	VoteELRL	VoteML	VoteC	VoteMR	VoteER	VoteVA
Constant	-7.12 (-6.27)	-7.52 (-5.18)	-69.87 (-18.24)	11.77 (6.24)		
POPRL	0.50 (26.64)					
POPML		0.81 (71.18)				
POPC			1.99 (37.89)			
POPMP				0.76 (44.30)		
POPER					0.76 (31.22)	
N	384	384	384	384	384	384
Ad. R ²	0.70	0.90	0.61	0.84	0.93	0.58

Table 19 Estimates of vote (first round) 2002-2017

Variable	VoteEL	VoteRL	VoteML	VoteC	VoteMR	VoteER	VoteVA
Constant		-2.83 (-3.57)	-3.10 (-2.44)			3.74 (3.81)	
VIEL	0.90 (40.92)						
VIRL		1.01 (51.72)					
VIML			1.05 (80.67)				
VIC				1.02 (87.28)			
VIMR					1.13 (67.32)		
VIER						0.81 (44.74)	
VIVA							
N	384	384	384	384	384	384	384
Ad. R ²	0.92	0.86	0.90	0.94	0.99	0.83	0.58

8. Conclusion

The model developed here allows us to explain and to forecast the results of the French legislative elections at the local level and at the national level (the first-round vote obtained by the Left and seats obtained by the Left) with local and national data. We showed the positive influence of a popularity rating between the Left and Right on the first-round vote obtained by the Left in the French legislative elections. We showed the positive influence of the annual change in the national unemployment rate and the influence of the GDP growth rate on the first-round vote obtained by the Left in the French legislative elections. On the whole, we can say that the estimations are satisfactory over the period 1986-2012 for the vote-function; and over the 1988-2012 period for the seat-function. The *ex ante* forecasts for the 2012 French legislative elections are satisfactory.

We can not adapt our economic voting model for the 2017 French legislative elections after the Macron's victory at the 2017 French presidential election and the high vote intentions for the LREM party (Forward) with its original political position: at the Center. It is possible to make a model with three estimations for the vote over the 2002-2017 period.

We make some estimations and *ex ante* forecasts for the 2017 French legislative elections. We make some estimations in vote (5 and 6) with a popularity variable and some estimations in vote (7) with a vote intentions (polls) variable. We also make *ex post* forecasts for the 2017 French legislative elections.

Future research could complete the forecasts for the first-round vote and present some forecasts in seats (before and after the first round).

It would be also interesting to study the influence of the economic situation by taking into account the political polarization. We can calculate it by studying the data for the French political parties (Manifesto Project Main Dataset, party preferences).

Appendix A Definition of variables and sources of the data

Table A1 Popularity function

Variable	Definition and source
POPLR _t	= $POPL_t - POPR_t$, $POPL_t$ is the popularity of the Left (the percentage of people having a good opinion of the Socialist party), $POPR_t$ is the popularity of the Right (the average of the percentages of people having a good opinion of the UDF and the RPR for 1982:4-2002:3 and the percentage of people having a good opinion of the UMP since 2002:4) <i>TNS-SOFRES - Magazine Figaro</i> - quarterly data ^a
POPLR1 _t	= $(POPLR_t + POPL_t)/2$
$\Delta 4UNEMNL_{t-1}$	= $\Delta UNEMN_{t-1}$ when the Left is the parliamentary majority and $\Delta UNEMNL_{t-1} = -\Delta UNEMN_{t-1}$ when the Right is the parliamentary majority, $\Delta UNEMN_{t-2}$ is the quarterly change in the national unemployment rate (quarterly average, metropolitan France) ^b <i>OCDE</i> data
HMLR2	An honeymoon variable equal to 2 during the first quarter after the appointment of left Prime Minister after a victory in the presidential election or in the legislative elections (1988:2 and 1997:2) and equal to 1 during the second quarter after the appointment of a left-wing Prime Minister after a victory in the French presidential election or in the French legislative election (1988:3 and 1997:3), equal to 2 during the first quarter after the appointment of a right-wing Prime Minister after a victory in the French presidential elections or in the French legislative elections (1986:2, 1993:2, 1995:2, 2002:2 and 2007:2) and equal to 1 during the second quarter after the appointment of right-wing Prime Minister after a victory in the French presidential election or in the French legislative election (1986:3, 1993:3, 1995:3, 2002:3 and 2007:3)
ELEC	An electoral variable equal to 1 in 1998:2, 2004:2 and 2010:2 after the 1998, 2004 and 2010 French regional elections won by the left and equal to 1 in 2009:2 after the 2009 French European election (unfavorable election's result for the socialist party).
CONG	equal to 1 1990:2 (Rennes Congress), 2005:4 (Le Mans Congress) and 2008:4 (Reims Congress) taking into account the negative consequences of some congresses of the Socialist party on its popularity

Notes: ^a The popularity ratings for the political parties were monthly until July, 2008 and have been quarterly since September, 2008 (the third month of the quarter).

We retain the data of the third month of every quarter when the data were monthly.

^b We prefer to use the UNEMNL variable in the first difference because the UNEMN variable is not stationary (integrated of order 1). The use of the first difference for the UNEMNL variable is also natural because we use the annual change in the vote-functions.

Table A2 Popularity variables (1986-2012)

Election	POPLR1CA	POPLR1CB
1986	30.15	28.63
1988	42.82	42.74
1993	15.47	13.98
1997	22.57	23.33
2002	20.18	22.31
2007	16.86	16.37
2012	34.06	35.02

Table A3 Vote function

Variable	Definition and source
VOTEL1	The share of vote received by the Left (left-wing political parties and ecologists) in every department of metropolitan France in the first round of French legislative elections
POPLR1	equal to the average between the absolute popularity of the Left (the percentage of people having a good opinion of the Socialist party) and the relative popularity of the Left ($POPLR_t$) which is the difference of the popularity between the Left and the Right (the average of the percentage of people having a good opinion of the UDF and the RPR for 1986, 1988, 1993, 1997, 2002 and the percentage of people having a good opinion of the UMP for 2007). The popularity data are the last data published before the French legislative elections <i>TNS-SOFRES - Magazine Figaro</i> ^{a,b}
POPLR1CA	The popularity variable $POPLR1_t$ filtered by removing the influence of the economic situation by using the estimation (1a) or (1b).
POPLR1CB	
DUNEMN	The difference between the national unemployment rate of two quarters before the French legislative elections and that of six quarters before the elections <i>OCDE</i> data
DUNEMNL	= $DUNEMN_t$ because the Left is the parliamentary majority (1986, 1993 and 2002 French legislative elections) and $DUNEMNL_t = -DUNEMN_t$ because the Right is the parliamentary majority (1988, 1997 and 2007 French legislative elections)
DGDP	The difference between the GDP growth rate of two quarters before the French legislative elections and that of six quarters before the elections <i>OCDE</i> data
DGDPL	= DGDP when the Left is the parliamentary majority (1986, 1993 and 2002 French legislative elections) and $DUNEMNL = -DUNEMN$ when the Right is the parliamentary majority (1988, 1997 and 2007 French legislative elections)
SEATL	The share of seats obtained by the Left (with the Greens) in every department of metropolitan France in the second round of the French legislative elections
TRI	the percentage of triangular contests (second round) with a candidate of the National Front, a left-wing candidate and a right-wing candidate in every department of metropolitan France;
MODEM	The share of vote received by the MODEM ^c and the CAP21 ^d at the 2007 French legislative elections in every department of metropolitan France

Notes: ^a Auberger (2010) uses the average of the last three monthly popularity data for the Socialist party but since August 2008 the popularity rating for the political parties are no longer monthly but quarterly (third month of every quarter).

^b The use of the President's popularity or the Prime Minister's popularity as a dependent variable is possible if we retain the President's (resp. Prime Minister's) popularity (popularity = % good opinion or popularity = % good opinion - % bad opinion) when the left makes up the presidential majority (resp. parliamentary majority) and the President's (resp. Prime Minister's) unpopularity (unpopularity = 100 % - % good opinion or unpopularity = % bad opinion - % good opinion) when the Right constitutes the presidential majority (resp. parliamentary majority). These two popularity variables seem to us less adapted than the popularity of the Left because the President's and the Prime Minister's popularity depend on personal factors and the use of these dependent variables give estimations with less satisfactory results.

^c The *Modem* (democratic Movement) is a party of the Centre, independent from the Right and from the Left and was created in 2007 (after the 2007 French presidential election).

^d Corinne Lepage (CAP21) had supported François Bayrou (UDF and then MODEM) at the 2007 French presidential election.

Appendix B Tests for fixed and random effects

Table B1 Tests for the vote-functions (1986-2012)

	Fisher	Breusch and Pagan	Hausman
3	18.75	800.63	-
4	22.67	879.79	-
5	21.34	855.26	-
6	12.57	621.54	-
6a	13.42	652.57	-
7	33.07	1020.44	-
8	35.76	1045.91	-
9	35.21	1040.99	-
10	32.58	1015.46	-
11	32.05	1009.94	-
7a	33.22	1022.69	-
8a	35.75	1046.52	-
9a	35.15	1041.06	-
10a	34.61	1036.13	-
11a	32.80	1018.46	-

Common notes to tables A1 and A3:

Critical values at 5% level: 1.32 (Fisher) ; 3.84 (Breusch and Pagan)

The estimated coefficients of fixed and random models are the same and thus the Hausman test give a zero value

Table B2 Tests for the seat-function (1988-2012)

	Fisher	Breusch and Pagan	Hausman
12	1.29	2.85	0.05

Common notes to tables A2 and A4:

Critical values at 5% level: 1.32 (Fisher) ;
3.84 (Breusch and Pagan) ; 7.82 (Hausman)

Appendix C List of the main French political parties

extreme left-wing parties:

LO: Lutte Ouvrière (Workers' Struggle)

LCR: Ligue Communiste Révolutionnaire (Revolutionary Communist League) then NPA:

Nouveau Parti Anticapitaliste (New Anti-capitalist party) in 2009

moderate left-wing parties:

PC: Parti Communiste (Communist Party) before

PG: Parti de gauche (left-wing party) since

PS: Parti Socialiste (Socialist Party)

Les Verts (The Greens)

center:

EM: en Marche! En Marche! (Forward!), 2016-2017

LREM (or LRM): La République en Marche! (Forward!), 2017

UDF: Union pour la Démocratie Française (Union for French Democracy), before 2007

moderate right-wing parties:

MoDem: Mouvement Démocrate (Democratic Movement), since 2007

UMP: Union pour un Mouvement Populaire (Union for a popular Movement), since 2002

RPR: Rassemblement pour la République (Rallying for the Republic), before 2002

MPF: Mouvement pour la France (Movement for France)

CPNT: Chasse, Pêche, Nature et Traditions (Hunt, Fish, Nature and Traditions)

extreme right-wing party:

FN: Front National (National Front)

Appendix D Descriptive Statistics

Table D1 Descriptive Statistics of Variables (1986-2012)

Variable	Mean	Standard dev.	Minimum	Maximum
VOTEL1	44.46	8.00	14.84	66.19
POPL	47.86	8.58	35.00	64.00
POPLR	4.14	11.58	-11.50	21.50
POPLR1	26.00	9.92	11.75	42.75
POPLR1C	26.12	9.09	15.03	43.26
DUNEMNL	0.13	0.43	-0.40	0.80
DGDPL	-0.37	0.57	-1.20	0.30

Table D2 Correlations between vote and popularity (1986-2012)

	POPL	POPLR	POPLR1	POPLR1C
VOTEL1	0.435	0.477	0.466	0.462

Table D3 Descriptive Statistics of Variables (1988-2012)

Variable	Mean	Standard dev.	Minimum	Maximum
SEATL	42.13	35.15	0.00	100.00
VOTEL1	44.46	8.00	14.84	66.19
TRI	3.32	11.39	0.00	100.00
MODEM	1.49	2.99	0.00	19.40

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