

# Voter Turnout and Fiscal Policy

RAPHAEL GODEFROY AND EMERIC HENRY\*

January 22, 2012

## Abstract

Though a large literature on the determinants of turnout has flourished, there is scant evidence on the causal impact of turnout on policies implemented in practice. Using data on French municipalities and instrumental variables for turnout based on temperature and influenza incidence variations, we show that a one percent increase in turnout decreases on average the municipalities' yearly budget by 1.5 percent. This is mostly due to a decrease in spending on equipment or personnel. We show that this could be the result of a negative effect of turnout on the strength of the incumbent's majority combined with the fact that the incumbent promises higher budgets. We argue, in the context of a theoretical model, that these different facts could be natural consequences of the well documented incumbency advantage.

## 1 Introduction

Voter turnout has consistently been decreasing in most Western democracies over the last 40 years. For instance, turnout in the first round of French municipal elections dropped from 78.2 in 1965 to 66.5 in 2008.<sup>1</sup> Many argue that this is a worrying sign for the health of our democracies. Although a large literature examines the determinants of turnout, little is known on the effect of turnout on policies implemented in practice.<sup>2</sup> We fill this gap by examining the impact of turnout on fiscal policy, using data on French municipalities.

A large literature in political science addresses the question of whether those who actually vote are representative of the larger population. Based on survey evidence, they find either no significant

---

\*Paris School of Economics, 48 boulevard Jourdan, 75014 Paris and Sciences Po, department of Economics, 28 rue des Saint Peres, 75007 Paris.

<sup>1</sup>The corresponding turnout figures for US presidential elections are 61.9 in 1964 and 57.37 in 2008 and the drop is much larger for midterm elections.

<sup>2</sup>Several papers, discussed below, study the effect of enfranchisement laws, which affect the number of eligible voters, on policy outcomes. Here, we focus on variations in turnout for a given eligible population.

differences (see the seminal paper by Wolfinger and Rosenstone 1980), or evidence suggesting that non voters tend to be poorer and may favor more public spending (e.g. Leighley and Nagler 2007 for the US, Perrineau 2007 for France). Our work, using revealed preferences observed in the data, provides new evidence, not on the overall population of non voters, but on the marginal voters with intermediate level of voting costs, who turn out to vote or not depending on specific conditions.

We show that these voters are significantly different from the rest of the voting population in terms of preferences for spending. Indeed, an increase in turnout has a significant and large negative impact on municipalities' budgets with an elasticity in the order of -1.5, suggesting that the marginal voter is on average in favor of lower spending. Furthermore, we construct a model and provide arguments that suggest that this may not reflect an intrinsic correlation between voting costs and budgetary preferences, but could be the result of electoral promises endogenously making the marginal voter vote against the spending associated to these promises.

Compulsory voting is a frequently discussed way of addressing the problem of decreasing turnout, and is implemented in several countries. However, the studies mentioned above, and evidence from simulations (Citrin et al. 2003), suggest that introducing mandatory voting might have little impact in terms of implemented policies.<sup>3</sup> Our work highlights the fact that policies to increase turnout other than mandatory voting, such as information campaigns or reforms facilitating voter registration, might actually have much larger impacts on implemented policies, and thus on welfare, since they affect those marginal voters that are at the limit between voting and not voting.

Two main problems have to be overcome to establish a causal effect of turnout on policies. First, turnout is endogenous. It is correlated with municipal characteristics, such as the number of residents of a municipality, their average income etc., that could impact municipal finances. We overcome this problem by using two different instruments for turnout, one based on weather conditions and the other on flu incidence.

Second, the rules that govern the elections of public representatives, set their collective decision procedures, and delimit their power, differ across nations, and may substantially vary across infra-national polities within a nation.<sup>4</sup> This heterogeneity impedes the comparison of policies across governments and requires to control for a wide array of variables in order to test the impact of turnout on policies.

---

<sup>3</sup>There is also a body of theoretical work discussing the question of whether compulsory voting is welfare enhancing that obtains ambiguous results (see Börgers 2004, Krasa and Polborn 2009)

<sup>4</sup>This is the case for US municipalities, for instance. Municipal government can take the form of either mayor-council or council-manager government, municipal and county governments may exist side-by-side, etc.

To overcome this second problem, we take advantage of one particularity of French local institutions: their homogeneity. Due to a highly centralized system, all municipalities are subject to the same national law, that sets the election date, election rules as well as the role of municipal councils. We thus use longitudinal data on fiscal policy and electoral outcomes that span the years 1998-2010, for a sample of around 4000 municipalities, located in the Western part of France.<sup>5</sup> Two municipal elections took place over this period, one in March 2001, the other in March 2008.

We propose the two following instruments for turnout. First, we use average temperature on election day. Higher temperatures on election day have a negative impact on turnout, significant for the election of 2001. Second, we use the number of patients with clinical symptoms of the flu who visit a general practitioner in the week before the elections. A higher number of infected people has a negative impact on turnout, significant for the 2008 election.

We do not claim that we have identified universal instruments that will always be powerful predictors of turnout. In fact, these effects are due to unusual weather conditions in 2001, and an unusually severe flu season in 2008, that took place at the time of - or just before - the elections in our area of study. These conditions were documented in several articles of the local newspaper, which we mention below, and confirmed by an examination of our data.<sup>6</sup> The idea of the instrument based on weather is that potential voters will be tempted to engage in outdoor activities rather than turnout to vote if the weather on Sunday is nicer. Thus this instrument is unlikely to work in a country such as the US where elections are run on a weekday. Nevertheless, in the context we study, these instruments turn out to be powerful predictors of turnout, and we find very robust effects of turnout on public finances, regardless of the instrument we use.

Our identification assumption is that, controlling for observable municipal characteristics, our instruments are uncorrelated with the unobservable factors that affect the trend of the fiscal outcomes we examine. In fact, we find that neither instrument is correlated with the municipal characteristics that we do actually observe, which include the main determinants of municipal finances. More importantly, when we restrict our sample to observations covering the years *before* a municipal election year, we find no significant correlation between any given fiscal outcome and the instrument for turnout for that election, and no impact of the instrument on the change in any given fiscal outcome after any arbitrary year.

Our first main result establishes that turnout has a significant negative impact on the revenues

---

<sup>5</sup>Comprehensive electoral data, recorded by a local newspaper, are available for this geographic area only.

<sup>6</sup>The average temperature on the elections weekend in 2001 was around 10°F above average, whereas the prevalence of the flu was around 70 percent higher than average in the month preceding the 2008 elections.

of the municipality. A one percent increase in turnout, decreases yearly revenues in the order of 1.5 percent. This represents an average decrease of 18 euros per capita per year for a one percent increase in turnout. It is remarkable that the result does not seem to depend on the origin of the variation in participation: regardless of whether temperature or flu caused this variation in turnout, the effect is of the same size and goes in the same direction.

These estimates can also be used to derive estimates of voting costs. Indeed the main result can also be expressed in a different way: an additional vote decreases on average the yearly budget by 2.3 euros. Thus the maximum expected benefit from voting of the marginal voter is 2.3 euros per year for 7 years, that is the length of a term, since in the worst case scenario the voter would not have benefited at all from this extra spending. This figure is an upper bound on voting costs, net of non financial benefits such as a warm glow from performing one's civic duty.

On the spending side, our second result is to show that this decrease is due mostly to a fall in spending on investments in equipment (such as building schools or roads) or a decrease in spending on personnel. The effect can be large: a one percent increase in turnout, decreased spending on equipment by at least 3 percent after the 2001 elections. We also find that turnout has no systematic impact on taxes.

The effect of turnout on municipal finances, that turns out to be large, is puzzling. We propose a mechanism, that appears to be supported by further evidence.<sup>7</sup> We argue that these effects are a consequence of a subtle electoral interaction. Indeed we establish that an increase in turnout decreases the probability that the incumbent majority has a large share of the municipal council. If it is the case that the incumbent proposes and implements a higher budget and larger spending on equipment, then our main empirical results naturally follow.

This difference between the incumbent's and the opposition's electoral platforms can be seen as a natural consequence of a well documented fact called the incumbent advantage. It has been systematically established, mostly for American elections, that the incumbent has a significantly higher probability of being elected. It appears to be true in our data where more than 63% of incumbent majority coalitions wins a majority of seats in the newly elected council. This advantage means that the incumbent mayor is less accountable. Thus, in a situation where he has a relative preference for a higher budget compared to voters, he can propose more spending and still preserve a good chance of being reelected.

To fix ideas, consider the following setting, which we study in detail in the theoretical model

---

<sup>7</sup>We cannot however reject alternative explanations (we discuss these alternative explanations in section 5.3).

of section 5. Suppose that an election is run, based on binding campaign promises, where both an incumbent and the opponent he is facing have, on top of regular spending on public goods, a preference for spending on particular pet projects, such as a school or a new townhall. These pet projects are supported by less than a majority of voters, but if proposed, cause the voters who favor them to turnout for sure. Consider moreover the following incumbency advantage: the incumbent can fund his preferred project at a lower cost than his rival (for instance he has easier access to subsidies or to the credit market).

In such a setting, the opposition candidate will never propose his pet project and his proposed budget will always be smaller than that of the incumbent. The key is that if both candidates propose their pet projects, voters who dislike both of these plans will still turn out to vote for the incumbent since he can fund his project at a lower cost. The most natural outcome is then that only the incumbent proposes his preferred project. Voters that support it turn out for sure while other voters, who vote against the incumbent if they come and vote, will only turnout if voting costs are low enough. Thus, a decrease in voting costs increases turnout, decreases the probability that the incumbent is reelected, and incidentally decreases the average budget implemented by the winner of the election (we show in Godefroy and Henry 2011 that these results also hold in a more general setting). In our model, the effect of turnout on fiscal policy is independent of the source of variation in turnout, which is consistent with our empirical results.

We insist on the fact that we can make no definitive welfare claims on the effect of higher turnout. Indeed it is not currently possible to establish whether budgets are too low or too high. Note that it is not even obvious in the theoretical context we outlined. If the preferences of the few voters who like the incumbent's pet project are sufficiently strong, then implementing such a project is welfare enhancing and increasing turnout would have a negative impact on welfare.

**Related Literature.** There is a growing theoretical literature examining whether making voting compulsory is welfare enhancing. Börgers 2004 shows that, in a situation where the expected number of supporters for the two candidates is equal in the population, compulsory voting is welfare reducing. Krasa and Polborn 2009 point out that the result depends on the assumption that the general electorate is equally split. If this is not the case, mandatory voting will typically be welfare improving. Note that both papers consider mandatory voting as a decrease in the cost of voting, which corresponds exactly to the case we examine empirically of a shock on weather or flu incidence. Citrin et al (2003), simulate the outcome of elections as if everyone had voted, fixing the preferences of non voters

based on their socioeconomic profile and suggest mandatory voting would not affect the outcome.

These papers build on the large theoretical literature on rational turnout (see survey by Dhillon and Peralta 2002 and Feddersen 2004). Most models in the game theoretic branch of the literature assume that potential voters make a rational decision comparing their cost of voting to the probability of being pivotal in the election, conditional on the other voters' strategies. We use the same type of model of turnout in section 5. This leads to the paradox of voting in large elections since the probability of changing the outcome becomes negligible. To judge how large this paradox is, we need to have a rough idea of voting costs, which is a byproduct of our results.

There is a large empirical literature studying the determinants of turnout that we will not attempt to fully survey here. One of the key findings of this literature, though, is that, on top of classical explanations based on socioeconomic background, information is one of the main determinants of voting. For instance, Banerjee, Kumar, Pande and Su 2010, show in the context of an experiment in India, that access to information on candidates significantly increases turnout. The effect of information is also reflected in the fact that higher level of education can lead to higher turnout rates (causal link established for instance in Milligan et al. 2003) and in the literature on the influence of the media: Stromberg 2004 shows that regions with higher radio penetration had higher levels of turnout, and Gentzkow 2006 shows the opposite effect of television (television making people less informed by moving them away from more traditional media) in the US. Enikolopov, Petrova and Zhuravskaya 2011, however, find no significant effect of the presence of an independent TV channel in Russia. Other factors can have sizable effect on turnout: Washington 2006 finds that the presence of Black Democrat candidates on the ballot has substantial and significant positive effects on turnout, both among Black and White voters.

Several papers study the effect of legal changes that led to an increase in turnout. Most of them (Husted and Kenny 1997, Lott and Kenny 1999, Miller 2009) examine the impact of the extension of voting rights, such as women's enfranchisement in the US, and find that it caused an increase in welfare spending, especially in public health policies. Similarly, Fujiwara 2010 finds similar results for Brazil through the study of the introduction of technologies to facilitate voting for less educated individuals. Although related our work differs substantially from these studies. First, they cannot distinguish the effect of the change in the size of the eligible population from the actual impact of voter turnout itself. More importantly, these changes modified the number of voters in a way that politicians could anticipate, and, in some cases, encouraged by supporting enfranchisement laws. Here, our focus is different since we are interested in variations of turnout that cannot be anticipated more

than a few weeks before the elections.

To the best of our knowledge, there is no study testing directly the impact of voter turnout on implemented policies. The effect of turnout on political outcomes is of course of wide interest in the political science literature. There are debates discussing whether higher turnout tends to give an advantage to Democrats. Recently, a few studies have started addressing the endogeneity problem inherent in the early literature, in particular instrumenting turnout with rainfall. Gomez et al. 2007 show that lower turnout increases the Republican party's vote share in national elections. Hansford and Gomez 2010, who also use rainfall as an instrument, confirm this finding and also show that an increase in turnout decreases the vote share of the incumbent. Gentzkow, Shapiro and Sinkinson 2011 find no impact of newspaper entry on incumbents' probability of reelection. However, their empirical strategy relies on shocks on turnout that could be anticipated by candidates and voters. More importantly, these studies examine the impact of turnout on political outcomes and not on actual policies implemented.

Some empirical papers address the effect of political variables on local public finances. Enikolopov and Zhuravskaya 2007 find that the effect of decentralization in Russia critically depends on whether local representatives are elected or appointed. Using data on local governments in Sweden, Pettersson-Lidbom and Tyrefors 2011 find that representative democracy increased both political participation and size of government, relative to direct democracy. In the US, Ferreira and Gyourko 2009 show that partisanship, i.e the fact that the mayor belongs to the Democrat or the Republican party, does not have an impact on policy outcomes (size of government, tax rates) at the municipal level in US cities.

We argue that the incumbent effect could be at the source of the results we observe. There is a large literature attempting to establish and explain this incumbent effect. For instance Lee 2008 using a regression discontinuity approach, shows that an incumbent who was barely elected in the previous election has a significantly higher chance of being elected in the next election than his rival. There are also numerous papers that we review in section 5 explaining this advantage. We provide a slightly different story than those typically suggested, since the source of incumbency advantage is in our model (supported by some empirical evidence) that the incumbent has better access to subsidies and to the credit market.

The remainder of the paper is organized as follows. In Section 2 we present the data and institutional background. In Section 3 we expose our identification strategy. Results are presented in section 4 and interpreted in the context of a particular model in section 5. Tables and proofs are presented in the appendix B.

## 2 Data and Institutional Background

Since the French Revolution, in 1789, the French territory has been divided in municipalities, the smallest administrative unit in the country. France now counts 36682 such municipalities<sup>8</sup> (compared to roughly 80000 in the whole of the EU). Both the rules that govern elections and the duties of the elected officials are set in national law and apply uniformly across the territory. In this section, we present some institutional background on French municipalities and information on the data we use. All summary statistics are in table 1. We also document the specific weather and flu spread conditions in 2001 and 2008 respectively.

Our data span the years 1998 to 2010. Two municipal elections took place over this period, in 2001 and 2008, on the same days in all municipalities. Municipal elections have two rounds in France, the second round occurring one week after the first. The first round of the 2001 elections was on Sunday, March 10th, the first round of the 2008 elections was on Sunday, March 9th.

### 2.1 Electoral system and data on elections

Municipalities are governed by a municipal council whose members are elected through direct universal suffrage. Any adult above 18 living in the city, French or EU national, can register to vote. Elections, organized on the same days nationwide, comprise two rounds, which are held at a week interval, always on a Sunday. The electoral system of a town, and the size of its municipal council, depend on its population. Below 3500 inhabitants, the electoral system follows a first-past-the-post voting method: every voter can give at most one vote to any arbitrary number of candidates smaller than the number of seats. The candidates fill the available positions in order of highest vote.<sup>9</sup> Above 3500 constituents, a degree of proportionality is introduced. The size of the council and other information on French local institutions is provided in Appendix A.

The municipal councilmen then elect one among themselves to serve as mayor (not necessarily the one that got the highest number of votes in the municipal election). The mayor is the agenda setter and the enforcer of decisions passed at the council. The municipal council must meet at least once every three months and deliberations are open to the public. Any proposal, including the city's budget, must be approved by a majority of councilmen.

---

<sup>8</sup>as of January 1st 2010

<sup>9</sup>a candidate can be elected in the first round only if more than half voters and at least a quarter registered voters voted for her or him.

Data on municipal elections come from two sources, the Ministry of Home Affairs, and the daily newspaper *Ouest France*, which covers the Western part of France. For every municipality and elections year, we know the level of voter turnout, the name of the incumbent mayor, the names of all the members of the newly elected council, including the newly elected mayor (source: *Ouest France*). Although candidates can run independently in towns with less than 2500 inhabitants, most actually belong to a coalition and the data from *Ouest France* mention for each candidate the coalition he/she belongs to. These coalitions are usually not, or very loosely, related to one the main parties active at the national level.

Given the importance of detailed electoral data to understand the mechanism through which turnout influences policies, we restrict our analysis to the area covered by the newspaper, i.e to the Western part of France. We define the *turnout* in some municipality and some election, as the number of individuals who voted in the first round of that election.

## 2.2 Municipal finances

The main areas of competence of French municipalities, set in national legislation, have been roughly stable since 1884 and more importantly, by and large, do not depend on the city size. Apart from administrative duties (such as keeping the register of deaths, births...), the municipality is in charge of providing services such as lighting, water and most importantly primary school education, of maintaining public buildings and roads and of deciding new investments (such as public housing, industrial zones, primary schools...).

The main sources of revenues are taxes, subsidies and loans.<sup>10</sup> The municipal council fixes the tax rate of three main categories of taxes: tax on homeowners, tax on inhabitants and professional taxes. It obtains subsidies from other local governments, or from the state. A share of these subsidies is based on well specified factors, such as the population or the surface of the municipality, but another is more discretionary. Finally, some municipalities contract loans. Note that they do not have to obtain authorizations from higher levels of government to sign a loan but that this additional money can only be used to finance new investments.<sup>11</sup>

Although municipal councils have a high level of autonomy, their accounts come under close scrutiny. The accounts are examined yearly by the an independent agency made up of civil servants

---

<sup>10</sup>By convention, municipal revenues include loans.

<sup>11</sup>In particular the townhall has to be able to finance, using collected taxes and the DGF, all the “current activities” (paying salaries, maintaining equipment...). In the municipal accounts, the total of Produits de Fonctionnement needs to cover the Charges de Fonctionnement

not subject to political fluctuations, so that misappropriation of funds does not seem of concern here.<sup>12</sup>

Data on municipal finances were provided by the French Ministry of Finances for the period 1998-2010. For every year and municipality in our sample, we observe the total amount of municipal revenues and expenses. On the revenue side we can distinguish specifically the amount of taxes. Unfortunately given the level of aggregation of our data, we cannot distinguish subsidies from loans. In terms of spending we can observe small purchases (computer, gas for vehicles), larger equipment (roads, schools) and personnel expenditures.

### 2.3 Data on municipal characteristics

Data on other municipal characteristics come from the *Institut National des Statistiques et Etudes Economiques*, roughly equivalent to the Census Bureau in the US and the French Ministry of Finances. For every municipality, we observe the number of primary residents, “population” hereafter, which was measured in the two last censuses that took place respectively in 1999 and 2007. In addition, we use data on the total net taxable income of primary residents, the total number of residents (that is primary residents plus people with a secondary residence in the municipality), the size of labor force (participating workers between 15 and 65), the yearly number of births and deaths, and the surface of the municipality, measured at the time of the censuses.

For every municipality and elections year, we also know the number of registered voters from two sources, the Ministry of Home Affairs and *Ouest-France*. These two sources do not match for a substantial number of municipalities. This measurement error may be correlated with the level of voter turnout, since it relies on information updated up to the day of the elections.<sup>13</sup>

### 2.4 Data on weather

Weather data were provided by *Meteo France*, the French national meteorological service. This service maintains records on daily temperature from a network of meteorological stations. We use observations from around a hundred stations in our area of study, for March 10th and 11th, from 1994 to 2001, and for March 8th and 9th, from 2002 to 2008.

Let  $T_i(d, m, y)$  denote the temperature measured at the station of observation  $i$ , on day  $d$  of month  $m$  in year  $y$ . Given a year of elections  $ye$ , we define:

---

<sup>12</sup>The *Chambre Régionale des Comptes* is the agency in charge of examining local public finances.

<sup>13</sup>Voters may be radiated from electoral lists in some municipality up to a few weeks before the elections, and can contest this decision up to the day of the elections. In every municipal elections cases arise of voters finding out that they were radiated when they go to vote, contesting the decision, and winning.

$$Z_i^{wea} \equiv \log T_i(de, me, ye) \tag{1}$$

where  $ye$ ,  $me$ , and  $de$  are respectively the year, month, and day of the first round of municipal elections.

Since the weather before the elections may be correlated with unobserved factors affecting fiscal outcomes, we may include the log of the average temperature on the Saturday preceding the elections,  $\log T_i(de - 1, me, ye)$ , and other past weather variables,  $\log T_i(de, me, y)$  for  $y < ye$ , as covariates in the estimations.

**Weather on elections weekend 2001.** Our choice of instrument was inspired by the effect of unusual weather conditions in our area of study, in particular on the weekend of the 2001 municipal elections. As shown in summary statistics by year presented in table 2, and confirmed in articles that we found in the archives of the local newspaper *Ouest-France*, the weather on the 2001 elections weekend was unusually nice, compared to previous (or following) years. In addition, the weather went back down to usual temperatures the following week, accompanied with heavy rains.<sup>14</sup>

In France most people do not work on the weekend, especially not on Sunday, and the nice weather on this weekend could have motivated potential voters to engage in outdoor activities.<sup>15</sup> The weather on the elections weekend of 2001 was unusually nice, and several articles in the newspaper *Ouest-France* mention outdoor activities that were organized to take advantage of the weather. For instance, many would-be voters may have taken advantage of fishing season, which began on Saturday, March 10.<sup>16</sup> Recreational fishing is in France a very common activity that is regulated, especially in the coastal area we focus on, which is also crossed by various rivers. In fact, we even found several articles that raised the concern that fishing would interfere with turnout on election day.<sup>17</sup> Our instrument is then based on the idea that voting is weighed against these outdoor activities: potential voters might make the most of a warm Sunday to engage in such activities. This might be particularly important for two days that are relatively warm, such as in 2001.<sup>18</sup>

---

<sup>14</sup>See *Ouest-France* of Saturday, March 10th 2001

<sup>15</sup>Similarly, voters who work that day - for instance employees of the tourism industry - will be busy that day, and may not have time to vote. The part of the population of our area of study that works in the tourism industry is relatively high compared to other French regions (tourism employed 5.5 to 8 percent of the workforce in 2003, compared to 4.3 in France (Source: INSEE).

<sup>16</sup>See newspaper *Ouest-France* of Saturday, February 19th 2001

<sup>17</sup>See *Ouest-France* of Saturday, March 10th 2001.

<sup>18</sup>If Sunday is warmer than Saturday but still too cold to really enjoy outdoor activities, we would not expect our instrument to work.

## 2.5 Data on flu prevalence

Data on the incidence of influenza-like illnesses are provided by the *Réseau Sentinelles* (roughly equivalent to the Center for Disease Control), that gathers data from general practitioners in France, and use them to follow the spread of the main infectious diseases over time and geography.<sup>19</sup> They do not disclose their data at the medical doctor level, but instead provide an interpolated aggregated estimation of the number of patients per 100,000 persons and per week who visited a general practitioner with symptoms of influenza, for around 115 evenly geographically distributed locations of observation. Flu symptoms are: fever above 39°C (102.1°F), myalgia and cough. The data span weeks 1 to 11 for the years 1992 to 2008.

Given a week  $we$  and year  $ye$  of elections, we define:

$$Z_{i,1}^{flu}(ye) \equiv \log N_i(we, ye) \quad (2)$$

where  $N_i(w, y)$ , the number of patients per 100,000 persons with flu symptoms in the closest location of observation to municipality  $i$  in week  $w$  and year  $y$ .

$N_i(we, ye)$  underestimates the total number of people infected with the flu since not all sick individuals visit a general practitioner and not all sick individuals who visit a general practitioner have all the symptoms necessary to be counted in the data. In fact, epidemiological studies indicate that the ratio of flu-infected individuals who both visit a doctor and present these symptoms could be at most 25%.<sup>20</sup>

In addition, we use the past average weekly incidence of patients with flu symptoms per 100,000 persons who were infected, from mid-January to mid-February as a control variable, that is  $\frac{1}{4}(N_i(we - 3, ye) + N_i(we - 4, ye) + N_i(we - 5, ye) + N_i(we - 6, ye))$ . The peak of flu epidemics is reached between

---

<sup>19</sup><http://websenti.b3e.jussieu.fr/sentiweb/>

<sup>20</sup>Carrat et al. 1999 and Carrat et al. 2002 investigate this question for France. Carrat et al. 2002 estimate that more than 40 percent people with clinical symptoms of the flu do not consult a medical doctor. This share is likely a lower bound, though, since their analysis is based on a survey among relatives of a group of people who visited a medical doctor in the few weeks preceding the survey. For the US, Monto and Sullivan 1993 estimated that 1 in 4 individuals with influenza-like symptoms consulted a medical doctor.

Among a sample of patients with some influenza-like symptoms, Carrat et al. 1999 estimate that around 50% patients with laboratory confirmed flu infection, have a temperature above 39°C (102.1°F) - the percentage is highly dependent on whether the temperature is obtained from the patient or the doctor, though. This ratio seems quite large compared with the other studies that investigate the same question, which almost all recommend a lower threshold for temperature (around 38°C - see reviews in Monto et al. 2000, Call et al. 2005). Boivin et al. 2000, for instance, find on a sample of patients from Quebec that at most 16% patients who have laboratory confirmed flu infection, presented a fever above 39°C (102.1°F).

Combining the results from Carrat et al. 1999 and Carrat et al. 2002, we likely observe at most 25 percent flu-infected patients.

mid-January to mid-February. This information is available to voters and candidates long before the elections, and may enter turnout expectations (the patients infected at that time should have no more symptoms of the flu, and be immune), or be correlated with municipal characteristics correlated with fiscal variables.

**Influenza infections in 2008.**  $Z_i^{flu}$  can be a good instrument in years where the influenza epidemic was virulent, and lasted long enough. It was in fact the case in 2008. A proportion of patients infected by the most common strain of influenza (Type A H1N1 - it represented 67% of the flu cases that year), appeared to be resistant to the main drug used to treat it (oseltamivir, commercialized under the name of Tamiflu®). The European Centre for Disease Prevention and Control and other agencies reported at the beginning of February 2008 that they had:

“detected an unusually high rate of resistance to the antiviral drug oseltamivir (Tamiflu) in random samples of seasonal influenza virus taken from around the continent.”

The share of resistant strains was then estimated to be around 14%, compared to 1% in the previous years. In Norway, the share of patients with oseltamivir-resistant was 70 percent (Hauge et al. 2009), this situation leading the World Health Organization to issue an alert. In France, Van Der Werf 2008 estimated at the end of the epidemics that around 30 percent of all infected patients had contracted that resistant strain. In addition, the prevalence of influenza in the few weeks preceding the elections in our area of study was very high in comparison with 2001, or with the other years (see table 2). This event may thus have modified the perceived risk of contracting the disease. In fact, we found evidence that the influenza was a concern that year. A broad search in the archives of Ouest-France indicated that around 50 articles in *Ouest-France* mentioned the flu between February 1st and March 15th 2008 (compared to less than 10 over the same period in 2001).

### 3 Specification and Identification

#### 3.1 Specification

Two elections took place over our period of study. Since the consequences of voters' turnout may change from one election to another, we estimate the effect of turnout for the elections of 2001 and 2008 separately. With a slight abuse of notations, we drop any subscript or superscript indicating the year of elections below for the sake of clarity.

For a given year of election  $ye$ , and two terms  $t = before$  and  $after$  the elections, the basic specification is a regression of the form:

$$\bar{F}_{i,t} = c_i + \alpha \log Turnout_i + \beta After_t + \gamma \log Turnout_i \times After_t + \xi X_{i,t} + \epsilon_{i,t} \quad (3)$$

where  $i$  indexes municipalities,  $t$  indexes terms,  $c_i$  is a municipality unobserved effect, and  $After_t$  is equal to 1 if  $t$  is the term after the elections ( $t = after$ ), and 0 otherwise, and  $\bar{F}_{i,t}$  is an outcome measure of interest. The term  $X_{i,t}$  is a vector of control variables that we detail below.

There is one observation by municipality and by term in the specification. If  $F$  is a fiscal policy variable, we define  $\bar{F}_{i,t}$  as the average of yearly  $F$  over the years of term  $t$ . We aggregate data over a term because of the serial correlation of fiscal policy variables that could bias the estimation of the standard errors. Such aggregation is also more consistent with the decision process of municipal councils which plan revenues and spending over a term.

To control for the effect of predictable long-term factors correlated with turnout that may impact the outcome of interest, the vector  $X_{i,t}$  is by definition  $X_i \times After_t$ , where  $X_i$  include the following municipal characteristics, or their logs or polynomials, interacted with time fixed-effects when relevant: *départements*<sup>21</sup> fixed effects, size of council fixed effects, the number of secondary residents, the surface of the municipality, the income of the primary residents of the town, the number of births and deaths in the municipality, and the number of registered voters in the municipality all variables measured *before* the elections.

All the estimations that follow are OLS or 2SLS estimations of the first-difference of the previous equation, that is:

$$\bar{F}_{i,after} - \bar{F}_{i,before} = \beta + \gamma \log Turnout_i + \xi X_i + \epsilon_{i,after} - \epsilon_{i,before} \quad (4)$$

The aim of the empirical analysis is to estimate the effect of turnout on municipal outcomes. The literature on voting has raised the point that both long-term factors (such as the level of education) and short-term factors (such as the weather on election day) could impact an individual's decision to turn out to vote. Here, we are interested in the effect of short-term factors only, factors that cannot be anticipated by the voters or the candidates more than a few weeks before the elections. To do so, we use the weather  $Z_i^{wea}$  and flu incidence  $Z_i^{flu}$  variables presented in section 2, as instrumental

---

<sup>21</sup>Higher administrative region, equivalent to a county.

variables, and estimate the parameter  $\gamma$  in two-stage least squares. The specification for the first stage of the 2SLS procedure is:

$$\log Turnout_i = \theta Z_i + \chi X_i + \eta_i \quad (5)$$

with the same notations as before, and  $Z_i = Z_i^{wea}$  or  $Z_i^{flu}$ . We define  $Z_i$  for a municipality  $i$  as the value of this variable measured at the location of observation closest to  $i$ . In all estimations that use these variables, standard errors are clustered at the location of observation level. All 2SLS estimations also report the cluster-robust F-statistics against the null that the instrument is irrelevant in the first stage regression.

### 3.2 Identification

Two conditions are necessary for identification: (1)  $Z_i^{wea}$  and  $Z_i^{flu}$  must impact turnout, and (2)  $Z_i^{flu}$  and  $Z_i^{wea}$  must be uncorrelated with the error  $\epsilon_{i,after} - \epsilon_{i,before}$ , that is uncorrelated with the unobserved factors affecting the trend of a given fiscal variable.

**The instruments impact turnout.** We first examine condition (1). Tables 4 and 5 report results of the estimation of equation 5, for  $Z_i^{wea}$  and  $Z_i^{flu}$  respectively, separately for each election year.

Table 4 shows that the weather has a negative impact on turnout. This negative impact is evidence that turning out to vote was weighed against weekend plans: if Sunday is warm, voters may want to go out to enjoy the weather rather than turning out to vote. In addition, the coefficient is significant in 2001. This result suggests that the level of temperature also matters in weekend plans. If it is too low on average, a small increase on Sunday will have no effect. This interpretation is consistent with the unusually nice weather of the elections weekend in 2001, documented in section 2.4.

Table 5 shows that flu incidence (as measured by the number of patients with clinical symptoms of the flu  $Z_i^{flu}$  in the week of the elections) has a negative impact on turnout. Sick people do not go to cast a ballot. This effect is significant in 2008, which confirms the large impact that this infection had that year, documented in section 2.5.

**The instruments are uncorrelated with the error.** We now turn to condition (2). Here, and in the rest of the paper, we use  $Z_i^{wea}$  as an instrument for turnout in 2001, and  $Z_i^{flu}$  as an instrument

for turnout in 2008.

To test the validity of condition (2), we first estimate the correlation between the instrumental variables and the main municipal characteristics that we observe, and the average revenues *before* the elections. The results of these estimations are reported in Table 6, and show no significant correlation. The fact that we cannot find any characteristic correlated with our instruments is a strong indication that our instruments may not be correlated with any unobservable municipal characteristics that impact the budget.

We run a second test that directly addresses the possible correlation between the instruments and trends in municipal finances. Restricting our sample to the observations in the years before an election year  $ye$ , we estimate the effect of the turnout in 2SLS on the change in some fiscal outcome after some arbitrary year  $Y < ye$  in this sample. This amounts to estimating the coefficients of equation 4 for a fictitious year of elections  $Y$ , and two fictitious terms, a term *before* comprising the years before  $Y$ , and a term *after* comprising the years  $Y$  to  $ye - 1$ .

If our identification assumption is valid, instrumented turnout in an election year should have no significant impact on the changes in any fiscal variable from one fictitious term to another. This is indeed the case, as shown in tables 7 and 8, where the fiscal variable of interest is total revenues.

It is still possible that our instruments affect municipal finances after the elections *directly*, and not through turnout. For instance, an extremely severe flu epidemic may push a local government to invest in health care infrastructure, to be ready to address future crises. Similarly, terrible weather conditions may force a municipality to renovate its buildings. We have no way to numerically estimate these possibilities. However, the weather conditions, and even the flu epidemics, that we consider, were unusual, but not dramatic. In fact, we couldn't find in the local newspaper any example of such investment. In addition, investment in health infrastructure is typically decided at a higher administrative level than the municipality<sup>22</sup>

Finally, we emphasize that all our control variables are observed at least a year before the time of the elections, except the number of registered voters. That number, correlated with turnout, could thus vary shortly before the elections for the same reason as turnout itself, and bias our estimations. There is indeed evidence that registration records are updated very shortly, or at the time of, the elections. Municipal administration has the possibility to radiate a registered voter up to two months before the elections if it deems that he/she does not reside in the municipality, and radiated voters

---

<sup>22</sup>Only very large towns or cities usually invest in significant health infrastructure. Our results hold if we exclude these towns or cities from our sample, for instance if we only consider municipalities that have less than 3500 inhabitants.

have the possibility to appeal radiation decisions up to the elections day.<sup>23</sup> In addition, we compared the number of registered voters from the two different sources to find that they did not match in a substantial number of cases, suggesting at the very least some measurement error in this variable, likely correlated with the turnout. Given this potential endogeneity of the number of registered voters, we report, for any regression, the results of the estimations with and without that variable.

## 4 Results

### 4.1 Effect of turnout on municipal revenues

This section analyzes the effect of turnout on two dimensions of municipal revenues: total revenues and tax revenues.<sup>24</sup> In all the regressions, we exclude the specific years of elections 2001 and 2008 because it is impossible to distinguish financial decisions made by the incumbents and by the newly elected council during that year. The specification for these estimations is equation 4.

Using this specification, we first report, in Table 9, the OLS estimation of the impact of turnout on total revenues. We find a small effect of turnout on municipal revenues, controlling for municipal characteristics, and this for both elections. These estimations suggest that turnout may have a negative effect on municipal revenues.

The 2SLS estimations are reported in Tables 10 for the 2001 elections and 11 for the 2008 elections. They confirm that turnout has indeed a significant negative impact on total revenues, both in 2001 and 2008. The effect is around ten times larger than what the OLS estimation suggested. An increase of 1 percent of turnout decreases municipal revenues by at least -1.5.

In the other columns of both tables, we show that this decrease in revenues do not necessarily correspond to a decrease in tax revenues, but may stem from a decrease in borrowing, in subsidies received by the municipality, in use of municipality's capital, or from a combination of all these sources. However, our data do not allow us so far to distinguish between these sources of revenues.<sup>26</sup>

In all these regressions, and the following, the coefficient on the log of turnout is roughly the

---

<sup>23</sup>The newspaper *Ouest France* gives the example of a town that radiated almost 10 percent of its registered voters in 2001.

<sup>24</sup>For any such variable  $F$ , a municipality  $i$ , and an election year  $ye$ , we define the dependent variable as  $\log \bar{F}_{i,after} - \log \bar{F}_{i,before}$ , where  $\bar{F}_{i,after}$  (resp.  $\bar{F}_{i,before}$ ) is the average of  $F$  over the years of the term starting (resp. ending) in year  $ye$ , and ending (resp. starting) in the last (resp. first) year of the term that we can observe.<sup>25</sup>

<sup>26</sup>For instance subsidies can be found in several of the categories reported in the summarized accounting data at our disposal.

opposite of the coefficient on the log of the number of registered voters, which suggests that it is the percentage of participation, more than the absolute number of voters, that impact the dependent variable. (Again, we stress that these estimations must be interpreted carefully due to the possible endogeneity of the number of registered voters that we discuss in the previous section.)

What is the order of magnitude of these effects? Given that the average budget is 2 million and the average population around 1700 inhabitants, a one percent increase in turnout corresponds to a fall in budget around 18 euros per capita per year (considering the of -1.5 for the elasticity, i.e a value close to the average elasticity). We can also express this as the expected impact of an additional vote. Given that the average number of voters who do turn out is around 800, the minimum expected gain for an individual from coming to vote is a decrease (resp. an increase) of around 2.3 euros of yearly budget if he votes for (resp. against) the candidate proposing the lower budget.<sup>27</sup>

These results also provide information on voting costs. We expressed the result as an expected gain or loss in terms of budget for every additional vote, which is in the order of 2.3 euros per year for 6 years (approximately 14 euros, in 2000 euros). Note that this is an upper bound since typically, people tend to discount the future at higher rates. If the vote is for a reduction in budget, the maximum welfare gain is easy to express: in the worst case scenario, the voter would not have benefited at all from this extra spending and 14 euros is the maximum expected gain. If the vote is in favor of an increase in budget, it is much harder to interpret since the gain can be larger depending on the utility derived from this expenditure. Furthermore, no information can be obtained for those voters who did not actually turn out.<sup>28</sup>

To go further we therefore need to make some assumptions on the distribution of voting costs. The easiest is to assume that costs are equal across the population. In that case we know, from the previous discussion, the maximum level of financial benefits for voters voting against the increase. Given that costs are identical, we can state that an upper bound on voting costs, net of non financial benefits of voting such as the satisfaction from achieving a civic duty, is 14 euros.

---

<sup>27</sup>We know that on average 8 additional voters decrease the budget by 18 euros per capita and we can thus derive the impact of one additional voter

<sup>28</sup>Consider two candidates  $H$  and  $L$  where  $H$  implements a high per capita budget  $b_H$  and  $L$  a lower one  $b_L$ . Let  $P_v$  be the probability  $H$  is elected if an individual favoring candidate  $L$  comes and votes and  $P_{nv}$  be the probability if he does not ( $P_v < P_{nv}$  since we consider someone favoring  $L$ ). Finally we denote  $g$  the extra benefit this individual derives from having the high budget implemented. In this discussion we implicitly assume that  $g$  cannot be negative, in other words you can get zero benefits from the extra public good but you will not suffer from it. The expected utility from coming to vote is then  $P_v(g - b_H) + (1 - P_v)(-b_L)$  while not voting yields  $P_{nv}(g - b_H) + (1 - P_{nv})(-b_L)$ . Thus a marginal voter who is indifferent between voting or not must have a cost of voting  $c$  such that  $c = (P_{nv} - P_v)(b_H - b_L - g)$ . What we actually observe in the data is the average value of  $(P_{nv} - P_v)(b_H - b_L)$ .

If voting costs are heterogeneous but are independent of the preferences for the budget, we can also draw conclusions. We could then state that the average voting costs (net of non financial benefits from voting) for the first three quartiles of the population (i.e population that does vote) is below 14 euros. Indeed this can be derived from the behavior of the voters voting against the budget. If this population is identical to those favoring a larger budget in terms of voting costs, we can then draw conclusions for the overall population of voters. We cannot however draw any conclusions about those who choose not to vote.

## 4.2 Effect of turnout on municipal expenses

In this section, we focus on spending variables: total expenses, investment in equipment, personnel expenses, purchases and renovation expenses, and subsidies granted by the municipality. Purchases and renovation expenses are operating expenditures, they comprise expenses to maintain the municipal capital, office stationery, etc. Like in the previous section, the dependent variable is the net increase of the average yearly fiscal variable of interest before and after the elections, and the specification is equation 4.

Tables 12 and 13 report the results of the 2SLS estimation. The largest effect that we find is a decrease in investment in equipment, although it is not significant in 2008. A one percent increase in turnout decreases these expenditures in the order of 3 percent. This category of investments is relatively large. It can correspond to building a school, a road, etc. It can also correspond to the purchase of large electric equipment but does not cover maintenance of existing property.

There is also a negative effect on spending on personnel and small purchases but it is not systematically significant. The category small purchases corresponds to maintenance and fuels for the city's vehicles, social events organized by the townhall or transportation cost of municipal staff. The effect is large and significant in 2001. Overall we therefore see that the impact is negative on all categories of spending with a particularly large effect on investments.

## 4.3 Effect of turnout on electoral outcomes

This section examines the effect of turnout on a selection of electoral outcomes. All regressions are linear probability models based on the specification 4, where the dependent variable is now a probability. Tables 14 and 15 report all the results of this section.

First, we estimate how turnout impacts the probability P1 that the new majority is conservative.

Results in Columns (1)-(2) of Tables 14 and 15 show no significant impact of turnout. More importantly, the sign of the coefficient differs from one election to another.

We then estimate the effect of turnout on the probability P2 that the incumbent majority coalition wins a majority of seats in the new council. We find, for both years, a negative impact of turnout, and this effect is significant at 10 percent in 2008.<sup>29</sup> Other estimations, not reported here, such as the effect of turnout on the share of seats won by the incumbent majority, give similar results. They all suggest that turnout affects negatively the probability of reelection of incumbent majority members.

Finally, we estimate the impact of turnout on the probability P3 that the incumbent majority wins all the seats in the new council - that is the probability that minority is not represented in the council. Overall, more than half municipalities have no presence of minority in the council. We find that the turnout decreases P3, and this effect is significant at 10 percent in 2001.

These results all indicate that higher turnout tends to make the incumbent's majority more fragile and makes it more difficult for him to pass his preferred budget. Several factors make any robust estimation difficult, though, such as the linear probability specification and the 2SLS estimation procedure. In addition, the identification of a significant effect of turnout on the strength of the incumbent's majority is complicated by the nature of the electoral system. For municipalities below 3500 inhabitants, individual first-past-the-post voting, gives a lot of flexibility to voters in the composition of the council. Indeed they can pick specifically the name of those they want to vote for without having to vote directly for a list. It is likely that voters, in particular in these small towns, have precise information about every candidate. Thus, even if the number of seats of each coalition is left unchanged, the identity of the actual councilmen may change, a change we cannot observe with our data and that could further weaken the incumbent coalition.

## 5 Interpretation of results

Our empirical analysis highlighted two main results. First, an increase in turnout decreases the budget. Second, an increase in turnout decreases the size and strength of the incumbent majority. This result, echoes what has been coined in the political science literature the anti-incumbent effect, i.e the fact that an increase in turnout decreases the probability of reelection of the incumbent, though it has not been systematically tested.<sup>30</sup> We argue that these two results form a coherent story, provided

---

<sup>29</sup>We cannot define any proper coalition for a substantial number of municipalities, which might lead to a sample selection bias.

<sup>30</sup>A notable exception is Hansford and Gomez (2010).

the incumbent promises and implements a higher budget than his or her rival. In fact, we show that this is a natural consequence of a third fact, well documented in the literature and apparently also present in our data, called the “incumbency advantage”.

The “incumbency advantage”, is well established at federal and state levels for the US. For instance Gelman and King 1990 show that the incumbency status translates into about 12 extra percentage points for US congressional elections. Two main explanations for this effect appear to dominate. First, incumbency gives access to resources of different kinds and opportunities to provide community services that facilitate reelection (Mayhew 1974, Fiorina 1977, 1989). Second, there is, by definition, more information on how a candidate could perform in a job he or she has already held.

In our data, the incumbency advantage appears to be present since more than 63 % of incumbent majority coalitions are reelected (row “IMC wins majority (P2)” in Table 1). Furthermore, our empirical analysis could suggest a particular source of “incumbency advantage”, different from the reasons generally mentioned in the literature. It is possible that the incumbent has better access to subsidies or loans for instance. This could suggest that the incumbent has better knowledge of the system or that his previous term allowed him to build political and financial connections.

Regardless of the source of the incumbency advantage, we argue that the three previously discussed facts (incumbency advantage, anti incumbent effect and negative impact of turnout on budget), are mutually consistent in an environment where candidates have preferences for higher budgets.<sup>31</sup> Because of the advantage conferred by his status, the incumbent can run a campaign announcing a higher budget than his rival while still maintaining a high probability of obtaining a large majority. In short, the incumbency advantage makes him less accountable. In turn the anti-incumbent effect means that as turnout increases, there is a lower probability that the incumbent obtains a large majority and can pass his budget. Overall the prediction is therefore that higher turnout leads to lower budgets.

In the following section, we develop a model that studies in detail the mechanics of this explanation. The main result is to show that the incumbency advantage and anti incumbent effects are simultaneously satisfied under credible assumptions on candidates and voters’ preferences. Note that in the context of our model the anti incumbent effect will correspond to the fact that higher turnout decreases the probability that the incumbent is reelected since we do not want to complicate the exposition by explicitly looking at the size of the majority.<sup>32</sup>

---

<sup>31</sup>This seems to be the most common situation that could be due to a variety of reasons: candidates can have some pet projects, may extract personnel rents from office or just prefer to administer a larger budget.

<sup>32</sup>Note that we find in our data a negative though non significant effect of turnout on the probability of reelection of the incumbent.

## 5.1 Model

An incumbent (indexed by  $I$ ) faces an opposition candidate (indexed by  $O$ ) in an election involving  $N$  voters. The two candidates compete by making binding campaign promises on the budget and its use. All candidates need to provide a minimum level of public goods. They also have pet projects that they can implement at a cost. To simplify the exposition we suppose there are three available choices:  $C \in \{L, H_I, H_O\}$ , where  $L$  is the minimum budget,  $H_I$  is the high budget implementing the project favored by the incumbent and  $H_O$  the one implementing the opposition's favored project.

The incumbency advantage takes a particular form: the incumbent can implement his favored project at a smaller cost than his rival (due for instance to better access to subsidies or to credit). Specifically, denoting  $b_l$  the minimum budget, the budget required for the opposition to implement  $H_I$  or  $H_O$  is  $b = b_l + b_h$  while for the incumbent it is only  $b = b_l + \alpha b_h$ , with  $\alpha < 1$ . The parameter  $\alpha$  quantifies the extent of the incumbency advantage (smaller  $\alpha$  corresponds to a larger incumbency advantage).

We assume that the preferences of candidates are identical. They get a benefit from being in office  $r$  and a benefit  $B$  if their preferred project is implemented. Voters have the following preferences: they dislike higher budgets in general but like that their preferred policy is implemented. Specifically, denoting  $C_i$  the preferred choice of elector  $i$ , preferences are given by  $-b + G1_{C=C_i}$ , where  $b$  is the budget implemented by the winner and  $G$  is the benefit if the preferred choice is made. We suppose that there are three groups:  $V_I$ ,  $V_N$  and  $V_O$  where  $V_I$  is the group of voters who prefer the same project as the incumbent,  $V_O$  those who agree with the opposition and  $V_N$  those who dislike both projects. We suppose that both groups  $V_O$  and  $V_I$  are made up of  $K < N/2$  voters.<sup>33</sup>

The election is decided by a majority rule. In case of a tie, we break the indifference in favor of the incumbent.<sup>34</sup> Because our focus is on turnout, we explicitly model costly voting. Each individual voter faces a cost of voting  $c$  which is randomly drawn. If the expected benefit from voting (based among other things on expectations about other voters' behavior) exceeds the cost, the voter comes to vote. We make the strong assumption that voters in group  $V_I$  and  $V_O$  always turn out if their preferred project is proposed. Implicitly this is an assumption on the level of  $G$ . This simplifies the computation of turnout.

There are two states of the world. With probability  $p$  the state is  $l$  and the cost of voting is

---

<sup>33</sup>We want to maintain the symmetry of the problem and at the same time add no extra advantage for the incumbent apart from the access to cheaper funding

<sup>34</sup>Using a different tie breaking rule does not fundamentally change the results but complicates significantly the exposition. We discuss specifically below how it can affect the results.

distributed according to  $F$  and with probability  $1 - p$  the state is  $h$  and the cost of voting is distributed according to  $G$ , where  $G$  first order stochastically dominates  $F$  and both distributions have support  $(0, \bar{C})$ . For instance state  $l$  can correspond to low incidence of flu and  $h$  to high incidence. A move from  $l$  to  $h$  increases the cost of voting. All voters observe the state before voting but the candidates make their campaign promises under the uncertainty about the state.

## 5.2 Resolution

We first discuss the equilibrium platforms chosen by the candidates. The incumbency advantage, which is here the fact that the incumbent can fund his preferred project at a cheaper cost, means paradoxically that, in equilibrium, the incumbent will propose a higher budget. Indeed we show that there is no equilibrium where the opposition proposes his preferred project: if both candidates propose their preferred projects, the opposition always loses since the neutral voters of group  $V_N$  then prefer the incumbent who has the smaller budget.

As a result only two outcomes turn out to be possible equilibria:  $(L, L)$  where both candidates propose the minimum budget and  $(H_I, L)$  where only the incumbent proposes his preferred project. At  $(H_I, L)$ , all voters in group  $V_I$  favorable to the incumbent come and vote. The final outcome depends on the probability that more than  $K$  of the remaining  $N - K$  voters decide to turn out (note that given the platform, preferences of voters in  $V_N$  and  $V_O$  are perfectly aligned). If  $b_h$  is low, i.e the extra budget spent on the non favored project is low, the benefit of voting is minimal and few of these voters will turn out. For a sufficiently low value of  $b_h$ , the probability that the incumbent wins will actually be greater than  $1/2$ : guaranteeing the votes of group  $V_I$  is very valuable. It is then a dominant strategy to propose  $H_I$ . On the contrary, if  $b_h$  is larger, when the incumbent chooses  $H_I$  rather than  $L$ , he trades off a lower probability of winning against a bigger gain if he does win, since his preferred project will be implemented. Overall this leads to the following result:

**Proposition 1.** *There exists  $\bar{b}$  and  $\bar{r}$  such that:*

- *if  $b_h < \bar{b}$ , the unique equilibrium is  $(H_I, L)$*
- *if  $b_h > \bar{b}$ , then if  $\bar{r} < B/r$ , the unique equilibrium is  $(H_I, L)$  and if  $B/r < \bar{r}$  the unique pure strategy equilibrium (if it exists) is  $(L, L)$ .*

*Furthermore  $\bar{r}$  is decreasing in the incumbency advantage  $\alpha$ .*

Proposition 1 shows that on average the incumbent will have a higher budget. As the incumbency advantage increases ( $\alpha$  smaller), the chances that the incumbent will have a strictly larger budget than his opponent increases. This is intuitive: a larger incumbency advantage means in our contest a lower cost for the pet project and thus lower incentives for the non favored voters to turn out and vote.

We now examine the effect of an increase in turnout on the probability that the incumbent is elected. Specifically we examine a change from state  $h$  where voting costs are high (high incidence of flu) to state  $l$ . If the equilibrium is  $(L, L)$ , turnout does not change nor does the probability that the incumbent is elected. The interesting case is when  $(H_I, L)$  is the equilibrium. In this case, all  $K$  voters in  $V_I$  turn out while the remaining voters turn out if their cost of voting is low enough, and if they do, vote for the opposition. Thus a decrease in voting costs increases turnout and since the marginal voters are favorable to the opposition, it decreases the probability that the incumbent is elected.

**Proposition 2.** *Moving from state  $h$  to  $l$ :*

1. *Weakly increases turnout*
2. *Weakly decreases the probability that the incumbent is reelected*

### 5.3 Discussion

The model we present exposes a coherent story which, based on a certain type of incumbency advantage, yields both the fact that the incumbent will have a higher budget and the fact that an increase in turnout decreases the probability he is elected. We argue that such a coherent story will naturally emerge, under rather weak conditions, even if the incumbency advantage is modeled differently.

In a companion paper (Godefroy and Henry 2011), we examine an environment where voter preferences are based both on the level of the budget (they dislike higher budgets provided a minimum level of public good is delivered) and on a random preference for one candidate. The candidates on the contrary have a preference for higher budgets. The incumbency advantage means in that paper that the distribution of the taste for one or the other candidate is skewed towards the incumbent. Note that we consider both the case of strategic and non strategic voting and we consider an identical voting cost for all voters.

It is clear, that, as in the model considered in this paper, given his electoral advantage, the incumbent will in equilibrium propose a higher budget. The more ambiguous part is to examine whether

the anti incumbent effect does hold. We show that this depends on the shape of the distribution of preferences. Consider an increase of voting cost from zero. For a zero cost, all voters vote and the incumbent wins with a probability greater than a half. When the cost increases, if the same number of voters in favor of the incumbent and in favor of the opposition stop turning out, this will have a positive impact on the probability that the incumbent is reelected, since it is a proportionally smaller effect on the number of voters voting in favor. Thus a sufficient condition is that the density of preferences is sufficiently flat.

There are of course other possible interpretations of our results, that we discuss here. The most obvious one is the existence of an exogenous correlation between the individual cost of voting and the preferences for the budget. For instance a lower level of flu could increase turnout only among senior voters, who are more fiscally conservative. Although we have no way of categorically rejecting this explanation, we have several reservations. First, using the two different instruments yields results going in the same direction, and with a similar order of magnitude, though the populations affected may be different. Second, there seems to be no impact of turnout on whether a conservative majority, presumably preferring smaller budgets, is reelected, while the effect on the electoral chances of the incumbent is significant. In addition, the survey based literature that compares voters to non voters, finds that non voters (i.e those who tend not to turnout unless conditions are favorable) tend to prefer higher levels of spending (Leighley and Nagler 2007 for instance). Overall, our model doesn't invalidate the possible existence of an exogenous correlation between marginal voters and fiscal conservatism, but it shows that negative effect of turnout on municipal budget still holds with weaker assumptions on voters' preferences.

## 6 Conclusion

Whereas the focus of most of the literature has been to examine the determinants of turnout, we take in this paper a first step towards understanding the effect of turnout on policy outcomes. We show that higher turnout has a large and significant negative impact on municipal revenues. We use these results to estimate some bounds on voting costs, and we provide an explanation based on a difference between the incumbent and the opposition.

In the empirical analysis, the variation in turnout is due either to variations in weather conditions or in flu intensity. We cannot categorically claim that our results will systematically generalize to situations where turnout varies for other unanticipated reasons, but we have good reasons to think

so. First, the results are remarkably robust, both in sign and in magnitude, regardless of whether we consider the flu or the weather based instruments. Second, the general model we present predicts systematic effects of turnout independent of the source of the variation. Furthermore, other plausible explanations present little consistency with our data.

We conclude by insisting on the fact that we have no way of directly judging whether a decrease in public revenues impacts overall welfare positively or negatively. Regardless of the sign of this impact, however, our paper shows that public policies that are aimed at encouraging voter turnout can have sizable welfare consequences.

## 7 Figures and Tables

Table 1: Summary statistics

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>	<b>N</b>
Total Revenues	1497.961	3344.246	21.159	80514.102	56381
Taxes	418.048	1079.958	0	23839.549	56381
Total Expenses	1308.035	3013.065	14.308	77445.211	56381
Personnel Expenses	330.711	938.074	0	17140.012	56381
Purchases	195.566	424.468	1.819	7231.205	56381
Grants	64.001	210.585	0	5863.713	56381
Equipment Expenses	377.017	788.828	0	25554.629	56381
Savings	189.925	449.36	-3251.291	11741.609	56381
Turnout	0.772	0.069	0.463	1	8309
Registered	947.798	1410.066	49	27706	8309
Population	1233.663	1883.009	75	37846	8309
Surface	16.646	13.302	0.08	110.28	56381
Total Net Taxable Income	11528.66	21685.826	359.516	431688.094	8297
Labor Force	660.002	950.128	26.56	18289.971	8305
Residents	1341.257	2096.905	64	36604	8297
Births	15.777	23.06	0	518	8297
Deaths	11.573	19.726	0	320	8297
Conservative mayor (P1)	0.599	0.49	0	1	8261
IMC wins majority (P2)	0.633	0.482	0	1	8015
IMC wins all seats (P3)	0.529	0.499	0	1	7981

---

NOTES: Fiscal variables and income are in thousands of euros of 2000. “IMC” stands for incumbent majority coalition.

Table 2: Weather Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
T° on Sunday-2001	53.856	1.515	50	57.38	4128
T° on Saturday-2001	53.467	1.058	50.18	55.58	4128
T° on Sunday-Average	45.993	1.415	42.417	49.257	4339

NOTES: This table reports temperature on Saturday, March 10th 2001, and Sunday, March 11th 2001, and the average temperature on the previous four years for the same two days.

Table 3: Flu Incidence Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Flu Incidence-2008	90.586	71.620	1	391.2	4148
Flu Incidence-Average	75.36	67.133	1	381.226	4128
Past Incidence-2008	452.011	221.43	1	954.733	4339
Past Incidence-Average	141.293	104.357	3.704	465.701	4339

NOTES: This table reports the weekly flu incidence (per 100,000 persons) for Monday, March 3rd to Sunday, March 9th 2008, and the average weekly incidence for the same week over the five previous years, the average weekly incidence from mid-January to mid-February 2008 (“Past Incidence-2008”) and the average weekly incidence from mid-January to mid-February over the five years preceding the elections (“Past Incidence-Average”). The peak of the epidemics is always reached at some point between mid-January and mid-February in our data.

Table 4: **Effect of Temperature on Turnout**

*Dependent Variable is log Turnout*

VARIABLES	(1) 2001	(2) 2001	(3) 2008	(4) 2008
Log T° on Sunday	-0.61* (0.19)	-0.73* (0.18)	-0.096 (0.13)	-0.10 (0.12)
Log Past T°	0.50* (0.24)	0.63* (0.24)	0.070 (0.086)	0.076 (0.086)
Log Registered		-0.094* (0.020)		-0.041* (0.019)
Log Population	0.11* (0.025)	0.15* (0.028)	0.012 (0.016)	0.050* (0.020)
Log Surface	0.0021 (0.0036)	0.017* (0.0022)	0.016* (0.0017)	0.017* (0.0018)
Log Income	-0.018+ (0.011)	-0.0056 (0.012)	-0.020+ (0.011)	-0.0078 (0.012)
Log Labor Force	-0.11* (0.018)	-0.096* (0.017)	-0.050* (0.011)	-0.056* (0.011)
Log Residents	-0.033* (0.013)	-0.0035 (0.014)		-0.0032 (0.012)
Log Births	-0.000075 (0.0022)	-0.00080 (0.0023)	-0.0048* (0.0024)	-0.0057* (0.0025)
Log Deaths	-0.00090 (0.0019)	0.00079 (0.0018)	0.0017 (0.0021)	0.0023 (0.0021)
Observations	4,106	4,106	4,191	4,191
R <sup>2</sup>	0.418	0.426	0.432	0.434
Clusters	78	78	103	103

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the meteorological station level.

There is one observation by municipality. “Log T° Sunday” is the log of the average temperature on Sunday March 11th, 2001 and March 9th, 2008, respectively. “Past T°” is the average temperature on the Saturday preceding election day. Turnout is as a percentage of registered voters. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. All regressions include regional (*departements*) and size of municipal council dummies, not reported here.

Table 5: **Effect of Flu Incidence on Turnout**

*Dependent Variable is log Turnout*

VARIABLES	(1) 2001	(2) 2001	(3) 2008	(4) 2008
Log Flu Incidence	-0.00093 (0.0022)	-0.00032 (0.0022)	-0.012* (0.0036)	-0.012* (0.0035)
Log Past Incidence	0.0034 (0.0030)	0.0044 (0.0029)	0.014* (0.0034)	0.014* (0.0034)
Log Registered		-0.093* (0.018)		-0.044* (0.018)
Log Population	0.12* (0.023)	0.16* (0.026)	0.020 (0.018)	0.047* (0.021)
Log Surface	0.0018 (0.0033)	0.017* (0.0022)	0.0083* (0.0027)	0.018* (0.0021)
Log Income	-0.020+ (0.011)	-0.0081 (0.012)	-0.012 (0.011)	-0.0018 (0.013)
Log Labor Force	-0.11* (0.021)	-0.10* (0.022)	-0.058* (0.012)	-0.060* (0.012)
Log Residents	-0.033* (0.011)	-0.0042 (0.012)	-0.0081 (0.012)	0.00046 (0.011)
Log Births	-0.00045 (0.0028)	-0.0012 (0.0028)	-0.0052* (0.0023)	-0.0058* (0.0023)
Log Deaths	-0.00073 (0.0023)	0.00099 (0.0022)	0.0013 (0.0021)	0.0023 (0.0021)
Observations	4,106	4,106	4,191	4,191
$R^2$	0.416	0.424	0.443	0.443
Clusters	115	115	115	115

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the location of observation of flu incidence level.

There is one observation by municipality. “Log Flu Incidence” is the log of the number of patients per 100,000 persons with the following clinical symptoms body aches, cough and fever above 39° Celsius, reported in a location of observation in the weeks March 4th to Sunday, March 10th 2001, and March 3rd to Sunday, March 9th 2008. “Past Incidence” is the average weekly number of patients per 100,000 persons who are reported in a location of observation with the same symptoms, from mid-January to mid-February (see section 2.5). By definition, the value of any of these variables in a municipality is the value measured at the closest point of observation. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. All regressions include regional (French *departements*) and size of municipal council dummies, not reported here.

Table 6: Correlation of Weather Change and Contamination Rate with Municipal Characteristics

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Revenues	Registered	Population	Residents	Surface	Labor Force	Income	Births	Deaths
Log T° on Sunday	-2.33 (4.60)	-1.07 (3.63)	-0.81 (3.75)	-0.43 (3.81)	-1.54 (2.92)	-0.076 (3.82)	2.26 (4.59)	1.30 (3.82)	-4.61 (3.00)
Observations	4,110	4,110	4,110	4,106	4,110	4,106	4,106	4,106	4,106

---

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Revenues	Registered	Population	Residents	Surface	Labor Force	Income	Births	Deaths
Log Flu Incidence	0.0016 (0.070)	-0.0013 (0.060)	-0.0079 (0.062)	-0.0012 (0.062)	0.045 (0.033)	-0.0085 (0.065)	0.00068 (0.072)	-0.0096 (0.056)	0.014 (0.046)
Observations	4,199	4,199	4,199	4,191	4,199	4,199	4,191	4,191	4,191

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the location of observation level.

This table reports the regression of the municipal variable at the top of a column on the log of temperature on Sunday, March 10th, 2001, the first day of the 2001 elections (top table), and on the log of flu incidence in week March 3rd to Sunday, March 9th 2008 - elections took place on March 9th 2008 - (bottom table). All regressions include regional (French *departements*) fixed effects, and past values of the instrumental variable (see Tables 4 and 5).

Table 7: Placebo Test 1 - Effect of Temperature on Total Revenues Before the 2001 Elections

*Dependent Variable is Log Revenues<sub>after</sub>-Log Revenues<sub>before</sub>, in the years before 2001*

VARIABLES	(1) Y=1998	(2) Y=1998	(3) Y=1999	(4) Y=1999
Log Turnout	0.91 (1.28)	0.63 (1.11)	-1.54 (1.06)	-1.41 (0.92)
Log Registered		0.22+ (0.12)		-0.036 (0.13)
Observations	4,106	4,106	4,106	4,106

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the meteorological station level.

Each column reports the 2SLS estimation of the net increase in average yearly municipal revenues for the years  $Y + 1$  to 2000, relative to average yearly municipal revenues for the years 1998 to  $Y$ . The log of turnout is instrumented by the log of temperature on Sunday, March 10th 2001. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. All regressions include municipal characteristics and log of temperature on Saturday as covariates.

Table 8: **Placebo Test 2 - Effect of Flu Incidence on Revenues Before the 2008 Elections**

*Dependent Variable is Log Revenues<sub>after</sub>-Log Revenues<sub>before</sub>, in the years before 2008*

VARIABLES	(1) Y=2000	(2) Y=2000	(3) Y=2002	(4) Y=2002	(5) Y=2004	(6) Y=2004	(7) Y=2006	(8) Y=2006
Log Turnout	0.75 (0.79)	0.75 (0.78)	-1.51 (1.27)	-1.50 (1.25)	-0.55 (0.82)	-0.54 (0.81)	-0.93 (0.97)	-0.93 (0.97)
Log Registered		-0.043 (0.083)		-0.073 (0.092)		-0.071 (0.074)		0.0048 (0.094)
Observations	3,919	3,919	3,919	3,919	3,919	3,919	3,919	3,919

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the location of observation of the flu level.

Each column reports the 2SLS estimation of the net increase in average yearly municipal revenues for the years  $Y + 1$  to 2007, relative to average yearly municipal revenues for the years 1998 to  $Y$ . The log of turnout is instrumented by the log of flu incidence in the week March 3rd to March 9th, 2008. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. All regressions include all municipal characteristics, regional (*departements*) and size of municipal council dummies, and past flu incidence variables as covariates.

Table 9: **Effect of Turnout on Revenues - OLS Estimation**

*Dependent Variable is  $\log \overline{Revenues}_{after} - \log \overline{Revenues}_{before}$*

VARIABLES	2001 Elections		2008 Elections	
	(1)	(2)	(3)	(4)
Log Turnout	-0.091 (0.063)	-0.11+ (0.065)	-0.0095 (0.068)	-0.016 (0.068)
Log Registered		-0.14* (0.062)		-0.086 (0.064)
Log Population	-0.098 (0.092)	-0.034 (0.099)	-0.11 (0.075)	-0.059 (0.083)
Log Surface	0.015* (0.0066)	0.018* (0.0068)	-0.016* (0.0071)	-0.015* (0.0073)
Log Income	0.093* (0.031)	0.11* (0.031)	0.10* (0.031)	0.12* (0.034)
Log Labor Force	0.0035 (0.076)	0.021 (0.076)	0.16* (0.054)	0.16* (0.054)
Log Residents	-0.036 (0.035)	0.0042 (0.037)	-0.13* (0.038)	-0.10* (0.039)
Log Births	0.011 (0.011)	0.0097 (0.011)	-0.0079 (0.014)	-0.0088 (0.014)
Log Deaths	-0.0093 (0.0087)	-0.0083 (0.0087)	-0.011 (0.0093)	-0.0093 (0.0093)
Observations	4,086	4,086	4,187	4,187
$R^2$	0.021	0.023	0.068	0.069

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the meteorological station level.

The dependent variable is the net increase in average yearly revenues from one term to another (that is from the years of the term *before* the elections to the years of the term *after*.) Coefficients are estimated in OLS. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. There is one observation by municipality. All regressions include regional (*departements*) and size of municipal council dummies, not reported here.

Table 10: Effect of Turnout on Revenues- 2SLS Estimation, 2001 Elections

VARIABLES	<i>Dependent Variable is <math>\log \bar{F}_{after} - \log \bar{F}_{before}</math></i>			
	(1) Revenues	(2) Revenues	(3) Tax Revenues	(4) Tax Revenues
Log Turnout	-2.51* (1.05)	-2.06* (0.91)	-4.18* (2.10)	-3.62* (1.77)
Log Registered		-0.32* (0.096)		-0.36* (0.17)
Log Population	0.20 (0.17)	0.27+ (0.16)	0.26 (0.28)	0.34 (0.28)
Log Surface	0.051* (0.018)	0.053* (0.018)	0.047 (0.035)	0.049 (0.034)
Log Income	0.044 (0.049)	0.090+ (0.048)	-0.024 (0.078)	0.031 (0.067)
Log Labor Force	-0.28+ (0.15)	-0.18 (0.13)	-0.45+ (0.25)	-0.32+ (0.20)
Log Residents	-0.12* (0.058)	0.0028 (0.038)	-0.022 (0.10)	0.12+ (0.072)
Log Births	0.010 (0.0090)	0.0074 (0.0083)	0.026+ (0.014)	0.023+ (0.013)
Log Deaths	-0.0094 (0.0097)	-0.0062 (0.0089)	-0.026+ (0.013)	-0.021+ (0.012)
Log Past T°	0.60 (0.63)	0.72 (0.56)	0.34 (0.75)	0.48 (0.66)
Observations	4,086	4,086	4,086	4,086
Fstat	23.6	31.4	23.6	31.4

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the meteorological station level.

The dependent variable is the net increase in average yearly  $F$  from one term to another (that is from the years of the term *before* the elections to the years of the term *after*), where  $F$  represent either total revenues, or tax revenues. The specification is equation 4. Coefficients are estimated in 2SLS, the log of the temperature on Sunday, March 10th 2001, is the instrument for the log of turnout. There is one observation by municipality. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. "Log Past T°" is the log of temperature on Saturday. All regressions include regional (*departements*) and size of municipal council dummies.  $Fstat$  is the F-statistic against the null that the instrument is uncorrelated with log turnout in the first stage.

Table 11: Effect of Turnout on Revenues- 2SLS Estimation, 2008 Elections

VARIABLES	<i>Dependent Variable is <math>\log \bar{F}_{after} - \log \bar{F}_{before}</math></i>			
	(1)	(2)	(3)	(4)
	Revenues	Revenues	Tax Revenues	Tax Revenues
Log Turnout	-1.52* (0.71)	-1.54* (0.70)	0.96 (0.80)	0.94 (0.80)
Log Registered		-0.15+ (0.078)		-0.024 (0.048)
Log Population	-0.073 (0.093)	0.013 (0.10)	-0.070 (0.054)	-0.053 (0.060)
Log Surface	0.0095 (0.013)	0.012 (0.014)	-0.056* (0.015)	-0.056* (0.015)
Log Income	0.070+ (0.038)	0.10* (0.042)	0.062* (0.028)	0.069* (0.027)
Log Labor Force	0.081 (0.078)	0.078 (0.078)	0.21* (0.054)	0.21* (0.054)
Log Residents	-0.14* (0.050)	-0.11* (0.053)	-0.12* (0.029)	-0.11* (0.030)
Log Births	-0.016 (0.014)	-0.017 (0.014)	0.019+ (0.010)	0.019+ (0.010)
Log Deaths	-0.0071 (0.0088)	-0.0051 (0.0088)	-0.018* (0.0061)	-0.017* (0.0062)
Log Past Incidence	-0.012 (0.0079)	-0.012 (0.0079)	-0.020* (0.0077)	-0.020* (0.0077)
Observations	4,187	4,187	4,187	4,187
Fstat	40.0	39.7	40.0	39.7

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the location of observation of flu incidence level.

The dependent variable is the net increase in average yearly  $F$  from one term to another (that is from the years of the term *before* the elections to the years of the term *after*), where  $F$  represent either total revenues, or tax revenues. The specification is equation 4. Coefficients are estimated in 2SLS, the log of flu incidence in the week of the elections (March 3rd to 9th, 2008) is the instrument for the log of turnout. The results with and without the log of the number of registered voters are reported separately due to errors of measurement of this variable possibly correlated with turnout. There is one observation by municipality. "Log Past Incidence" is the average incidence from mid-January to mid-February. All regressions include regional (*departements*) and size of municipal council dummies, not reported here. *Fstat* is the F-statistic against the null that the instrument is uncorrelated with log turnout in the first stage.

Table 12: Effect of Turnout on Expenses - 2SLS Estimation, 2001 Elections

VARIABLES	<i>Dependent Variable is <math>\log \bar{F}_{after} - \log \bar{F}_{before}</math></i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Expenses	Total Expenses	Personnel	Personnel	Purchases	Purchases	Equipment	Equipment
Log Turnout	-2.51* (1.17)	-2.06* (1.01)	-2.03 (1.35)	-1.63 (1.12)	-4.09* (1.99)	-3.47* (1.58)	-7.48* (3.65)	-6.08* (2.82)
Log Registered		-0.28* (0.10)		-0.22 (0.14)		-0.38* (0.16)		-1.01* (0.28)
Log Population	0.14 (0.17)	0.20 (0.17)	0.20 (0.20)	0.24 (0.21)	0.39 (0.24)	0.46+ (0.24)	0.33 (0.57)	0.58 (0.56)
Log Surface	0.053* (0.020)	0.053* (0.020)	0.013 (0.023)	0.013 (0.022)	0.053+ (0.030)	0.054+ (0.028)	0.11* (0.057)	0.12* (0.052)
Log Income	0.014 (0.044)	0.057 (0.041)	0.038 (0.038)	0.075* (0.028)	-0.026 (0.053)	0.035 (0.049)	0.069 (0.11)	0.21* (0.11)
Log Labor Force	-0.21 (0.16)	-0.12 (0.14)	-0.19 (0.18)	-0.10 (0.14)	-0.41+ (0.23)	-0.27+ (0.16)	-0.50 (0.55)	-0.19 (0.43)
Log Residents	-0.11+ (0.057)	0.0030 (0.038)	-0.16* (0.074)	-0.063 (0.054)	-0.18+ (0.099)	-0.023 (0.068)	-0.29 (0.19)	0.074 (0.097)
Log Births	0.016 (0.011)	0.014 (0.010)	0.048* (0.011)	0.046* (0.0100)	0.028* (0.012)	0.025* (0.011)	-0.020 (0.036)	-0.030 (0.035)
Log Deaths	-0.0047 (0.011)	-0.0014 (0.011)	-0.016 (0.016)	-0.012 (0.015)	0.00048 (0.013)	0.0052 (0.012)	-0.0023 (0.031)	0.0074 (0.028)
Observations	4,086	4,086	4,081	4,081	4,086	4,086	4,081	4,081
Fstat	23.6	31.4	23.9	31.9	23.6	31.4	23.0	30.7

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the location of observation of flu incidence level.

The dependent variable is the net increase in average yearly  $F$  from one term to another, where  $F$  represent the type of expenses at the top of the column. All regressions include past temperature variables, regional (*departements*) and size of municipal council dummies, not reported here.  $Fstat$  is the F-statistic against the null that the instrument is uncorrelated with log turnout in the first stage.

Table 13: Effect of Turnout on Other Fiscal Outcomes - 2SLS Estimation, 2008 Elections

VARIABLES	<i>Dependent Variable is <math>\log \bar{F}_{after} - \log \bar{F}_{before}</math></i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Expenses	Total Expenses	Personnel	Personnel	Purchases	Purchases	Equipment	Equipment
Log Turnout	-1.29+ (0.76)	-1.31+ (0.76)	-0.85+ (0.47)	-0.87+ (0.47)	-0.19 (0.44)	-0.20 (0.44)	-1.28 (1.99)	-1.27 (1.99)
Log Registered		-0.17* (0.082)		-0.11* (0.050)		-0.057 (0.056)		-0.19 (0.18)
Log Population	-0.20* (0.094)	-0.11 (0.11)	-0.071 (0.054)	-0.00019 (0.063)	-0.079 (0.061)	-0.045 (0.068)	-0.21 (0.27)	-0.12 (0.31)
Log Surface	0.011 (0.015)	0.014 (0.016)	0.0073 (0.012)	0.0085 (0.012)	0.0028 (0.0089)	0.0038 (0.0096)	0.049 (0.043)	0.054 (0.045)
Log Income	0.090* (0.041)	0.13* (0.045)	0.019 (0.028)	0.046+ (0.027)	0.055* (0.025)	0.068* (0.030)	0.030 (0.080)	0.071 (0.081)
Log Labor Force	0.12 (0.084)	0.12 (0.085)	0.067 (0.043)	0.064 (0.043)	0.065 (0.056)	0.064 (0.056)	0.18 (0.24)	0.18 (0.24)
Log Residents	-0.066 (0.048)	-0.028 (0.049)	-0.031 (0.027)	-0.0024 (0.028)	-0.068* (0.027)	-0.055+ (0.029)	-0.087 (0.12)	-0.050 (0.12)
Log Births	-0.0075 (0.015)	-0.0098 (0.016)	0.0049 (0.0093)	0.0040 (0.0094)	0.014 (0.0093)	0.013 (0.0096)	-0.0091 (0.043)	-0.013 (0.044)
Log Deaths	-0.0023 (0.010)	-0.00046 (0.010)	-0.020* (0.0066)	-0.018* (0.0066)	-0.0053 (0.0068)	-0.0046 (0.0067)	0.045+ (0.026)	0.045+ (0.026)
Observations	4,187	4,187	4,182	4,182	4,187	4,187	4,184	4,184
Fstat	40.0	39.7	39.6	39.4	40.0	39.7	39.9	39.7

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the location of observation of flu incidence level.

The dependent variable is the net increase in average yearly  $F$  from one term to another, where  $F$  represent the type of expenses at the top of the column. All regressions include past flu incidence variables, regional (*departements*) and size of municipal council dummies, not reported here.  $Fstat$  is the F-statistic against the null that the instrument is uncorrelated with log turnout in the first stage.

Table 14: Effect of Turnout on Electoral Outcomes - 2SLS Estimation, 2001 Elections

VARIABLES	<i>Dependent Variable is P1, P2 or P3</i>					
	(1) P1	(2) P1	(3) P2	(4) P2	(5) P3	(6) P3
Log Turnout	1.86 (2.00)	1.41 (1.69)	-2.46+ (1.47)	-2.41+ (1.27)	-3.73* (1.74)	-3.32* (1.40)
Log Registered		0.24 (0.16)		0.056 (0.16)		-0.024 (0.19)
Log Population	-0.25 (0.27)	-0.29 (0.28)	0.072 (0.25)	0.036 (0.28)	0.32 (0.28)	0.26 (0.30)
Log Surface	0.00097 (0.037)	0.0012 (0.036)	0.033 (0.021)	0.031 (0.021)	-0.012 (0.028)	-0.016 (0.027)
Log Income	0.14* (0.064)	0.10+ (0.056)	-0.11+ (0.057)	-0.11* (0.045)	0.018 (0.062)	0.048 (0.049)
Log Labor Force	0.00035 (0.26)	-0.095 (0.21)	0.014 (0.22)	0.020 (0.18)	-0.18 (0.25)	-0.10 (0.20)
Log Residents	0.13 (0.093)	0.021 (0.065)	-0.11 (0.10)	-0.11 (0.10)	-0.28* (0.12)	-0.21+ (0.11)
Log Births	0.031+ (0.017)	0.032+ (0.017)	0.032 (0.020)	0.033 (0.020)	0.013 (0.018)	0.015 (0.019)
Log Deaths	0.0056 (0.013)	0.0021 (0.014)	0.022 (0.018)	0.023 (0.018)	0.0022 (0.014)	0.0064 (0.014)
Observations	4,086	4,086	4,086	4,086	4,086	4,086
Fstat	23.6	31.4	23.6	31.4	23.6	31.4

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the meteorological station level.

P1 is the probability that the newly elected mayor is conservative. P2 is the probability that the incumbent majority wins a majority of seats in the newly elected council. P3 is the probability that the incumbent majority wins all the seats. All regressions include past temperature variables, regional (*departements*) and size of municipal council dummies, not reported here. *Fstat* is the F-statistic against the null that the instrument is uncorrelated with log turnout in the first stage.

Table 15: Effect of Turnout on Electoral Outcomes - 2SLS Estimation, 2008 Elections

Dependent Variable is  $P1$ ,  $P2$  or  $P3$

VARIABLES	(1)		(2)		(3)		(4)		(5)		(6)	
	P1	P1	P1	P1	P2	P2	P2	P2	P3	P3	P3	P3
Log Turnout	-0.84 (1.17)	-0.83 (1.17)	-2.03* (1.02)	-2.02* (1.01)	-1.53 (0.98)	-1.51 (0.98)	-0.075 (0.12)	-0.14 (0.15)	-0.22 (0.022)	-0.020 (0.022)	0.13* (0.060)	0.13 (0.12)
Log Registered		0.16 (0.10)		-0.063 (0.13)								
Log Population	-0.22* (0.11)	-0.30* (0.12)	-0.16 (0.12)	-0.12 (0.15)	-0.19 (0.13)	-0.14 (0.15)						
Log Surface	0.060* (0.026)	0.056* (0.026)	0.026 (0.021)	0.027 (0.023)								
Log Income	0.051 (0.051)	0.015 (0.047)	-0.044 (0.059)	-0.021 (0.059)	0.11+ (0.062)	0.13* (0.060)						
Log Labor Force	0.012 (0.099)	0.013 (0.099)	0.063 (0.10)	0.059 (0.10)	0.13 (0.12)	0.13 (0.12)						
Log Residents	0.027 (0.056)	-0.0073 (0.060)	0.040 (0.061)	0.058 (0.061)	-0.059 (0.069)	-0.039 (0.074)						
Log Births	0.0035 (0.019)	0.0062 (0.020)	-0.033+ (0.019)	-0.033+ (0.020)	-0.039+ (0.020)	-0.039* (0.020)						
Log Deaths	0.043* (0.016)	0.042* (0.016)	0.012 (0.016)	0.014 (0.016)	-0.0076 (0.016)	-0.0056 (0.016)						
Observations	4,187	4,187	3,743	3,743	3,743	3,743						
Fstat	40.0	39.7	39.2	39.7	39.2	39.2						

NOTES: + Significant at the 10 percent level. \* Significant at the 5 percent level.

Standard errors are clustered at the meteorological station level.

P1 is the probability that the newly elected mayor is conservative. P2 is the probability that the incumbent majority wins a majority of seats in the newly elected council. P3 is the probability that the incumbent majority wins all the seats. All regressions include past flu incidence variables, regional (*departements*) and size of municipal council dummies, not reported here. *Fstat* is the F-statistic against the null that the instrument is uncorrelated with log turnout in the first stage.

## 8 References

- Banerjee, A., S. Kumar, R. Pande and F. Su.** 2010. *Do Informed Voters Make Better Choices? Experimental Evidence from Urban India*, mimeo.
- Blais A.** 2000. *To Vote or Not to Vote*. University of Pittsburgh Press.
- Boivin G., Hardy I., Tellier G. and Maziade J.** 2000. "Predicting Influenza Infections during Epidemics with Use of a Clinical Case Definition" *Clinical Infectious Diseases* 31:1166-9
- Borgers T.** 2009. "Costly voting." *The American Economic Review*, 94(1): 57-66.
- Card, D. and E. Moretti.** 2007. "Does Voting Technology Affect Election Outcomes? Touch-Screen Voting and the 2004 Presidential Election" *The Review of Economics and Statistics*, 89(4), pp. 660-673.
- Call S, Vollenweider A, Hornung CA, Simel D, McKinney WP.** 2005. "Does This Patient Have Influenza?" *JAMA*. 2005;293(8):987-997 (doi:10.1001/jama.293.8.987)
- Carrat F, Sahler C, Rogez S, Leruez-Ville M, Freymuth F, Le Gales C, Bungener M, Housset B, Nicolas M and C. Rouzioux.** 2002. "Influenza burden of illness: estimates from a national prospective survey of household contacts in France." *Archives of Internal Medicine*, Sep 9;162(16):1842-8.
- Carrat F, Tachet A, Rouzioux C, Housset B, Valleron AJ.** 1999. "Evaluation of clinical case definitions of influenza: detailed investigation of patients during the 1995-1996 epidemic in France." *Clinical Infectious Diseases*. 28:283-290.
- Citrin J., E. Schickler and J. Sides.** 2003. "What if everyone voted? Simulating the impact of increased turnout in Senate elections " *American Journal of Political Science*, 47: 75-90.
- Dhillon A. and S. Peralta.** 2002. "Economic theories of voter turnout." *The Economic Journal*, 112: 332-352.
- Dyer O.** 2008. "European agencies find 14% of flu isolates are resistant to oseltamivir" *British Medical Journal* 336 : 298 doi: 10.1136/bmj.39482.466019, Feb. 7th 2008.
- Eccles R.** 2005. "Understanding the symptoms of the common cold and influenza", *The Lancet* vol. 5.
- Enikolopov R. and E. Zhuravskaya.** 2007. "Decentralization and political institutions", *Journal of Public Economics* 91(11-12), 2089-2306.
- Enikolopov R., M. Petrova and E. Zhuravskaya.** 2011. "Media and Political Persuasion: Evidence from Russia", *American Economic Review*.

- Feddersen T.** 2004. "Rational choice theory and the paradox of not voting." *The Journal of Economic Perspectives*, 18(1): 99-112.
- Ferreira F. and J. Gyourko.** 2009. "Do Political Parties Matter? Evidence from U.S. Cities." *The Quarterly Journal of Economics*, 124(1): 349-397.
- Fiorina M.** 1973. "Congress: Keystone of the Washington establishment." *Yale University Press*.
- Fraga B. and E. Hersh.** 2010. "Voting Costs and Voter Turnout in Competitive Elections" *Quarterly Journal of Political Science*, 5, 339-356.
- Fujiwara T.** 2010 "Voting Technology, Political Responsiveness, and Infant Health: Evidence from Brazil", mimeo.
- Gelman A. and G. King.** 1990. "Estimating incumbency advantage without bias." *Polity*, 6: 295-317.
- Gentzkow ..** 2006. "Television and Voter Turnout." *The Quarterly Journal of Economics*, 121(3): 931-972.
- Gentzkow M., J. M. Shapiro, and M. Sinkinson.** 2011. "The Effect of Newspaper Entry and Exit on Electoral Politics." *The American Economic Review*.
- Godefroy R. and E. Henry.** 2011. "Incumbency advantage and anti incumbent effect: a unifying theoretical model." *working paper*.
- Gomez B., T. Hansford and G. Krause.** 2007. "The Republicans should pray for rain: weather, turnout and voting in US Presidential elections." *The Journal of Politics*, 69(3): 649-663.
- Hansford T. and B. Gomez.** 2010. "Estimating the electoral effects of voter turnout." *American Political Science Review*, 104(2): 268-288.
- Hauge S., S. Dudman, K. Borgen, A. Lackenby, and O. Hungnes.** 2009. "Oseltamivir-Resistant Influenza Viruses A (H1N1), Norway, 2007-08" *Emerging Infectious Diseases* 2009 February; 15(2): 155-162.
- Husted T. and L. Kenny.** 1997. "The Effect of the Expansion of the Voting Franchise on the Size of Government", *The Journal of Political Economy* 105(1): 54-82.
- Tyrefors Hinnerich B. and P. Pettersson-Lidbom.** 2011. "Democracy, Redistribution and Political Participation: Evidence from Sweden 1919-1950". mimeo
- Horichi Y. and J. Saito.** 2009. "Rain, elections and money: the impact of voter turnout on distributive policy outcomes in Japan." *Asia Pacific Economic Papers No. 379*.
- Knack S..** 1994. "Does rain help the Republicans? Theory and evidence on turnout and the vote", *Public Choice* 79: 187-209.

- Krasa S. and M. Polborn.** 2009. "Is mandatory voting better than voluntary voting?" *Games and Economic Behavior*, 66: 275-291.
- Lee D..** 2008. "Randomized Experiments from Non-random Selection in U.S. House Elections" *Journal of Econometrics*, 142(2): 675-697.
- Leighley J. and J. Nagler.** 2007. "Who votes now? " *Annual Meetings of the Midwest Political Science Association*.
- Lott, John and Lawrence Kenny.** 1999. "Did Women's Suffrage Change the Size and Scope of Government?" *Journal of Political Economy*, 107, pp. 1163-1198.
- Matusaka J. and Filip Palda.** 1999. "Voter Turnout: How Much Can We Explain?" *Public Choice*, 98(3/4): 431-446.
- Mayhew D..** 1974. "Congressional elections: The case of vanishing marginals" *American Journal of Political Science*, 34: 1142-1164.
- Miller G..** 2008. "Women's Suffrage, Political Responsiveness, and Child Survival in American History" *Quarterly Journal of Economics*, 123(3), pp. 1287-1327.
- Monto AS..** 2002. "Epidemiology of Viral Respiratory Infections", *The American Journal Of Medicine*, Volume 112 (6A).
- Monto AS., and Sullivan KM.** 1993. "Acute respiratory illness in the community. Frequency of illness and the agents involved." *Epidemiology and Infections* 1993; 110: 145-60.
- Monto AS, Gravenstein S, Elliott M, Colopy M, Schweinle J.** 2000. "Clinical signs and symptoms predicting influenza infection." *Archives of Internal Medicine* 2000;160:3243-3247
- Perrineau P..** 2007. "Qui sont les abstentionnistes du 10 juin 2007" . *Le Panel Electoral Français CEVIPOF*
- Philipson T..** 2000. "Economic Epidemiology and Infectious Disease."in *Handbook of Health Economics*, volume 1B, Part 8; edited by J. Newhouse and T. Culyer. New York: North-Holland.
- Stromberg D..** 2004. "Radio's impact on public spending." *The Quarterly Journal of Economics*, 119(1): 589-221.
- Van Der Werf S..** 2008. "Les virus de la saison : une année particulière."XIIIème Journée Nationale des Groupes Régionaux d'Observation de la Grippe.
- Washington E..** 2006. "How Black Candidates Affect Voter Turnout" *Quarterly Journal of Economics* 121(3): 973-998.
- Wolfinger R. and S. Rosenstone.** 1980. "Who votes?" *New Haven: Yale University Press*.

## Appendix A: French Municipal Councils

Table 16: French Municipal Councils

Constituents	# Municipal councilmen	Voting system
Less than 100	9	Individual/First-past-the-post (FPTP)
100 - 499	11	Individual/FPTP
500 - 999	15	Individual/FPTP
1000 - 2 499	19	Individual/FPTP
2 500 - 3 499	23	Individual/FPTP
$\geq 3500$	$\geq 27$	List system/Partly proportional

## Appendix B: Proofs

### Proposition 1

We first establish that  $(H_I, H_O)$  and  $(L, H_O)$  cannot be equilibria. If the proposed platform is  $(H_I, H_O)$ , all voters in  $V_I$  and  $V_O$  turn out while the remaining voters in  $V_N$ , if they turn out, vote for the incumbent who has a lower budget. Therefore the incumbent always gets weakly more votes and given how we defined the tie breaking rule, always wins. Thus, the opposition would always want to deviate and propose platform  $L$  that at least gives him a chance of winning. Similarly,  $(L, H_O)$  cannot be an equilibrium since the incumbent would always want to deviate: he would win for sure and get higher benefits upon victory.

Let us first examine the conditions under which  $(H_I, L)$  is an equilibrium. At  $(H_I, L)$ , the expected benefit of the incumbent is  $[pP_l + (1 - p)P_h][r + B]$  and that of the opposition is  $[p(1 - P_l) + (1 - p)(1 - P_h)]r$ . In this case, all  $K$  voters in  $V_I$  turn out while the remaining voters turn out if their cost is low enough. The benchmark cost depends on the state  $s \in \{l, h\}$ . For instance, for state  $l$ , voters turn out if  $c < c_l^*$  where  $c_l^*$  is the solution to the problem below ( $c_h^*$  defined in the same way using distribution  $G$ ):

$$c = [C_{N-K-1}^K (F(c))^K (1 - F(c))^{N-2K-1}] \alpha b_H \quad (6)$$

Indeed an individual voter in  $V_N$  or  $V_O$  changes the outcome of the election only if  $K$  of the  $N - K - 1$  other voters in those groups do not turn out. Furthermore if the incumbent is defeated they get a net benefit of  $\alpha b_H$ , i.e the budget spent by the incumbent on his preferred project.

As previously explained, the opposition will never deviate, and if the incumbent deviates he gets  $r/2$ , so  $(H_I, L)$  is an equilibrium if:

$$r/2 < [pP_l + (1 - p)P_h][r + B] \quad (7)$$

An examination of equation (6) shows that  $c_s^*$  is an increasing function of  $b_H$  for both states. Thus  $P_l$  and  $P_h$  are also increasing function of  $b_H$ . It is therefore possible to find  $\bar{b}$  such that  $r/2 = [pP_l(\bar{b}) + (1 - p)P_h(\bar{b})][r + B]$ . If  $b_H > \bar{b}$ , then  $(H, L)$  is always an equilibrium (equation 7 is always satisfied), equilibrium that can be shown to be unique. On the other hand, if  $b_H < \bar{b}$ , then  $(H, L)$  is

an equilibrium only if  $r/2 < [pP_l + (1-p)P_h][r+B]$ . Thus we see that if we define:

$$\bar{r} = \frac{1}{2[pP_l + (1-p)P_h]} - 1 \quad (8)$$

Then if  $B/r > \bar{r}$ ,  $(H, L)$  is an equilibrium. Note that from equation (6), we can see that  $c_l^*$  is an increasing function of  $\alpha$  ( and so is  $c_g^*$  ) and therefore, so are  $P_l$  and  $P_h$ . Thus  $\bar{r}$  is a decreasing function of  $\alpha$ .

We now examine the conditions under which  $(L, L)$  is an equilibrium. It is clear that a necessary condition for  $(L, L)$  to be an equilibrium is that the incumbent does not want to deviate, i.e  $B/r < \bar{r}$ .<sup>35</sup>

### Proposition 2

At state  $l$ , the cutoff cost  $c_l^*$  is defined by

$$c_l^* = [C_{N-K-1}^K (F(c_l^*))^K (1 - F(c_l^*))^{N-2K-1}] \alpha b_H \quad (9)$$

and at state  $h$ , the cutoff cost  $c_h^*$  is defined by

$$c_h^* = [C_{N-K-1}^K (G(c_h^*))^K (1 - G(c_h^*))^{N-2K-1}] \alpha b_H \quad (10)$$

Given that  $G$  first order stochastically dominates  $F$ , we have for all  $c$ ,  $F(c) > G(c)$ . Thus at  $c_l^*$ , if  $K < N - 2K - 1$  (argument along the same lines for  $K > N - 2K - 1$ ), using equation 9, we must have:

$$c_l^* < [C_{N-K-1}^K (G(c_l^*))^K (1 - G(c_l^*))^{N-2K-1}] \alpha b_H$$

Thus in equilibrium, we must have  $c_h^* > c_l^*$ , and  $F(c_l^*) > G(c_h^*)$ . So a move from  $h$  to  $l$  increases turnout.

Furthermore the probability that the incumbent is elected if state is  $l$  is given by:

$$P_l = \sum_{k=0}^K [C_{N-K}^k (F(c_l^*))^k (1 - F(c_l^*))^{N-K-k}]$$

---

<sup>35</sup>It is however possible that the condition guaranteeing that the opposition does not want to deviate is more binding and we therefore specify in the statement of the proposition “(if the equilibrium exists)”

And the probability for state  $h$  is:

$$P_h = \sum_{k=0}^K \left[ C_{N-K}^k (G(c_h^*))^k (1 - G(c_h^*))^{N-K-k} \right]$$

Thus, as  $F(c_i^*) > G(c_h^*)$ , we have  $P_l < P_h$