

The Weather Effect: Estimating the Effect of Voter Turnout on Electoral Outcomes in Italy



BANCO DE PORTUGAL
EUROSYSTEM

Working Papers 2014

Alessandro Sforza

5



5

THE WEATHER EFFECT: ESTIMATING THE EFFECT OF VOTER TURNOUT ON ELECTORAL OUTCOMES IN ITALY

Working Papers 2014

Alessandro Sforza

February 2014

The analyses, opinions and findings of these papers represent the views of the authors, they are not necessarily those of the Banco de Portugal or the Eurosystem

Please address correspondence to
Banco de Portugal, Economics and Research Department
Av. Almirante Reis 71, 1150-012 Lisboa, Portugal
Tel.: 351 21 313 0000, email: estudos@bportugal.pt



BANCO DE
PORTUGAL
EUROSYSTEM

Lisbon, 2014 • www.bportugal.pt

LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCES

The Weather Effect: estimating the effect of voter turnout on electoral outcomes in Italy

Alessandro Sforza

June 2013

Abstract

This paper examines the effect of variation in voter turnout to electoral outcomes in Italy. I use data on spatial distribution of turnout for 2008 and 2013 to examine how it can affect differences in electoral outcomes. Exploiting the exogenous variation in weather conditions across municipalities I use rainfalls to instrument for turnout levels: if non-voters systematically differ from habitual voters in terms of their characteristics or preferences, the effect of turnout on the electoral outcome can generate "extreme" outcomes. I find that bad weather decreases turnout and that a higher turnout favours the Movimento 5 Stelle, while both the Democrats and the Centre are negatively affected.

JEL codes: D72, P16

1 Introduction

The Italian political debate in the last months has been largely about the surprising outcome of the national elections held in February: indeed for the first time in history, a newly born movement - the "Movimento 5 Stelle" led by the ex-comedian Beppe Grillo - entered the parliament with the highest share as a single party (25.5%).

The movement was born as a protest against the established political and bureaucratic system "that costs millions of Euros and creates inefficiencies": within only a few years it began a party with a longitudinal system of political recommendations, ranging from the left (green energy, strong welfare policies against unemployment) to the right/populist (no immigration, exit from the Euro zone), thus capturing the favour of millions of voters from both sides.

Moreover, because of the political crisis and the anticipated breakdown of the technician government led by Mario Monti, the Italian President Giorgio Napolitano, had been obliged to convene to new elections in February. This is very unusual because elections are usually held in summer to avoid inconvenience related to bad weather and to ensure that everyone can exercise the right to vote.

Starting from this empirical observation and exploiting the peculiarities of this specific case, we will investigate the effect of voter turnout on electoral outcomes. This is an important topic in political science because, besides the importance of high political participation in "social" terms¹, if non-voters systematically differ from habitual voters in terms of their characteristics, the effect of turnout on the electoral outcome can generate interesting outcomes; for instance, a higher turnout can either advantage the incumbent, the democrats, the "residual" parties or uniformly affect all the parties in the electoral arena.

Almost all the literature about the topic test a partisan hypothesis (or an incumbent hypothesis²) meaning that parties will benefit differently from changes in turnout level. DeNardo

¹A high level of voter turnout is not only preferable for expressive reasons, but also reduces the bias in terms of the unobserved difference between voters and non-voters, thus increasing the overall quality of political representation

²An alternative hypothesis is that higher turnout disadvantages the incumbent: Grofman, Owen and Collet [Grofman et al., 1999] use the argument of growing unpopularity to corroborate their thesis.

([DeNardo, 1980] , [DeNardo, 1986]) argues that the partisan composition of the electorate has a strong impact on the partisan effect, while Martinez and Gill ([Martinez and Gill., 2005]) use the "social class differences" argument to explain the difference in outcomes³. The empirical evidence provided to explain the effect of turnout on electoral outcomes is mixed and unclear: some scholars use survey data on voters and non-voters to estimate the degree to which these two sub-groups can influence the elections because of the differences in their preferences (see Martinez and Gill [Martinez and Gill., 2005], Citrin, Schikler and Sides [Citrin et al., 2003]), while other scholars directly regress the level of turnout on the electoral outcomes (Radcliff [Radcliff, 1994], Erikson [Erikson, 1995], Nagel and McNulty [Nagel and McNulty, 1996]). However, neither the former nor the latter approach provides a convincing methodological strategy to assess the causal relationship between turnout and electoral outcomes.

In this work we try to shed some light on the causal link between turnout and electoral outcomes using an instrumental variable approach that exploits the randomness of weather conditions in the election days as an instrument for voters turnout; we will then focus on the spatial autocorrelation of bad weather in certain regions to rule out this potential source of bias.

In section 2 we will present the data and describe the methodology while in section 3 we will present the results. In section 4 we will discuss the spatial autocorrelation issue providing some tentative solutions and in section 5 we will conclude.

2 Data and Methodology

2.1 Political data

In order to estimate the impact of turnout on electoral outcome, we use official electoral data (by parties) at the municipality level for the national elections held in 2008 and 2013 for both Chamber and Senate. The level of detail allow us to have a sample of 7745 municipalities for which we observe vote share by parties in both Chamber and Senate; since the Italian law restricts the vote for the Senate only to the population with more than 25 years old, we can disentangle the amount of votes coming from young voters by manually subtracting the vote to the Senate from the ones

³Empirical evidence is provided by Radcliff ([Radcliff, 1994]) and Erikson ([Erikson, 1995]).

to the Chamber. Moreover, we have data for voters and eligible in both Chamber and Senate at municipality level for both elections divided by gender. With this enormous amount of information we can compute different turnout, ranging from the total one - given by the percentage of eligible casting on the election - to female and male turnout and young voters' turnout. For the latter however, we shall make a non-trivial assumption; in fact, we need to assume that all the voters that turnout and are eligible for Senate, will vote for both the Chamber and the Senate. If this assumption holds, than we can compute the young voters' turnout by using the difference in eligible and voters in Chamber and Senate. Indeed, frequently in the data eligible express their preference for both political bodies, but some residual concern on how to treat municipalities with young voters' turnout greater than one is left unsolved (this is the case when when eligible do not cast for the Senate hence the differences between voters for Chamber and Senate is disproportionately big).

The parties that we include in the analysis are the major parties: Democrats (PD) led by Pierluigi Bersani, People of Freedom (PDL) led by Silvio Berlusconi, Movimento 5 Stelle (M5S) led by Beppe Grillo, Scelta Civica (SC) led by Mario Monti, Centre (UDC) led by Pierferdinando Casini, Northern League (LN) led by Umberto Bossi and Left (SEL) led by Nichi Vendola. Finally, we have a large set of covariates ranging from measures of social capital at municipality level such as blood donation or participation to the 1974 divorce referendum to measures of economic performance such as GDP per capita, unemployment level and mean earnings.

2.2 Geographical informations

In order to capture the effect of weather on turnout, we have different measures of weather conditions (rain, visibility, temperature) gathered from the website ilmeteo.it for the 4 elections days (2 days in 2008 and 2 days in 2013); the variable that we use in the estimation is rainfall, a dummy equal to one if in the election dyad in a given municipality we observe precipitations (in both days). Moreover, we have geographical information (altitude, distance from the sea, area, kilometres of coasts) at municipality level gathered from ISTAT (Italian statistical office) and municipality boundaries updated in 2011 (shape); these large amount of information is useful to have an understanding of the diffusion of the weather phenomena across the Italian Regional boundaries.

2.3 Methodology

The theoretical connection between turnout and electoral outcome is the following: if voters and non-voters systematically differ in their set of preferences, then different levels of turnout can generate very different electoral outcomes. It is however dared assuming that the decision to turn out is completely exogenous to the vote choices of the voter, i.e. there is selection into voting, thus the endogeneity issue arises.

A potential solution to the endogeneity problem would be an experimental design in which agents are "encouraged" or "forced" to vote according to a random assignment to the treatment (voters) or to the control (non-voters). In this case, since the assignment to treatment is random, the researcher can causally claim the impact of higher turnout artificially generated on the electoral outcome. This is because the random assignment would solve the problem of different preferences between voters and non-voters because the treated agents are chosen randomly among the whole population.

However, it is straightforward to notice that a similar experiment is hard to implement for ethical reasons; on the one hand it is not possible to force people to turnout while on the other hand, a Lab experiment that resemble the characteristics of real elections would never capture the complexity of the phenomena. To find causal evidence of the effect of turnout on electoral outcomes, we use an instrumental variable (IV) approach exploiting the randomness of weather conditions (rainfalls) as an instrument for voters' turnout. The theoretical framework we will refer to is a Local Average Treatment Effect (LATE) model with heterogeneous potential outcomes (Angrist and Pischke, [Angrist and Pischke., 2009]). Within this framework, rainfall will work as a suitable instrument for turnout if:

1. Is "as good as randomly assigned" (Angrist and Pischke [Angrist and Pischke., 2009]) and exogenous to electoral outcomes (independence);
2. It explains the differences in electoral outcomes only through turnout (exclusion restriction);
3. It is correlated with turnout-the endogenous variable-in the first stage (existence of first stage);
4. Has a monotonic relationship with turnout (monotonicity).

If these conditions hold, the IV will produce consistent estimates; however, whereas assumptions (3) and (4) can be tested using the available data, respectively with the first stage regression and a

t-test of difference in means between the difference in turnout in treated places-where the dummy variable for rain is equal to one- and non-treated locations (or equivalently an OLS regression)⁴, both the independence assumption and the exclusion restriction cannot be tested.

It seems legitimate to claim that a huge part of the variation in electoral outcomes due to different weather conditions works through differences in turnout by changing the opportunity cost of peripheral voters. Substantially, assuming utility maximizing agents, an increase in the cost induced by bad weather would reduce the utility of voting. However, one can also argue that bad weather has a direct effect on voters' mood: for instance, bad weather would advantage conservative parties (people are in a bad mood because of the weather) while good weather would encourage people to ask for reforms. This in turn is equivalent of assuming that rainfalls have two different effects, a direct effect on voters' mood and a mediated one on different turnout levels. The argument of risk aversion is used in a work in progress paper by Bassi [Bassi, 2013] where she uses an experimental approach to test if weather conditions directly affect electoral outcomes in India; results show that after controlling for a wide set of individual characteristics, bad weather favours less risky candidates. This idea is partially ruled out by our IV estimations which point out that a worsening in weather conditions do not favour conservative parties (perceived as less risky); nevertheless, the existence of a direct channel cannot be completely tested using our data, but the relative magnitude of the latter with respect to the important indirect impact of rainfalls through turnout can justify the exclusion restriction.

Henceforth, no other factors like electoral law or politically driven alteration of the electoral race (e.g. a change in identification requirements) took place from 2008 to 2013, hence we can be confident that the main channel through which a change in weather conditions will affect electoral outcome is turnout.

The IV Two Stage Least Squares (2SLS) estimation that we perform is the following:

$$\Delta Y_{ji} = \beta_0 + \beta_1 \Delta \hat{X}_i + \beta_2 \Delta M_i + \beta_3 FE + \epsilon_{it} \quad (1)$$

and the First stage

⁴The difference in means is .0144099 and it is significant at one per cent. The t-test is 11.7490.

$$\Delta X_{ji} = \beta_0 + \beta_1 \Delta Z_i + \beta_2 \Delta M_i + \beta_3 FE + \epsilon_{it} \quad (2)$$

where:

- ΔY is the vote share variation for a single party (j) in a given municipality (i) from 2008 to 2013;
- ΔZ is the variation in rainfalls (the instrument) equal to 1 if there is a worsening in weather condition from 2008 to 2013 in a given municipality, zero otherwise;
- M is a set of covariates (varying at municipality level and over time);
- FE is the geographical fixed effect;
- ΔX is the variation in turnout (the endogenous variable);
- μ and ϵ are the error terms;

The variable rainfall (Z) is equal to one if in the election dyad in a given municipality we observe rainfalls (in both days) while the difference in rainfalls (ΔZ) between the two elections is equal to one if there is a worsening in the weather conditions, so that the dummy rainfall (Z) equals one in 2013 and zero in 2008⁵. We can employ less stringent measures of weather conditions (visibility, rainfalls in only one of the two days), but they all fail to identify the model in the first stage. Indeed, a marginal change in weather conditions would not change drastically the opportunity cost to turnout while a rainstorm can have a serious impact on turnout levels.

It is important to notice that we estimate a heterogeneous effect model with covariates implying that the independence assumption is as well conditional on covariates: in fact, the rainfalls differential (ΔZ) is random conditional on the geographical location of the municipality. In our case, conditioning is not necessary for the statistical identification of model - it holds both conditional and unconditional on covariates - but it is necessary from a theoretical point of view. Effectively, even though weather conditions are certainly exogenous to political decisions, conditioning on the municipality's altitude ensures that the volatility of electoral outcomes to weather conditions is

⁵We do not distinguish among zero (equal) and minus one (better) because this would cause interpretation problems and provide little additional insight.

smoothed across the Regions. In Figure 1 we present the physical map of Italian municipalities while in Figure 2 and in Figure 3 we show the distribution of rainfalls during the two elections⁶: it is evident that the binary indicator for rainfall has some spatial patterns for the single election dyad, but the difference in rainfalls (see Figure 4) in a single municipality conditional on its altitude and given that the elections took place in very different periods of the year - one at the end of April while the other in mid-February - is as good as if randomly assigned.

3 Results

We begin by estimating the baseline OLS specification where we directly regress rainfalls on parties' shares. We perform a first difference model with regional fixed effect and a set of controls; table 1 reports the results for the baseline OLS specification. Democrats (PD - column 1) benefits the most from a bad weather with a 0.8% increase in the party share in case of rainfalls while the Movimento 5 Stelle (M5S - column 3) is strongly and negatively affected from rainfalls with a decrease of 1.1%. The effect of rainfalls is also significant for the Centre (SC) led by Mario Monti (+0.49%), while it is not significant for the People of Freedom (PDL).

It is important to notice that we do not have data for 2008 elections for Movimento 5 Stelle (M5S) and Scelta Civica (SC), so we can only perform cross section estimation with regional fixed effects for these two parties. Nonetheless, this would not change the exclusion restriction of the IV specification, but it will only change the standard errors of the model.

In Table 2 we presents the results for the IV estimation⁷; we control for a set of covariates capturing the level of social capital, the GDP and other characteristics and for the altitude of the municipality (Figure 1). Moreover, the introduction of the Regional fixed effects accounts for the potential bias generated by region specific unobservable, the geography of the place and partially for the spatial autocorrelation within Regions (discussed in Section 4).

In columns 1 and 4 we show the first stage regressions of rainfalls on turnout; both coefficients are strongly significant (1%) with the expected negative sign. Indeed, the coefficients (columns 1 and 4) indicates that rainfalls decrease turnout respectively by 0.7 and 1.4 percentage points. Results

⁶All the maps are obtained with municipality data in ArcGIS.

⁷The uncentered R2 is reported because of different intercepts among groups.

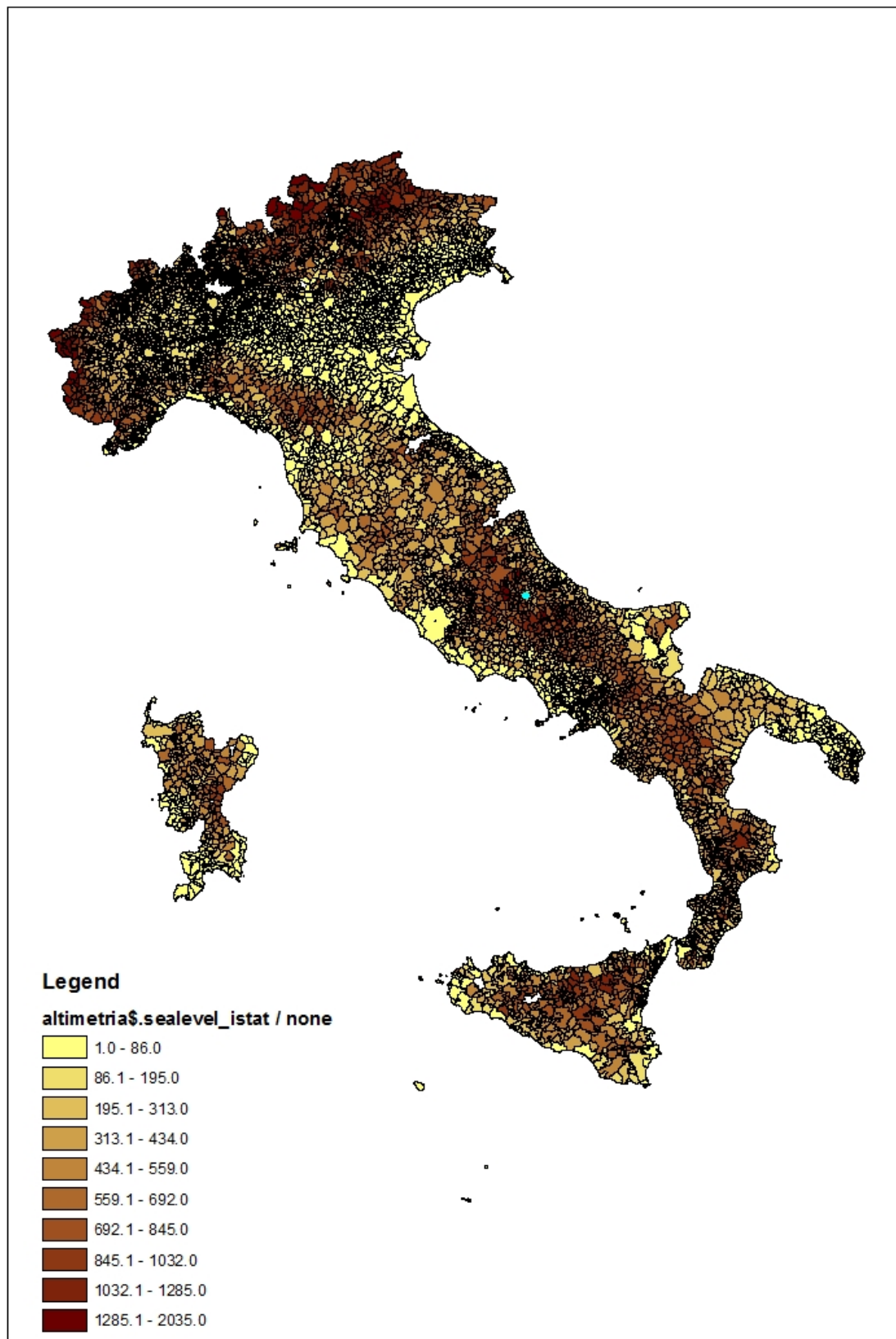


Figure 1: Altitude

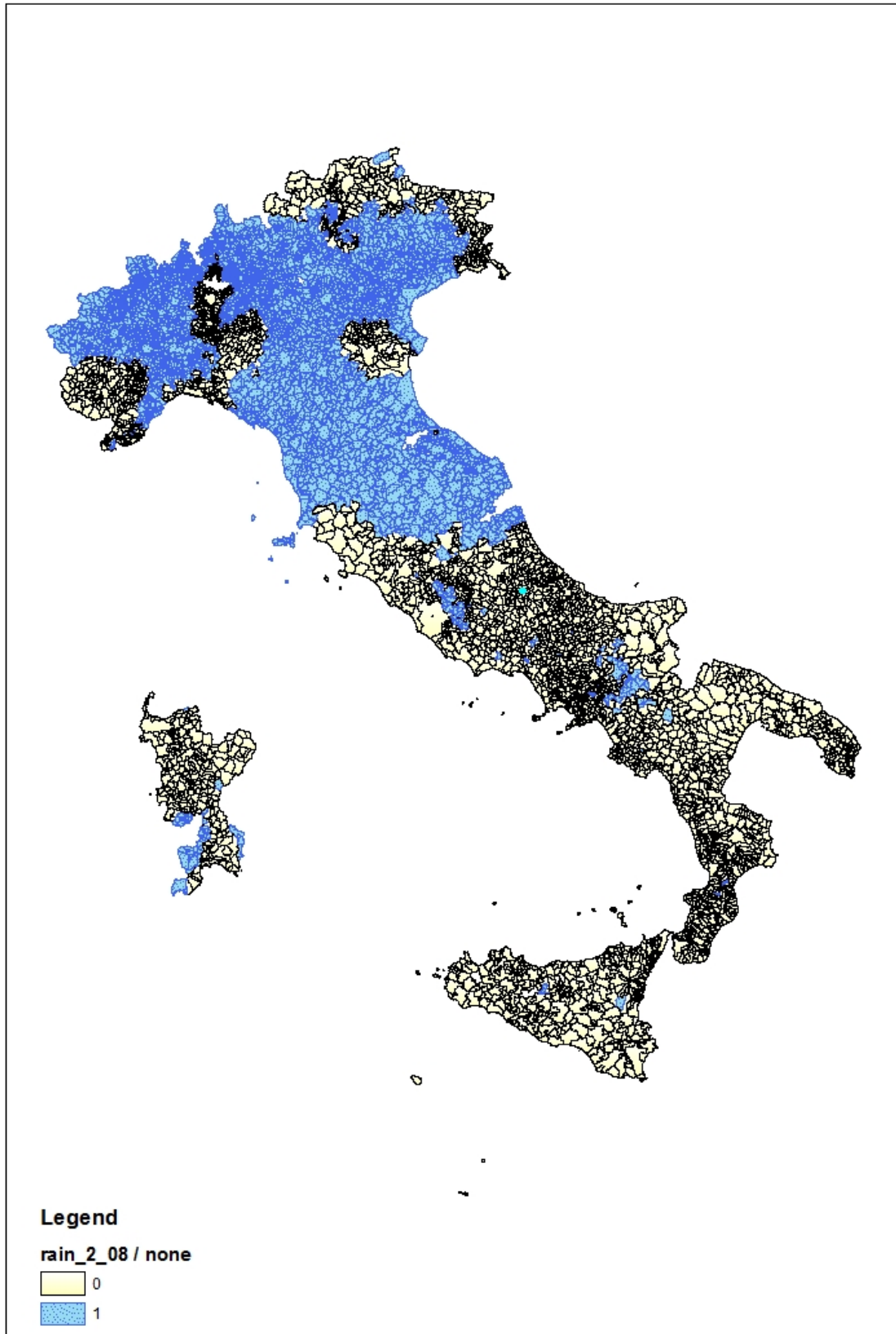
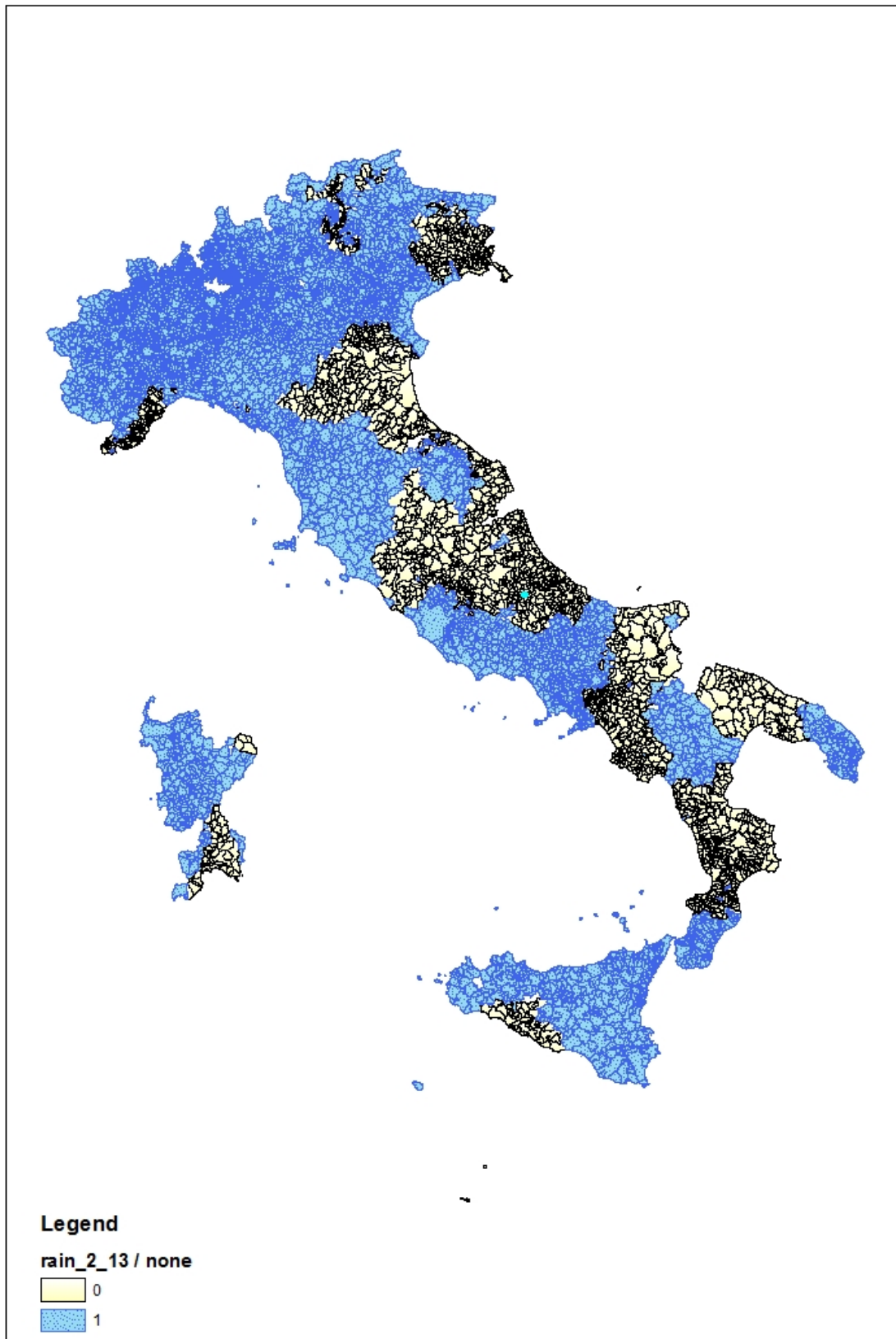


Figure 2: Rain 2008



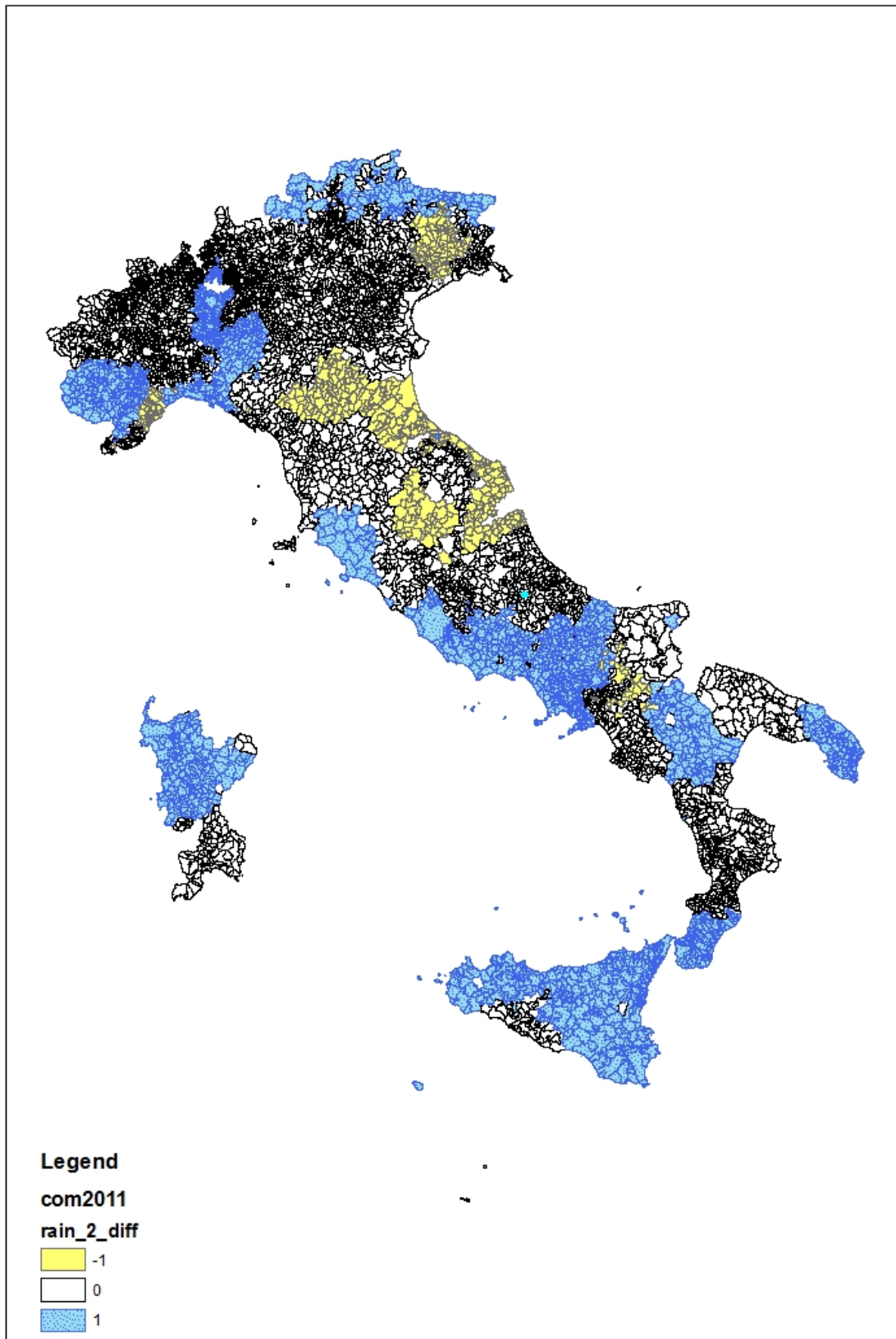


Figure 4: Rain Difference

Table 1: Effect of rainfalls on electoral outcome (OLS)

VARIABLES	(1) PD	(2) PDL	(3) M5S	(4) SC
Rainfalls	0.00888*** (0.00148)	0.000681 (0.00177)	-0.0116*** (0.00205)	0.00495*** (0.00124)
Altitude	YES	YES	YES	YES
Social Capital	YES	YES	YES	YES
FE	YES	YES	YES	YES
Observations	7,150	7,150	7,155	7,155
R-squared	0.415	0.381	0.432	0.359

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Effect of rainfalls on electoral outcome (IV)

VARIABLES	(1) First Turnout	(2) IV PD	(3) IV PDL	(4) First Turnout	(5) IV M5S	(6) IV SC
Rainfalls	-0.00681*** (0.00150)			-0.0147*** (0.00197)		
Turnout		-1.295*** (0.334)	-0.105 (0.261)		0.788*** (0.170)	-0.345*** (0.0970)
Social Capital	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES
F test	.	20.72	.	55.30		
R2	0.692	0.462	0.882	0.995	0.930	0.836
Observations	7,106	7,106	7,106	7,131	7,131	7,131

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

are robust to the F-test of excluded instruments with scores between 20 and 56.

The second stage regressions confirm the initial hypothesis showing that a higher turnout disproportionately favours the Movimento 5 Stelle (M5S - column 5): rainfalls lead to a decrease in turnout of 1.47% which itself leads to a decrease in the vote share of the party of 1.15% ($-0.0147 * 0.788 = -0.01158$) while it negatively affects the Democrats (PD - column 1) decreasing their share by 0.88% ($-0.00681 * -1.295 = 0.0088$). This in turn implies that in absence of rainfalls in the last political elections, the Movimento 5 Stelle would have gained an additional 1.15 percentage point, moving from 25.55% to 26.7%. On the one hand, the former finding captures the essence of the exploit of the party that intercepted the preferences of non-habitual voters; hence the vote share for the Movimento 5 Stelle is increasing in turnout. On the other hand, the result for the Democrats is capturing a counter intuitive behaviour: non-habitual voter would usually vote big parties⁸, but surprisingly the Democrats' share drastically decreases with turnout. This result can be partly explained by both a weak electoral campaign and the austerity measures proposed - and largely regretted by most of the Italian population; the latter hypothesis is further confirmed by the negative coefficient (overall effect of 0.5%) for the Centre leaded by Mario Monti (SC - column 6) who firstly proposed the austerity measures.

As a robustness check, we perform the estimation splitting the voters' sample in females and males; Table 3 and Table 4 present the results for the two samples. Observing the coefficients for males and females, we cannot find any significant difference in their behaviour: they do not differ in the sensitivity of turnout levels to rainfalls; hence they show similar behaviours in the second stage regression.

Finally, we test the model for young voters (table 5) aged from 18 to 24 that voted for the first time, but the model has a little F-test. This can be because the distribution of young voters' turnout is biased by the fact that we replace turnout levels greater than one with values of one, hence implying that in municipalities in which eligible do not cast for the Senate young voters have a very high turnout level.

⁸To the best of my knowledge there is no literature about the difference in preferences between voters and non-voters in Italy and most of the literature on the topic is about US elections where only two parties compete in the race. In fact, with Democrats and Republicans only, the mostly tested hypotheses are the "partisan effect", "anti-incumbent effect" or the "volatility effect" (See Gomez et al[Gomez et al., 2007] and Hansford and Gomez [Hansford and Gomez, 2010]). We find some evidence of the anti-incumbent effect shown by the negative coefficient for the Centre leaded by Mario Monti.

Table 3: Effect of rainfalls on electoral outcome: Females

VARIABLES	(1) First Turnout	(2) IV PD	(3) IV PDL	(4) First Turnout	(5) IV M5S	(6) IV SC
Rainfalls	-0.00671*** (0.00168)			-0.0150*** (0.00223)		
Turnout		-1.313*** (0.371)	-0.107 (0.266)		0.771*** (0.173)	-0.338*** (0.0972)
Social Capital	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES
Observations	7,106	7,106	7,106	7,131	7,131	7,131
F test	.	15.98	15.98	.	45.26	45.26
R2	0.695	0.359	0.882	0.994	0.924	0.825

YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Effect of rainfalls on electoral outcome: Males

VARIABLES	(1) First Turnout	(2) IV PD	(3) IV PDL	(4) First Turnout	(5) IV M5S	(6) IV SC
Rainfalls	-0.00685*** (0.00152)			-0.0142*** (0.00190)		
Turnout		-1.286*** (0.336)	-0.104 (0.259)		0.814*** (0.176)	-0.356*** (0.100)
Social Capital	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES
Observations	7,106	7,106	7,106	7,131	7,131	7,131
F test	.	20.31	20.31	.	56.11	56.11
R2	0.622	0.442	0.883	0.996	0.928	0.837

YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Effect of rainfalls on electoral outcome: Young voters

VARIABLES	(1) First Turnout	(2) IV PD	(3) IV PDL	(4) First Turnout	(5) IV M5S	(6) IV SC
Rainfalls	-0.0158** (0.00674)			-0.0137*** (0.00338)		
Turnout		-0.572** (0.259)	-0.105 (0.125)		0.817*** (0.252)	-0.357*** (0.136)
Social Capital	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES
Observations	6,583	6,583	6,583	6,588	6,588	6,588
F test	.	5.502	5.502	.	16.34	16.34
R2	0.0208	-0.943	0.862	0.987	0.864	0.741

YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4 Spatial Autocorrelation

The instrument that we use for turnout in section 3 is rainfall, a dummy variable (equal to 1 if there are precipitations) not necessary randomly distributed across space⁹(see Figure 2 and Figure 3); this potentially generates spatial autocorrelations of the residuals of the IV2SLS (two stage least squares model) regression across municipality in the same area. A weather phenomenon locally clustered can drives the results of our estimation; to smooth this source of bias we estimate a first differences fixed effect (FE) IV model controlling for the altitude of the municipality. The FE should control for any regional specific variable that is constant over time, thus it should capture some of the variability that is left in the residual term. Nonetheless, Region or Province-election specific variables could escape from our controls: this can be ideally tackled with Province-elections fixed effect, but the strategy is unfeasible in our case because we have only two elections and the interaction term would capture all the variability.

For a deeper understanding of the potential bias generated by the spatial autocorrelation, we perform the spatial analysis of the residuals of the IV model. The residuals are capturing what is left in explaining electoral outcomes once we account for the variation in turnout instrumented with

⁹It is exogenous to electoral outcome, but not randomly distributed across space.

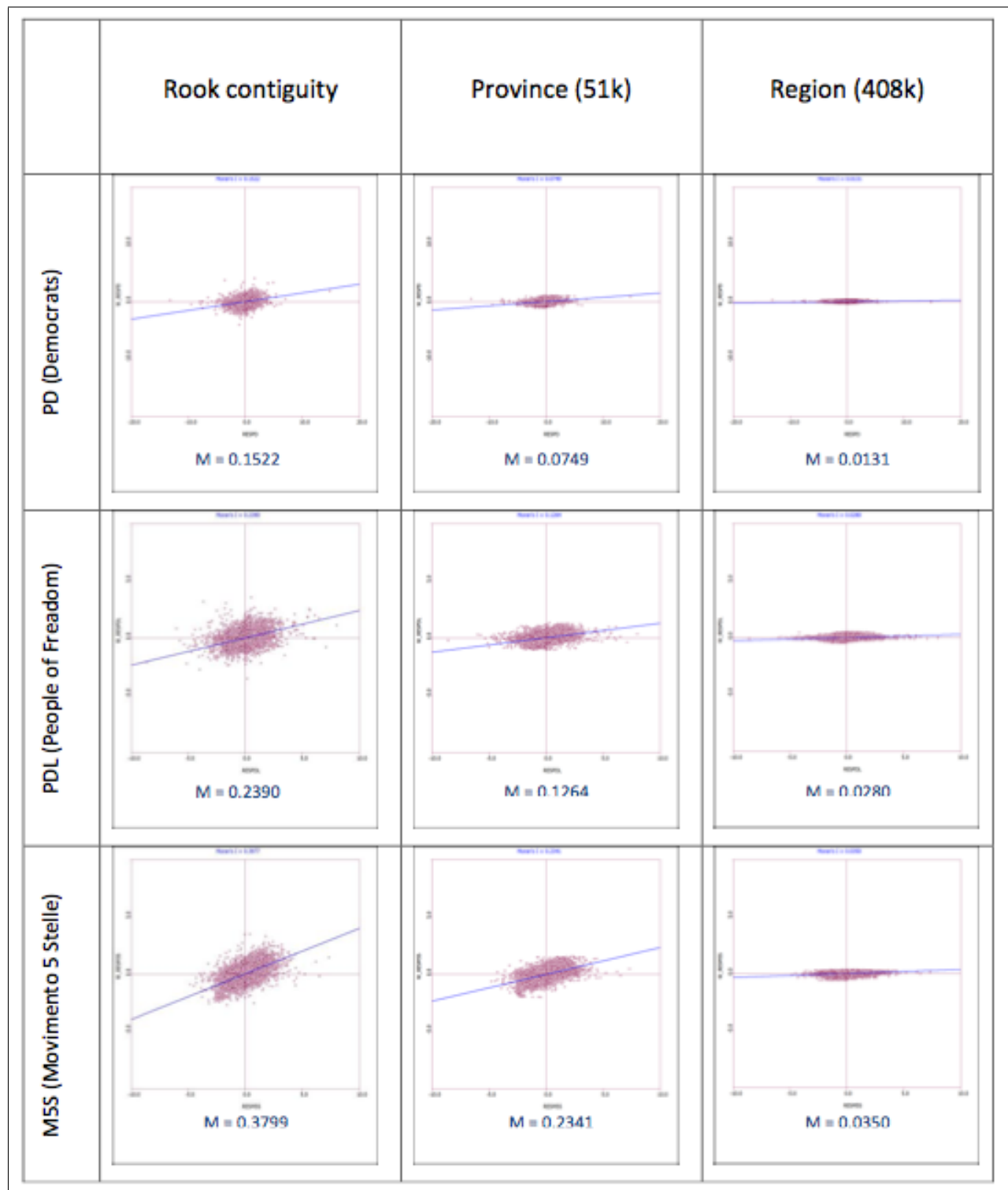


Figure 5: Moran's I

rainfalls net of a number of controls at the municipality level (blood donation, altitude, participation to the 1974 divorce referendum). We compute the Moran's I (Moran, 1948) for all the parties (Figure 5 shows the results for the three main parties while the analysis of other parties is presented in the appendix) with different sets of weights ranging from the rook contiguity¹⁰ to the aggregation of 51 municipalities (the average number of municipalities per Province) until 408 municipalities to resemble the average Region. We decide to artificially aggregate municipality to "mimic" the average Province or Region instead of using the official grouping of municipalities in each Region or Province because residuals - and weather - should probably be autocorrelated in certain areas irrespective of the geographic boundaries that delimit the area itself. Thus, given the relevant heterogeneity in the municipalities' area, we follow Anselin (2002) arguing that the weighting scheme with the k-nearest neighbours avoids also the creation of "islands" (areas without neighbours) and forces an even distribution of neighbours per data point.

Results show that the Moran's I by Province range from a high 0.2341 for the Movimento 5 Stelle to a low 0.0749 for the Democrats (PD) while if we consider the Regions as the main aggregation area, we have value from 0.0131 (PD) to 0.0350 (M5S). Moreover, in order to highlight the clusters and their significance level we perform the LISA (Anselin, [Anselin, 1995])¹¹ statistic using the Province level as weighting scheme. Results (Figures from 5 to 7) underline the existence of some clusters, though with low significance (often below 5%).

The Moran's I and the LISA statistics suggest that spatial autocorrelation is a residual concern in our model with respect to identification; therefore, we do not use a Spatial Error (SE) model accounting for autocorrelation in the error term because it would impose a structure to the former that could not be supported with sounding economic theory. However, we prefer to estimate the baseline model with robust standard errors that account for potential heteroskedasticity across municipalities (for completeness a SE model is presented in the appendix).

¹⁰This is the most conservative specification because you consider as neighbours only the municipality that share a boarder. We do not implement Queen Contiguity because the specifications of interest pertains Provinces and Regions.

¹¹Local Indicator of Spatial Autocorrelation (LISA) is a local version of the Moran's I.

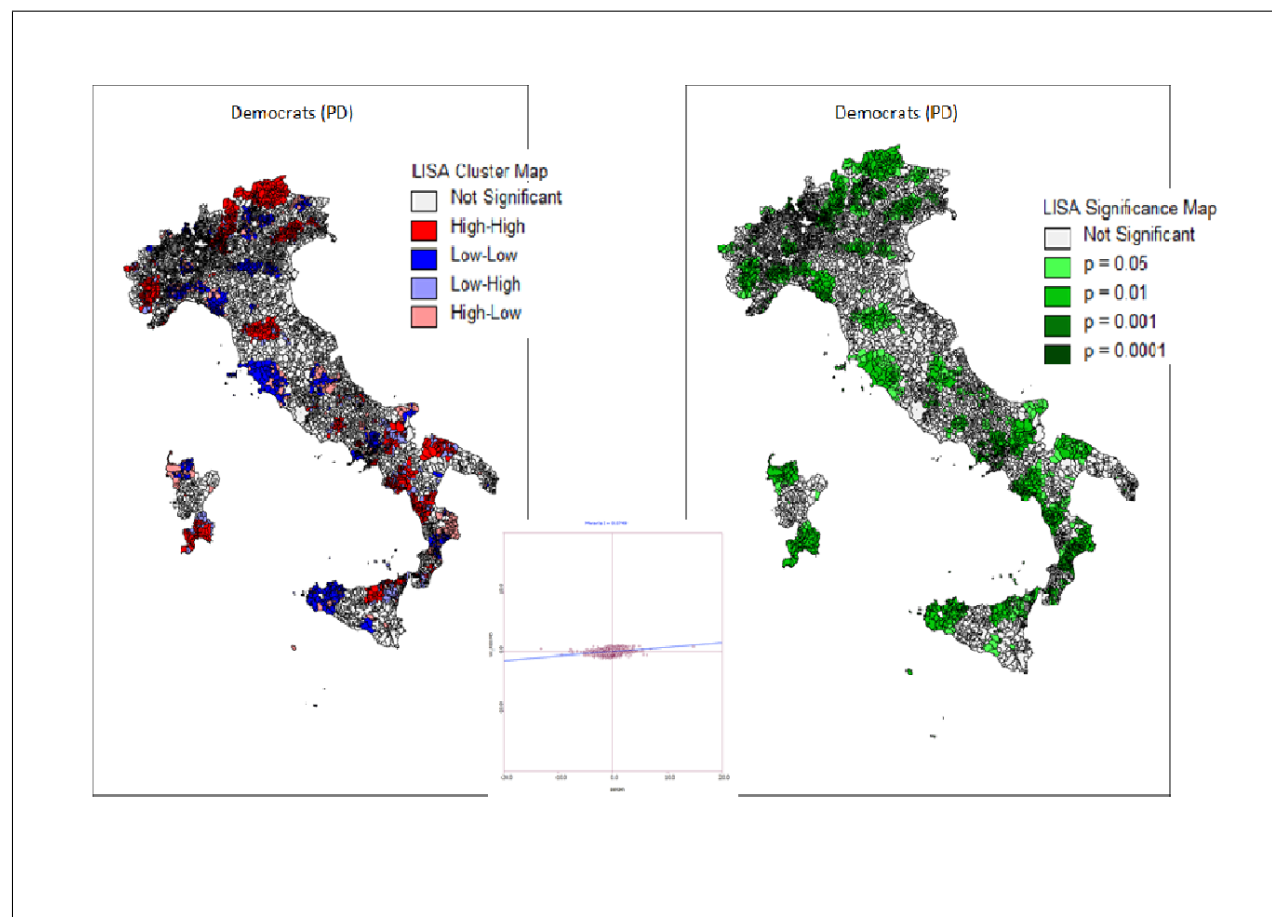


Figure 6: LISA Democrats (PD)

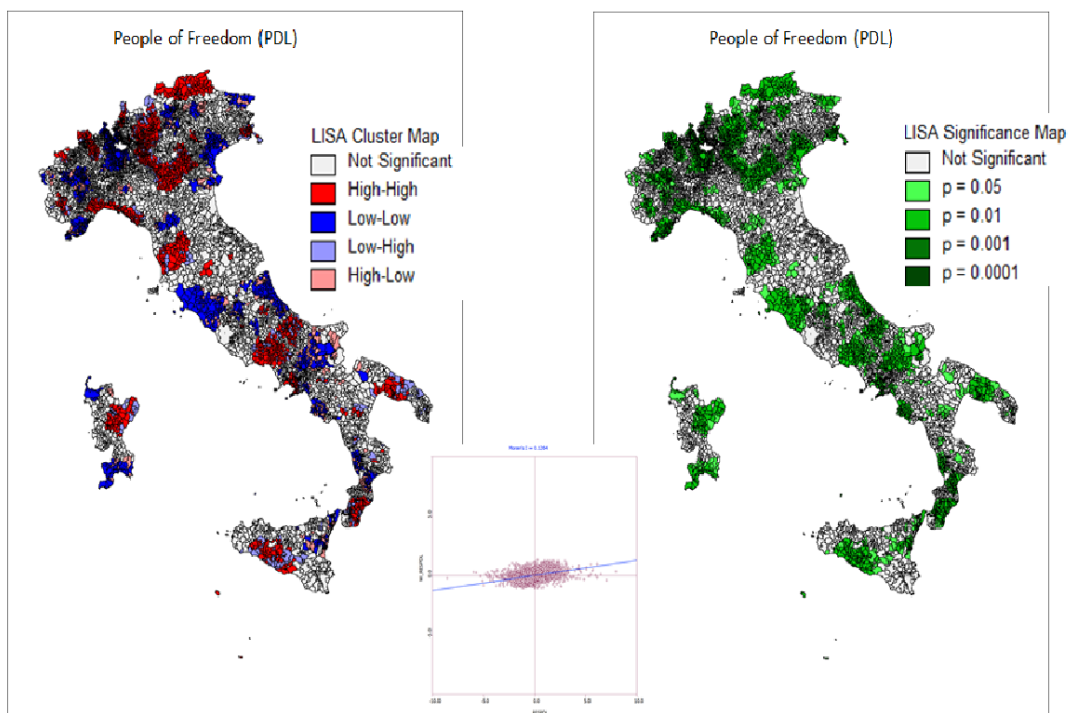


Figure 7: LISA People of Freedom (PDL)

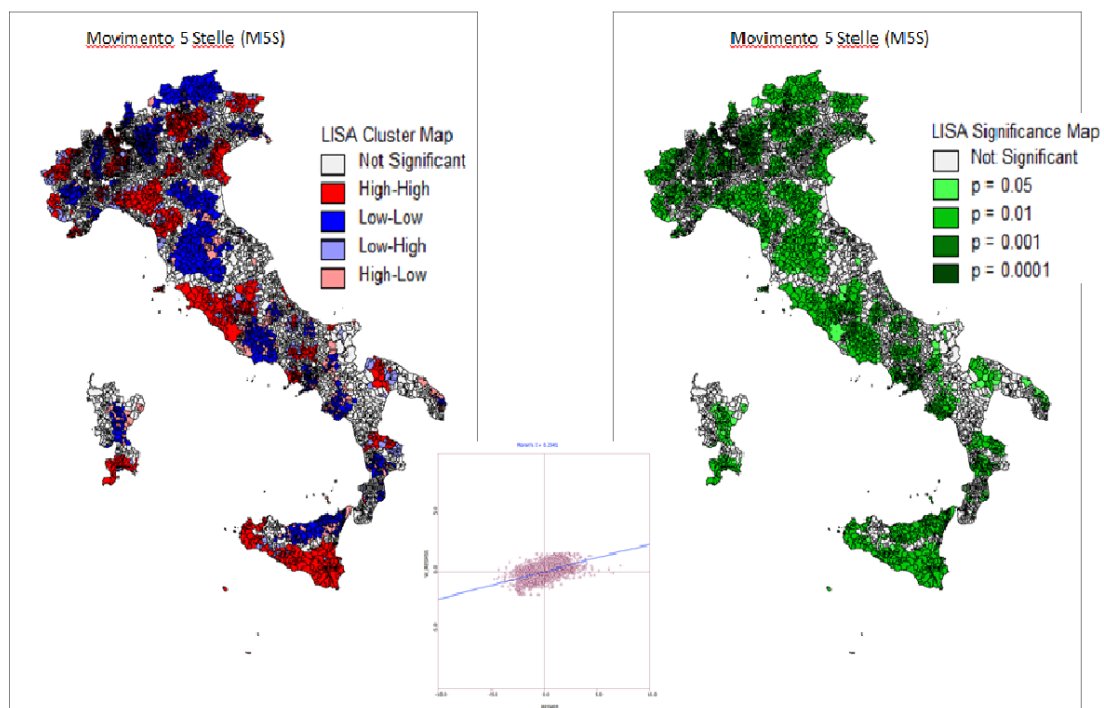


Figure 8: LISA Movimento 5 Stelle (M5S)

5 Concluding Remarks

The understanding of the effect of turnout on the electoral outcomes has been a central topic in the political debate for long and has captured the attention of political scientists in the recent past.

In this work we have tried to shed some light on the causal relationship between turnout and electoral outcomes using an IV fixed effects model where we instrument voter turnout with rainfalls. Results show that there is a significant effect of weather on turnout and that the latter generates differential outcomes depending on the parties: the incumbent as well as the traditional parties lose their vote share because of higher turnout (generated by good weather), while the new protest party (Movimento 5 Stelle) benefits from good weather conditions by capturing the preferences of non-habitual voters.

Being worried about the spatial autocorrelation of the residual terms in our main specification, we performed a spatial analysis of the clusters (Provinces or Regions). We computed Moran's I and LISA statistics using several weighting schemes for all the main parties; results suggest that spatial autocorrelation is a residual concern with respect to the identification strategy, thus it is not essential to use a spatial error model.

There are several possible future steps for this work. First, collecting data for a consistent number of municipality elections, we can try to introduce municipality fixed effects that should clean our estimates from any residual source of concern. Indeed, a long panel helps in isolating the single causal effect of turnout on electoral outcomes.

Second, we can collect post elections data surveying the Italian population on the effect of weather on their voting decision. This information would help us in understanding the magnitude of the direct channel of weather on parties' shares, hence disentangling the pure turnout effect.

References

- [Angrist and Pischke., 2009] Angrist, J. and Pischke., J. (2009). *Mostly Harmless Econometrics; an Empiricists Companion*. Princeton.
- [Anselin, 1995] Anselin, L. (1995). Local indicators of spatial associationâ lisa. *Geographical Analysis*, 27(2):93–115.
- [Anselin, 2002] Anselin, L. (2002). Under the hood : Issues in the specification and interpretation of spatial regression models. *Agricultural Economics*, 27(3):247–267.
- [Bassi, 2013] Bassi, A. (2013). The indian rain dance of the incumbent: The effect of weather beyond turnout. *Not published*.
- [Citrin et al., 2003] Citrin, J., Schickler, E., and Sides, J. (2003). What if every- one voted? simulating the impact of increased turnout in senate elections. *American Journal of Political Science* 47 (January): 75- 90.
- [DeNardo, 1980] DeNardo, J. (1980). Turnout and the vote: The joke’s on the democrats. *The American Political Science Review*, 74(2):pp. 406–420.
- [DeNardo, 1986] DeNardo, J. (1986). Does heavy turnout help democrats in presidential elections? *American Political Science Review* 80.
- [Erikson, 1995] Erikson, R. S. (1995). State turnout and presidential voting: A closer look. *American Politics Quarterly* 23 (October): 387-96.
- [Gomez et al., 2007] Gomez, B. T., Hansford, T. G., and Krause, G. A. (2007). The republicans should pray for rain: Weather, turnout, and voting in u.s. presidential elections. *Journal of Politics*, 69(3):649–663.
- [Grofman et al., 1999] Grofman, B., Owen, G., and Collet., C. (1999). Rethinking the partisan effects of higher turnout: So what’s the question? *Public Choice* 99 (June): 357-76.
- [Hansford and Gomez, 2010] Hansford, T. G. and Gomez, B. T. (2010). Estimating the electoral effects of voter turnout. *American Political Science Review*, 104:268–288.

- [Martinez and Gill., 2005] Martinez, M. D. and Gill., J. (2005). The effects of turnout on partisan outcomes in u.s. presidential elections 1960-2000. *Journal of Politics* 67 (November): 1248-74.
- [Nagel and McNulty, 1996] Nagel, J. H. and McNulty, J. E. (1996). Partisan effects of voter turnout in senatorial and gubernatorial elections. *The American Political Science Review*, 90(4):pp. 780–793.
- [Radcliff, 1994] Radcliff, B. (1994). Turnout and the democratic vote. *American Politics Quarterly* 22 (July): 259-76.

A Appendix

A.1 Spatial Autoregressive Model

The decision of not using a Spatial error model has a theoretical foundation that lies in the economic theory behind our analysis.

The use of a Spatial "y" model ("spatially lagged dependent variable", [Anselin, 2002]), such as a spatial autoregressive model (SAR) or a spatial lags model (SL) would have been inconsistent because very difficult to justify with theory: it is obscure how the electoral outcome in a certain municipality influences simultaneously the electoral outcome in other municipalities net of a number of controls. Effectively, it can happen that a general factor (i.e. the regional governance) influences the votes of people living in neighboring municipalities, but this effect should be captured by the introduction of regional fixed effects.

Secondly, a spatial "x" model (SLX) implies the existence of cross regressive terms that affect the outcomes of neighboring places. This in turn implies that the turnout in a certain municipality which is instrumented with weather in that municipality has an effect on the turnout of neighboring municipalities. While it is easy to claim that weather conditions can be similar across municipalities, showing a common pattern in certain areas, it is puzzling that turnout rates in a certain place simultaneously affects turnout of neighbors. Moreover, this effect should be relevant net of the introduction of regional fixed effects and the usual set of controls.

Lastly, we discuss the spatial error model (SE). The use of this model is slightly controversial because in principle it would suit perfectly our case by completely eliminating any concern about the existence of a spatial pattern in the error term of our specification (residuals of IV). Spatially autocorrelated error terms would lead to inconsistent and inefficient estimates, hence the use of SE model would account for this nuisance. The decision on whether to use the SE model has been mainly based on the results of the spatial statistics computed, i.e. Moran's I and LISA; where, the analysis of the spatial dependence of the residuals show that at the Regional level there is no significant spatial pattern that is worth noting, while at Province level we have values of Moran's I from a high 0.2 to a low 0.07. The introduction of the first stage regression residuals of the neighboring places - lagged residuals - in our IV model on the one hand would reduce the spatial autocorrelation

Table 6: Spatial Error Model

VARIABLES	(1) First Turnout	(2) IV PD	(3) IV PDL	(4) First Turnout	(5) IV M5S	(6) IV SC
Rainfalls	-0.00595*** (0.00145)			-0.0139*** (0.00188)		
Turnout		-1.559*** (0.415)	0.352 (0.256)		0.924*** (0.162)	-0.814*** (0.151)
Social Capital	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES
Observations	7,106	7,106	7,106	7,131	7,131	7,131
F test	.	16.82	20.67	.	54.74	35.42
R2	0.708	0.360	0.887	0.996	0.942	0.755

YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

problem by reducing the standard errors, on the other would not cause any significant change in the regression coefficients (because in the case it has a significant impact, it would affect only consistency and efficiency, but not unbiasedness). Since the robust standard errors in our IV specification are not too big and given the Moran's I values, we decide to stick to the normal IV model without the superimposition of any structure (even one of spatial autocorrelation) to the error term.

However, to be completely certain of our choice, we perform a SE model in STATA using Provinces as weights; specifically, we firstly compute the residual of the first stage regression in STATA, and subsequently we use this information together with the weight files created (that weight the residuals of the first stage of neighboring municipalities) to implement IV estimation. Results of the SE model shown in Table 4 do not highlight any striking difference with respect to the benchmark specification.

A.2 Complete tables

Table 7: IV Complete

VARIABLES	(1) Turnout	(2) PD	(3) PDL	(4) UDC	(5) LN	(6) SEL	(7) Turnout	(8) M5S	(9) SC
Rainfalls	-0.00681*** (0.00150)						-0.0147*** (0.00197)		
Turnout		-1.295*** (0.334)	-0.105 (0.261)	0.316* (0.191)	-0.0592 (0.159)	0.164 (0.105)		0.788*** (0.170)	-0.345*** (0.0970)
Social Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,106	7,106	7,106	7,106	7,106	7,111	7,131	7,131	7,131
R-squared	0.205	-0.242	0.379	-0.012	0.745	0.214	0.544	0.147	0.160
F test	.	20.72	20.72	20.72	20.72	20.84	.	55.30	55.30
R2	0.692	0.462	0.882	0.534	0.854	0.647	0.995	0.930	0.836

YES
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: IV Complete Females

VARIABLES	(1) Turnout	(2) PD	(3) PDL	(4) UDC	(5) LN	(6) SEL	(7) Turnout	(8) M5S	(9) SC
Rainfalls	-0.00671*** (0.00168)						-0.0150*** (0.00223)		
Turnout		-1.313*** (0.371)	-0.107 (0.266)	0.321 (0.197)	-0.0600 (0.161)	0.166 (0.108)		0.771*** (0.173)	-0.338*** (0.0972)
Social Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,106	7,106	7,106	7,106	7,106	7,111	7,131	7,131	7,131
F test	.	15.98	15.98	15.98	15.98	16.10	.	45.26	45.26
R2	0.695	0.359	0.882	0.516	0.854	0.637	0.994	0.924	0.825

YES
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: IV Complete Males

VARIABLES	(1) Turnout	(2) PD	(3) PDL	(4) UDC	(5) LN	(6) SEL	(7) Turnout	(8) M5S	(9) SC
Rainfalls	-0.00685*** (0.00152)						-0.0142*** (0.00190)		
Turnout		-1.286*** (0.336)	-0.104 (0.259)	0.314* (0.190)	-0.0588 (0.158)	0.163 (0.105)		0.814*** (0.176)	-0.356*** (0.100)
Social Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES
Altitude	YES	YES	YES	YES	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,106	7,106	7,106	7,106	7,106	7,111	7,131	7,131	7,131
F test	.	20.31	20.31	20.31	20.31	20.40	.	56.11	56.11
R2	0.622	0.442	0.883	0.532	0.853	0.645	0.996	0.928	0.837

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

WORKING PAPERS

2012

- | | |
|---|---|
| <p>1 12 Public-private wage gaps in the period prior to the adoption of the euro: An application based on longitudinal data
Maria Manuel Campos Mário Centeno</p> <p>2 12 Asset pricing with a bank risk factor
João Pedro Pereira António Rua</p> <p>3 12 A wavelet-based assessment of market risk: The emerging markets case
António Rua Luis C. Nunes</p> <p>4 12 Cohesion within the euro area and the U.S.: A wavelet-based view
António Rua Artur Silva Lopes</p> <p>5 12 Excess worker turnover and fixed-term contracts: Causal evidence in a two-tier system
Mário Centeno Álvaro A. Novo</p> <p>6 12 The dynamics of capital structure decisions
Paula Antão Diana Bonfim</p> <p>7 12 Quantile regression for long memory testing: A case of realized volatility
Uwe Hassler Paulo M. M. Rodrigues Antonio Rubia</p> <p>8 12 Competition in the Portuguese Economy: An overview of classical indicators
João Amador Ana Cristina Soares</p> <p>9 12 Market perception of fiscal sustainability: An application to the largest euro area economies
Maximiano Pinheiro</p> | <p>10 12 The effects of public spending externalities
Valerio Ercolani João Valle e Azevedo</p> <p>11 12 Collateral requirements: Macroeconomic fluctuations and macro-prudential policy
Caterina Mendicino</p> <p>12 12 Wage rigidity and employment adjustment at the firm level: Evidence from survey data
Daniel A. Dias Carlos Robalo Marques Fernando Martins</p> <p>13 12 How to create indices for bank branch financial performance measurement using MCDA techniques: An illustrative example
Fernando A. F. Ferreira Paulo M. M. Rodrigues Sérgio P. Santos Ronald W. Spahr</p> <p>14 12 On International policy coordination and the correction of global imbalances
Bruno Albuquerque Cristina Manteu</p> <p>15 12 Identifying the determinants of downward wage rigidity: some methodological considerations and new empirical evidence
Daniel A. Dias Carlos Robalo Marques Fernando Martins</p> <p>16 12 Systemic risk analysis using forward-looking distance-to-default series
Martín Saldías</p> <p>17 12 Competition in the Portuguese Economy: Insights from a profit elasticity approach
João Amador Ana Cristina Soares</p> <p>18 12 Liquidity risk in banking: Is there herding?
Diana Bonfim Moshe Kim</p> |
|---|---|



19|12 Bank size and lending specialization
Diana Bonfim | Qinglei Dai

2013

01|13 Macroeconomic forecasting using low-frequency filters
João Valle | Azevedo, Ana Pereira

02|13 Everything you always wanted to know about sex discrimination
Ana Rute Cardoso | Paulo Guimarães | Pedro Portugal

03|13 Is there a role for domestic demand pressure on export performance?
Paulo Soares Esteves | António Rua

04|13 Ageing and fiscal sustainability in a small euro area economy
Gabriela Castro | José R. Maria | Ricardo Mourinho Félix | Cláudia Rodrigues Braz

05|13 Mind the gap! The relative wages of immigrants in the Portuguese labour market
Sónia Cabral | Cláudia Duarte

06|13 Foreign direct investment and institutional reform: Evidence and an application to Portugal
Paulo Júlio | Ricardo Pinheiro-Alves | José Tavares

07|13 Monetary policy shocks: We got news!
Sandra Gomes | Nikolay Iskrev | Caterina Mendicino

08|13 Competition in the Portuguese Economy: Estimated price-cost margins under imperfect labour markets
João Amador | Ana Cristina Soares

09|13 The sources of wage variation: a three-way high-dimensional fixed effects regression model

Sonia Torres | Pedro Portugal | John T. Addison | Paulo Guimarães

10|13 The output effects of (non-separable) government consumption at the zero lower bound
Valerio Ercolani | João Valle e Azevedo

11|13 Fiscal multipliers in a small euro area economy: How big can they get in crisis times?
Gabriela Castro | Ricardo M. Felix | Paulo Julio | Jose R. Maria

12|13 Survey evidence on price and wage rigidities in Portugal
Fernando Martins

13|13 Characterizing economic growth paths based on new structural change tests
Nuno Sobreira | Luis C. Nunes | Paulo M. M. Rodrigues

14|13 Catastrophic job destruction
Anabela Carneiro | Pedro Portugal | José Varejão

15|13 Output effects of a measure of tax shocks based on changes in legislation for Portugal
Manuel Coutinho Pereira | Lara Wemans

16|13 Inside PESSOA - A detailed description of the model
Vanda Almeida | Gabriela Castro | Ricardo M. Félix | Paulo Júlio | José R. Maria

17|13 Macroprudential regulation and macroeconomic activity
Sudipto Karmakar

18|13 Bank capital and lending: An analysis of commercial banks in the United States
Sudipto Karmakar | Junghwan Mok



2014

- 1|14 Autoregressive augmentation of MIDAS regressions
Cláudia Duarte
- 2|14 The risk-taking channel of monetary policy – exploring all avenues
Diana Bonfim | Carla Soares
- 3|14 Global value chains: Surveying drivers, measures and impacts
João Amador | Sónia Cabral
- 4|14 Has US household deleveraging ended? a model-based estimate of equilibrium debt
Bruno Albuquerque | Ursel Baumann | Georgi Krustev
- 5|14 The weather effect: Estimating the effect of voter turnout on electoral outcomes in Italy
Alessandro Sforza

