

# My Research Paper Title

**POL837 Research Paper**

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This is the abstract of my research paper. It is a brief summary of the main findings and conclusions of the paper. It should be no longer than 250 words.

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I thank Alonso Quijano-Ruiz, M.A. for providing valuable guidance on the empirical approach and the algorithm to obtain daily weather data from the U.S. government National Oceanic and Atmospheric Administration (NOAA).

# **I Introduction**

## **II Background**

## **III Empirical Approach**

### **A Data**

### **B Identification Strategy**

$$y_{it} = \alpha + \tau_t + \theta_j + \beta \text{temp}_{it} + \mathbb{X}'_{it}\gamma + u_{it} \quad (1)$$

## **IV Results**

### **A Baseline Specifications**

Table 1 shows baseline results of the logit fixed effects estimation of Equation 1, which are the baseline empirical models of this paper, implementing only daily weather variables and canton and interview date fixed effects. These results serve as a benchmark comparison for the subsequent models that include additional control variables. Further, models without any

Table 1: Logit coefficients for baseline specifications

	(1)	(2)	(3)	(4)
Min. temperature (°C)	0.018 (0.028)			0.029 (0.027)
Max. temperature (°C)		−0.044*** (0.019)		−0.051*** (0.018)
Avg. temperature (°C)			−0.023 (0.035)	
Precipitation (mm)				−0.004 (0.004)
N	14 118	14 118	14 118	14 118
AIC	18 302	18 297	18 302	18 297
RMSE	0.465	0.465	0.465	0.465
Canton fixed effects	X	X	X	X
Interview date fixed effects	X	X	X	X

Note: Baseline models explaining presidential approval through daily weather variables and canton and interview date fixed effects. Standard errors shown in parentheses are clustered by canton. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

type of political behaviour controls leverage a large sample size. I later estimate models with controls to examine the robustness of these results and the existence of omitted variable bias.

Specification (1) considers only daily minimum temperature as a weather variable, which shows a positive logit coefficient which is not statistically distinguishable from zero at any conventional significance level. Specification (2) only includes maximum daily temperature, which shows a negative logit coefficient that is statistically significant at the 0.01 level. Specification (3) includes my measure of average temperature, again showing no statistically significant relationship between temperature and presidential approval. Specification (4) considers the relationship between both daily temperature variables, to account for interconnected rela-

tionships between these two variables. I also include a daily precipitation variable, to account for the possibility that a more humid rain may have an effect. It is shown that maximum temperature keeps its significance at the 0.01 level, while the other weather variables remain statistically insignificant at any conventional significance level. It is valuable to note that standard errors for these variables are not notably large, which suggests that the lack of statistical significance may not be due to a lack of precision in the estimation process. This is evidence which supports the hypothesis that voters may commit attribution errors when evaluating politician's performance, and tend to evaluate the president worse in days with higher temperatures.

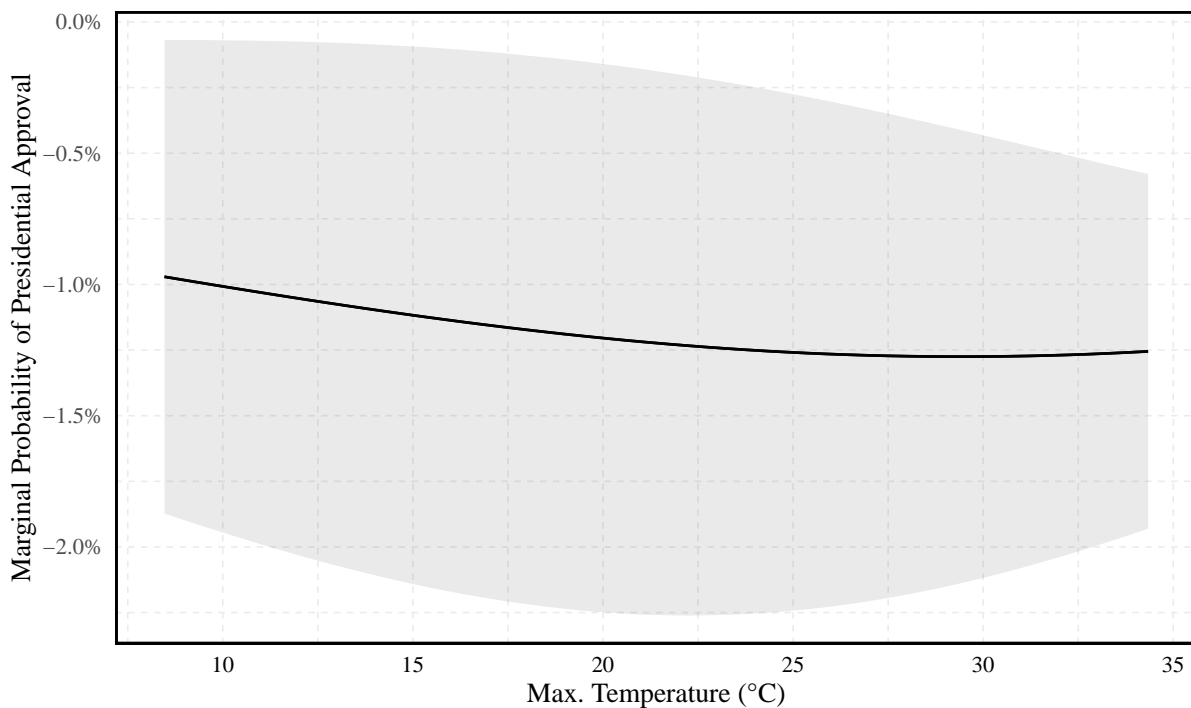


Figure 1: Marginal Effects of Max. Temperature on Presidential Approval

Figure 1 shows the marginal effects plot of maximum temperature on presidential approval

from Specification (4). The plot shows that the marginal probability of presidential approval decreases as maximum temperature increases. At about 10°C of maximum daily temperatures, an additional degree makes survey respondents one percent point less likely to approve of the president. At the highest maximum temperature, which is about 34°C, an additional degree makes survey respondents about 1.3 percent points less likely to approve of the president. These translate to an average marginal effect of -1.1%, as it can be seen in Table A.1 in Appendix A, which displays average marginal effects for all specifications in Table 1.

## B Controlling for political behaviour

Table 2: Logit coefficients for specifications with controls

	(1)	(2)	(3)	(4)
Min. temperature (°C)	0.013 (0.059)			0.014 (0.054)
Max. temperature (°C)		-0.107*** (0.031)		-0.112*** (0.029)
Avg. temperature (°C)			-0.110* (0.060)	
Precipitation (mm)				-0.008 (0.006)
Female	-0.126*** (0.053)	-0.128*** (0.053)	-0.130*** (0.053)	-0.127*** (0.053)
Age	0.004* (0.002)	0.003* (0.002)	0.003* (0.002)	0.003* (0.002)
Rural area	-0.044 (0.112)	-0.057 (0.114)	-0.049 (0.113)	-0.053 (0.116)
Primary education (ref. No education)	0.114 (0.339)	0.112 (0.334)	0.120 (0.334)	0.109 (0.335)
Secondary education	0.134 (0.341)	0.135 (0.336)	0.140 (0.336)	0.130 (0.337)
Higher education	0.065	0.064	0.071	0.059

Table 2: Logit coefficients for specifications with controls (*continued*)

	(1)	(2)	(3)	(4)
	(0.347)	(0.342)	(0.342)	(0.343)
Not in Labour Force	−0.068	−0.063	−0.061	−0.066
	(0.060)	(0.061)	(0.060)	(0.060)
Unemployed	−0.172	−0.179	−0.174	−0.180
	(0.114)	(0.115)	(0.114)	(0.115)
Perceived worse personal economy	−0.404***	−0.406***	−0.402***	−0.407***
	(0.087)	(0.087)	(0.088)	(0.087)
Perceived worse country economy	−0.731***	−0.729***	−0.730***	−0.728***
	(0.087)	(0.087)	(0.087)	(0.087)
Ideology score (0-10)	−0.053***	−0.052***	−0.053***	−0.052***
	(0.016)	(0.016)	(0.016)	(0.016)
Supports democracy	0.405***	0.408***	0.407***	0.407***
	(0.089)	(0.090)	(0.090)	(0.090)
Political pride score (0-7)	0.219***	0.218***	0.217***	0.218***
	(0.022)	(0.022)	(0.022)	(0.022)
Perceives corruption	0.272***	0.278***	0.277***	0.277***
	(0.090)	(0.089)	(0.090)	(0.089)
Tolerates bribes	−0.243***	−0.252***	−0.251***	−0.249***
	(0.092)	(0.091)	(0.091)	(0.091)
Trust in police score (0-7)	0.116***	0.118***	0.117***	0.117***
	(0.021)	(0.021)	(0.021)	(0.021)
Trust in local gov. (0-7)	0.058	0.058	0.059	0.059
	(0.044)	(0.044)	(0.044)	(0.043)
N	5855	5855	5855	5855
AIC	7194	7183	7189	7185
RMSE	0.443	0.442	0.443	0.442
Canton fixed effects	X	X	X	X
Interview date fixed effects	X	X	X	X

Note: Models explaining presidential approval through daily weather variables and con-

trols. Standard errors shown in parentheses are clustered by canton. \*\*\*p<0.01, \*\*p<0.05,

\*p<0.1.

Table 2 shows the results of the logit fixed effects estimation of Equation 1 with additional political behaviour controls. I control for regular demographic and socioeconomic variables, as well as political ideology and behaviour. I control for sex, age and rural status (vs. an urban status reference level). I also compare the effect of different levels of education, where my reference level is no reported education level (0 years of education). For labour market status, I consider four categories, where the reference level is being employed and binary variables for not being the labour force (retired, not working, student, and homemakers.) and being unemployed (looking actively for a job). Personal perceptions of both personal and country economic situations are included too. The country's economic situation is particularly informative, given that it partials out the relationship of economic voting from the weather variables.

I also control for political ideology through a 0-10 scale indicating the degree to which a survey respondent identifies with a more right-wing ideology. Finally, I include variables for support for democracy, as measured by the classic "Churchill" definition, political pride, corruption perceptions, corruption tolerance (bribes) and trust scores for police and local government. By including these controls, I aim to address any potential omitted variable bias that could be present from the underlying model in Table 1. The literature has pointed to several factors that can interact with voters' attribution processes; these could act as confounders in my estimation procedure and should be controlled for to the extent that is possible.

Specifications (1) through (4) in Table 2 show the results of the specifications in Table 1, but

with the addition of the political behaviour controls. These results show that the sign and statistical significance of daily maximum temperature remain unchanged, which suggests that the relationship between temperature and presidential approval is robust to the inclusion of these controls. Further, I also find a negative and statistically significant relationship between presidential approval and my measure of average temperature in specification (3), which was not present in the baseline models.

With regard to the political behaviour controls, I find that the relationship between presidential approval and the political behaviour controls is consistent with the literature. Those who perceive the country's economic situation as worse are less likely to approve of the president, as are those who perceive the country as more corrupt and those more tolerant of bribes. The former result is consistent with most of the literature on economic voting. Further, I find that support for democracy, police, and political pride are positively related to presidential approval, while the opposite is true for those who are more right-wing and those who are unemployed. No demographic or socioeconomic variables are statistically significant at any conventional significance level other than sex (female).



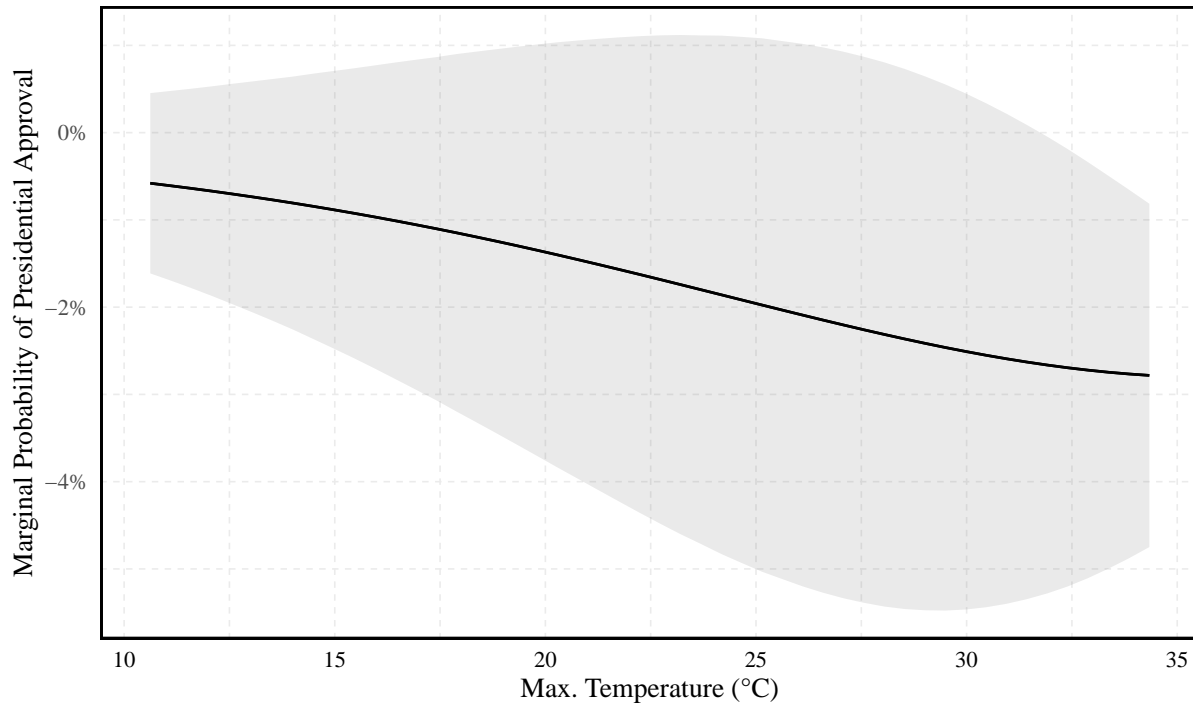


Figure 2: Marginal Effects of Max. Temperature on Presidential Approval with Controls

Above, Figure 2 the marginal effects plot of maximum temperature on presidential approval from Specification (4) with controls is shown. Comparing to Figure 1, it is shown that the inclusion of controls does not change the decreasing marginal probability of presidential approval acrossing maximum temperature. The relationship is in fact increased after controls are included, suggest a downward bias in the baseline models. The average marginal effect of maximum temperature on presidential approval is -2.2%, as it can be seen in Table A.2 in Appendix A, which displays average marginal effects for all specifications in Table 2.

## C Heterogenous effects of temperature on presidential approval

In this subsection I allow for heterogeneity in the effect of temperature on presidential approval.

Table 3 below follows the general model below, which includes an interaction term.

$$y_{it} = \alpha + \tau_t + \theta_j + \beta \text{ temp}_{it} + \mathbb{X}'_{it}\gamma + \delta \text{ temp}_{it} \times g_{it} + u_{it} \quad (2)$$

All variables are defined as in Equation 1, but I include an interaction term between temperature and any explanatory variable  $g_{it}$ , which was only contained in the vector of controls  $\mathbb{X}'_{it}$ . In this section, I explore important covariates that can interact with temperature to affect presidential approval, which are region<sup>1</sup>, perceived economic situations for both the country and the respondent, and political ideology. If the interaction term is statistically significant, it would suggest that the effect of temperature on presidential approval is not constant across the population, and that the relationship between temperature and presidential approval is conditional on the value of the covariate.

Table 3: Logit coefficients for models with interaction terms

	(1)	(2)	(3)	(4)
Min. temp. (°C)	0.000 (0.057)	0.025 (0.057)	0.010 (0.059)	−0.050 (0.070)
Max. temp. (°C)	−0.082*** (0.037)	−0.117*** (0.034)	−0.092*** (0.033)	−0.020 (0.045)
Costa × Min. temp. (°C)	0.061 (0.043)			

<sup>1</sup>I did not include region as a explanatory variable in other models since it would induce perfect collinearity. See the background section for more information on Ecuadorian regions.

Table 3: Logit coefficients for models with interaction terms (*continued*)

	(1)	(2)	(3)	(4)
Sierra $\times$ Min. temp. ( $^{\circ}\text{C}$ )	0.037 (0.056)			
Costa $\times$ Max. temp. ( $^{\circ}\text{C}$ )	-0.026 (0.054)			
Sierra $\times$ Max. temp. ( $^{\circ}\text{C}$ )	-0.065* (0.033)			
Worse country econ. $\times$ Min. temp. ( $^{\circ}\text{C}$ )		-0.031 (0.022)		
Worse country econ. $\times$ Max. temp. ( $^{\circ}\text{C}$ )		0.018 (0.030)		
Worse personal econ. $\times$ Min. temp. ( $^{\circ}\text{C}$ )			-0.019 (0.023)	
Worse personal econ. $\times$ Max. temp. ( $^{\circ}\text{C}$ )			0.005 (0.032)	
Ideology score $\times$ Min. temp. ( $^{\circ}\text{C}$ )				0.011*** (0.005)
Ideology score $\times$ Max. temp. ( $^{\circ}\text{C}$ )				-0.014*** (0.006)
N	5855	5855	5205	5205
AIC	7182	7185	6375	6368
RMSE	0.442	0.442	0.444	0.444
Canton fixed effects	X	X	X	X
Interview date fixed effects	X	X	X	X

Note: Models allowing for heterogeneous effects of temperature on presidential approval.

Standard errors shown in parentheses are clustered by canton. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

## Appendix A: Average Marginal Effects

Table .2: Average partial effects for models with controls in Table 2

	(1)	(2)	(3)	(4)
Min. temperature (°C)	0.002 (0.011)			0.003 (0.010)
Max. temperature (°C)		−0.021*** (0.008)		−0.022*** (0.007)
Avg. temperature (°C)			−0.021 (0.014)	
Precipitation (mm)				−0.001 (0.001)
Female	−0.025*** (0.011)	−0.025*** (0.011)	−0.025*** (0.011)	−0.025*** (0.011)
Age	0.001* (0.000)	0.001* (0.000)	0.001* (0.000)	0.001* (0.000)
Rural area	−0.009 (0.022)	−0.011 (0.023)	−0.010 (0.022)	−0.010 (0.023)
Primary education (ref. No education)	0.022 (0.067)	0.022 (0.065)	0.024 (0.066)	0.021 (0.066)
Secondary education	0.026 (0.067)	0.027 (0.066)	0.028 (0.066)	0.026 (0.066)
Higher education	0.013 (0.068)	0.013 (0.067)	0.014 (0.068)	0.012 (0.068)
Not in Labour Force	−0.013 (0.012)	−0.012 (0.012)	−0.012 (0.012)	−0.013 (0.012)
Unemployed	−0.034 (0.023)	−0.035 (0.023)	−0.034 (0.023)	−0.035 (0.023)
Perceived worse personal economy	−0.081*** (0.019)	−0.081*** (0.017)	−0.081*** (0.019)	−0.082*** (0.019)
Perceived worse country economy	−0.151*** (0.019)	−0.150*** (0.018)	−0.150*** (0.018)	−0.150*** (0.018)
Ideology score (0-10)	−0.010*** (0.003)	−0.010*** (0.004)	−0.010*** (0.004)	−0.010*** (0.003)
Supports democracy	0.081*** (0.019)	0.081*** (0.016)	0.081*** (0.020)	0.081*** (0.019)
Political pride score (0-7)	0.043*** (0.005)	0.043*** (0.005)	0.043*** (0.005)	0.043*** (0.005)
Perceives corruption	0.054*** (0.020)	0.055*** (0.017)	0.055*** (0.020)	0.055*** (0.020)
Tolerates bribes	−0.048*** (0.019)	−0.050*** (0.018)	−0.050*** (0.019)	−0.049*** (0.019)
Trust in police score (0-7)	0.023***	0.023***	0.023***	0.023***

	(0.005)	(0.004)	(0.004)	(0.004)
Trust in local gov. (0-7)	0.011	0.011	0.012	0.011
	(0.009)	(0.009)	(0.009)	(0.009)
N	5855	5855	5855	5855
AIC	7194	7183	7189	7185
RMSE	0.443	0.442	0.443	0.442

Note: Average partial effects for models explaining presidential approval through daily weather variables, canton and interview date fixed effects, and political behaviour controls. Standard errors shown in parentheses are clustered by canton. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table .1: Average partial effects for baseline models in Table 1

	(1)	(2)	(3)	(4)
Min. temperature (°C)	0.004 (0.006)			0.006 (0.006)
Max. temperature (°C)		−0.010*** (0.004)		−0.011*** (0.004)
Avg. temperature (°C)			−0.005 (0.008)	
Precipitation (mm)				−0.001 (0.001)
N	14 118	14 118	14 118	14 118
AIC	18 302	18 297	18 302	18 297
RMSE	0.465	0.465	0.465	0.465

Note: Average partial effects for baseline models explaining presidential approval through daily weather variables and canton and interview date fixed effects. Standard errors shown in parentheses are clustered by canton. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.