"Let them Eat Cake": Drought in 1788 and political outcomes in the French Revolution*

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Abstract

The paper studies whether a severe drought in 1788 impacted political outcomes during the French Revolution. I construct a community-level dataset with information on local drought severity and local political outcomes in 1789. Results indicate that the drought had political impacts: 1) Those more affected by the drought more often participated in peasant revolts against the feudal system; and 2) they had higher demand for institutional change as expressed in the 'lists of grievances'. The results provide evidence on specific ways in which the drought impacted the French Revolution, a milestone in the democratization of Western Europe. They also contribute to our understanding of the political impacts of weather shocks, one of the defining features of climate change.

1 Introduction

In 1788, a drought hit France and caused severe crop failure. Grain prices soared. A growing part of the population went hungry. As France was already in deep economic and political crisis, the French king Louis XVI had limited means to import grain

*The sentence "Let them eat cake" (fr. "Qu'ils mangent de la brioche") was attributed to Marie-Antoinette (1755-1793), wife of the French King Louis XVI, to illustrate the selfishness and ignorance of the French upper class. In reality, Jean-Jacques Rousseau wrote this sentence already in 1765 in *Confessions*: "At length I remembered the last resort of a great princess who, when told that the peasants had no bread, replied: "Then let them eat brioches."

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from aboard or to quell public discontent using military means. While grain prices continued to rise public discontent grew. By summer 1789, open revolt against the feudal *ancien régime* had broken out. Several historians have hypothesized that the drought of 1788 and ensuing harvest failure affected the course of the French Revolution (Le Roy Ladurie, 1971; Lefebvre and White, 1973; Neumann, 1977; Neumann and Dettwiller, 1990).

In this paper, I provide an econometric test of this hypothesis. In particular, I examine whether the drought affected the French Revolution by impacting 1) the outbreak of peasant revolts in the summer of 1789, and 2) demand for institutional change in the *cahiers de doléances* (lists of grievances).

For this purpose, I construct a canton-level data set for all 3,500 French cantons with information on local drought severity in the growing season of 1788 and local political outcomes during the French Revolution. To measure drought, I obtain information on local growing-season temperature and precipitation from Luterbacher et al. (2004) and Pauling et al. (2006). These data have been reconstructed from instrumentally-measured weather records, historical sources, and geological archives such as tree ring series, ice core data and lake sediments.

In the first part of the analysis, I test whether peasants in areas more affected by the drought were more likely to participate in uprisings. In the summer of 1789, shortly before the new harvest was to be brought in, famished peasants rose in revolt against their landlords. The peasants were enraged by the fact that they - many close to starvation - owed excessive taxes to their landlords. Their landlords, in contrast, were exempt from all taxation and also enjoyed numerous other political and economic privileges.[1] The peasants attacked their landlords' castles and burned charters enshrining these privileges.

Using data on the exact locations of around 300 peasant revolts, I show that areas with more severe drought were significantly more likely to experience peasant revolts. I also show that the drought had particulary large effect on early revolts from where protests spread to other parts of France. These results are consistent with economic theory. A negative economic shock increases the probability of revolt among the disenfranchised by decreasing opportunity costs of revolt (Acemoglu and Robinson, 2001; 2006). These violent revolts mattered for the course of the French Revolution because they were one of the factors that finally coerced the political elite into committing to comprehensive institutional reform. In August 1789, "[...] in an effort to appease the peasants and to forestall further rural disorders", the National Assembly formally abolished the feudal regime (Merriman, 2010, 447; Neely, 2008,

[1] These privileges (*privilèges*) were a hallmark of the French feudal system.

80).

In the second set of results, I investigate the impact of the drought on demands for institutional change in the lists of grievances. The lists of grievances contain the results of a nationwide, locality-level survey, commissioned by King Louis XVI, on the French population's demands for change, including demands for institutional change. The survey was undertaken in the spring of 1789, *after* the drought and *before* the outbreak of the revolution, in preparation of the Estates General.[2] The drought may have affected the content of the lists of grievances if those more affected by the drought had better information on the inadequacy of the existing regime to protect the common population from such calamities.

Using information on more than 1,100 demands for institutional changes from more than 600 lists of grievances, I document that commoners in areas hit more severely by drought conditions had significantly higher demand for democratic change, e.g., for eliminating certain privileges of the nobility, for establishing free municipal elections, and for creating a free press. In economic theory, manifestations of demand for democracy by the disenfranchised increase incentives of the ruling elite to agree to institutional reform (Acemoglu and Robinson 2001; 2006). During the French Revolution, growing demand for institutional change in general and the content of the lists of grievances in particular gave the representatives of the Third Estate at the Estates General in Paris, later at the National Assembly, a clear mandate to fight for more participatory institutions and a more equitable distribution of political and economic rights.

The paper contributes to the literature examining the relationship between the drought of 1788 and the French Revolution (Le Roy Ladurie, 1971; Lefebvre and White, 1973; Neumann, 1977; Neumann and Dettwiller, 1990). It provides the first econometric test of the hypothesis that the drought influenced the course of the French Revolution, in particular the outbreak of peasant revolts, and the content of the lists of grievances. In addition, I show that the effect of the drought was particularly large for the crucial first revolts that later on spread across France. It also contributes to more recent literature addressing important questions in economics using rich French historical data from the French Revolution or from later time periods (Franck, 2016; Squicciarini and Voigtlaender, 2016; Squicciarini, 2019; Franck and Michalopoulos, 2017).

The paper further contributes to the literature on the political impacts of weather

[2]The Estates General was an assembly of representatives of the three estates (the First Estate representing the clergy, the Second Estate representing the nobility, and the Third Estate representing all commoners) that met in Paris in May 1789 to debate ways out of the country's deep political and financial crisis.

shocks, one of the defining features of climate change. So far, this literature has focused on the impact of weather shocks on civil wars, uprisings, and other forms of violence (Dell, 2012; Spoerer and Berger, 2001; Chaney, 2013; Belloc et al., 2016; Zhang et al., 2006; Brückner and Ciccone, 2011; Burke and Leigh, 2010; Miguel et al., 2004; Burke et al., 2009; Bai and Kung, 2011). Hsiang and Burke (2014) provide a useful overview. I add to this literature by documenting that the French Revolution, one of the milestones of democratization of Western Europe, has been affected by a weather shock. I further show that the weather shock did not only increase uprisings, but that it also increased demand for democracy in the lists of grievances. Demand for democracy is an important building block of transitions towards democracy. Increases in manifestations of demand for democracy caused by a weather shock may be a relevant mechanism underlying the relationship between weather shocks and democratic transitions documented in Brückner and Ciccone (2011).

2 Historical Background

In the 1780s, France was in deep economic and political crisis for a number of long- and medium-term reasons. After years of warfare and an exuberant lifestyle at the French court, France's financial resources were exhausted.[3] The highly inefficient tax system exempted the rich and overburdened the poor. It was firmly in the hands of the nobility and did not generate sufficient income for the state. When the French king sought to reform the rigid and inequitable tax system, which would have reduced the nobility's income from taxation, a lengthy dispute between the king and the French nobility ensued. The members of French nobility were not willing to agree to reform unless the king considerably increased their political power (Hoffman and Rosenthal, 2000).

80 percent of the French population worked in agriculture as small share croppers or day labourers who lived just above subsistence level. The French economy was heavily reliant on the agricultural sector. The feudal institutions governing the agricutlural sector left little room for innovation. It was technologically backward compared, for example, to the English agricultural sector. The famine resulting from the catastrophic harvest of 1788 further reduced tax revenues and hit a population whose meagre resources were depleted from years of economic crisis (Kaiser and

[3]The wars include the War of the Austrian Succession (1740-48), the Seven Years' War (1756-63), and the American War of Independence (1775-1783). Unlike the English monarchy, France lacked a financial institution such as the Bank of England, where it could have borrowed at lower interest rates (Norberg, 1994: 270; Bossenga, 2001: 38 ; Hoffman and Rosenthal, 2000: 442).

Van Kley, 2010, 5f.).

2.1 Lists of grievances

In spring 1789, the French king Louis XVI was under immense political and economic pressure. To avert state bancrupcy he had to solve the stalemate with the French nobility over the reform of the tax system. In spring 1789, the French king Louis XVI saw himself forced to convene the Estates General. It was the first time since 1614. The Estates General were an assembly of representatives of the three estates (clergy, nobility, and commoners) with a purely consultatory function. The plan of both the king and the nobility was to win the clergy and commoners over to take their respective side.

In preparation of the Estates General, the King asked the nobility, the clergy, and the male tax-paying population of the Third Estate[4] to hold town hall meetings at the parish or town level, and to produce lists of grievances (*cahiers de doléances*) (Merriman, 2010, 443). These grievances could include any topic concerning all spheres of French public life. The estates then elected representatives at the *bailliage* (electoral-district) level who took these lists to the Estates General in Paris.[5] Starting in May 1789, representatives of all Estates advocated for these requests at the Estates General in Paris.

2.2 Peasant revolts

Hopes had been high among commoners that the Estates General would establish a more equitable and participatory political and economic system. These hopes were soon disappointed. In July 1789, any sort of major political reform remained elusive, and frustration grew among the common population. Besides, the population was under enormous economic pressure due to the failed harvest of 1788 (Lefebvre and White, 1973). "As the price of bread rose to its highest points [...], the interaction between subsistence problems and the stimulated popular awareness of politics became explosive," (Campbell, 2006, 32).

As mentioned before, a large part of the agricultural sector consisted of small peasant cultivators who lived just above self-sufficiency, with little in the way of a financial cushion. In July 1789, shortly after the fall of the Bastille, peasants organized armed protests against their landlords, against the heavy tax that they owed to them and the inequitable distribution of economic and political rights (Lefebvre

[4]That is the male tax-paying population above 25 years of age.

[5]The lists were also summarized at the bailliage level. I use the original locality-level lists.

and White, 1973, 118). The financial crisis limited the king's means to either appease or subdue these uprisings. No longer able to pay for grain imports and unable to pay military troops, the king no longer could rely on the two main strategies he had used in the past to avert social unrest.

By August 1789, the majority of the National Assembly, nobility, clergy, and the Third Estate alike, wished to restore public order. Many sympathized with the peasants' request to abolish both the peasants' feudal obligations and the nobles' economic and political privileges; others, whose properties were attacked, were willing to make concessions to limit further damage (Neely, 2008, 80). "On August 4, 1789, in an effort to appease the peasants and to forestall further rural disorders, the National Assembly formally abolished the "feudal regime," including seigneurial rights [and] renounced privilege, the fundamental organizing principle of French society," (Merriman, 2010, 447).

3 Data and variables

To examine whether the drought of 1788 impacted political outcomes in 1789, I construct a cross-section data set for 3,666 French cantons[6] with information on local drought exposure, on the outbreak of peasant revolts, on local demand for instititutional change as expressed in the lists of grievances, on the locations of political societies, and on control variables.

3.1 Data on drought in 1788

The European Drought Observatory (EDO, 2012) define drought as a lack in water supply that results from a lack in precipitation, from high temperatures that increase evapotranspiration, or from both.[7] Following this definition, I measure drought severity based on local growing-season temperature in 1788 and local growing-season precipitation in 1788, as well the interaction of the two variables. I obtain information on temperature and precipitation in the growing season of 1788 from Luterbacher et al. (2004) and Pauling et al. (2006).[8] These are gridded data with grid cells measuring about 50 by 50 kilometers. The data have been reconstructed based on

[6]The canton is a small administrative division of the French state, one level below the *département*. The 3,666 cantons in the dataset are all cantons in mainland France. Other territories, e.g. Corsica and French overseas territories (France d'outre-mer) were excluded because most data were not available for these areas.

[7]In addition, the interaction effect of temperature and precipitation on crop yields is well-documented (Leng et al., 2016; Matiu et al., 2017; Ray et al., 2015).

[8]The growing season is defined as the spring and summer season spanning the months March to August. Winter spans the months December to February.

instrumentally-measured weather data, historical records, and geological archives, such as tree-ring series and ice cores.

To capture the effect of the local weather shock rather than the effect of a canton having a warmer and drier climate in general, I use deviations from local long-term means in temperature and precipitation as explanatory variables. Following Dell (2012), I define deviations from the long-term temperature mean in the growing season of 1788 as the ratio of growing-season temperature in 1788 over the long-run growing-season temperature mean (1750 to 1800).[9] Deviations from the long-run precipitation mean in the growing season of 1788 are defined accordingly (see equations 1 and 2). I exploit the fact that – while long-term average temperature and precipitation remain relatively stable over time – the deviation from long-term mean temperature and precipitation is exogenous.

$$Temperature_{cr} = \frac{Temperature_{1788}}{\frac{1}{51}\sum_{1800}^{1750} Temperature_t} \tag{1}$$

$$Precipitation_{cr} = \frac{Precipitation_{1788}}{\frac{1}{51}\sum_{1800}^{1750} Precipitation_t} \tag{2}$$

Table 1 shows summary statistics. Growing-season temperatures in 1788 were up by between 2.5 and 15 percent. Growing-season precipitation levels in 1788 were between 25 percent below the long-term mean and 3 percent above the long-term mean. Figure 1 shows a map of the distribution of temperature and precipitation deviations in the growing season of 1788. Different parts of France were differently affected by the drought. Areas in central France and Eastern France were especially affected (in red and orange). Northwestern France was especially affected by low precipitation (in beige), whereas Southeastern France was especially affected by high temperatures (in yellow).

3.2 Data on peasant uprisings

To measure whether a canton experienced a peasant revolt in the summer of 1789, I collect data on the exact locations of 299 peasant revolts during the summer of 1789 using information from Lefebvre and White (1973, 4). Based on place names,

[9] Table 8 shows that results are robust to the use of other definitions of long-term temperature and precipitation.

I identify geographic coordinates for each peasant revolt. I then create an indicator variable, *PeasantRevolt*, that is one if canton c in region r experienced a peasant revolt in 1789, 0 otherwise. Figure 1 provides a map of peasant revolts. They touched most parts of France, except for Brittany in northwest France. Panel 2 in Table 1 shows that the share of cantons that experienced a peasant revolt is higher among relatively hot cantons (with above-median growing-season temperature deviation) compared to relatively cool cantons (with below-median growing-season temperature deviation).

3.3 Data from the lists of grievances

I collect information on demands for institutional change from the lists of grievances (*cahiers de doléances*). I base my analysis on one of the most comprehensive collections of lists of grievances compiled by the French Parliamentary Archive (Mavidal and Colombey, 1870). It contains about 600 lists of grievances, including the name of the place where the list was produced, the estate (nobility, clergy, Third Estate), and an index of topics raised in the lists of grievances. Topics include a wide range of matters from local to national affairs touching virtually all spheres of public life: demands to repair local churches and roads, improve other local infrastructure (e.g., to relocate abattoirs and cemeteries), tighten religious practice (e.g., punish blasphemy in court), and change the organization of schools.

Based on the index, I identify five demands to abolish or reform political institutions or to introduce more participatory institutions. These institutions determine political rights of commoners (the third estate), of the nobility, and the king:

Political representation of commoners and access to all professions The political and economic rights of the Third Estate (commoners) were minimal in pre-Revolutionary France. Certain lists of grievances demand the political representation of the Third Estate, and access to all professions. In particular, they demanded that the number of representatives of the Third Estate, that represented 96 percent of the population, equals the number of both the representatives of the first (clergy) and of the second (nobility) estates at the Estates General.

Demands for a free press Under the *ancien régime*, all publications were under the scrutiny of royal censorship. Any publications with political content were strictly prohibited. The lists of grievances contain demands to establish a free press and to curtail or to end royal censorship.

Election of municipal officers Municipal officers were regularly appointed by the king or regional ruler, often in exchange for a considerable financial contribution. The appointee then had the right to collect taxes from the local population. In most cases, he took full advantage of this possibility by extracting taxes irrespective of the living conditions of the local population. The lists of grievances contain demands to appoint these municipal officers by election.

Abolish feudal privileges of the nobility Feudal privileges were the cornerstone of the French feudal system (*privilèges*). They enshrined the right of the nobility to be exempted from most taxes. They also enshrined the nobility's rights to levy taxes and to administer the law on their lands (*droit seigneurial*). The nobility further had the right to be judged by certain courts only (*committimus*).[10] Feudal privileges enshrined the exclusion of commoners from all political and many economic activities.

Abolish the king's right to issue *lettres de cachet* In the ancien régime, the king had the right to issue *lettres de cachet*. These were letters, signed by the king, enforcing arbitrary decisions and judgments. They were often used to silcence and imprison political adversaries without trial. There was no possibility to appeal against these letters, and they became symbols of the king's unlimited political power.

I geo-reference the locations of all places for which a list of grievances is available, and identify among them all places with a demand in any of these categories. Based on this information, I create six variables: I define *Number of Demands for Insitutional Change* as the number of demands described above. Then, I create five indicator variables, one for each demand. The indicator variable *political representation* takes a value of one for canton c if a location in canton c demanded better political representation of the third estate or access to all professions, and zero otherwise. The indicator variable for demands 2) to 5) are defined accordingly. Figure 2 presents the share of cantons with lists of grievances that demand any (1) or a specific type of institutional change (2 to 6). Almost 50 percent of cantons demand at least one institutional change. Almost forty percent include demands to abolish feudal privileges of the nobility. About 30 percent demand to abolish the king's right to issue the lettres de cachet. 22 percent containt demands to improve the political representation of the third estate. 21 percent contain demands for press freedom,

[10] It was the nobility's way of circumventing the French justice system. As a result, it was virtually impossibly for the common population to obtain justice.

and about 16 percent demand the introduction of local municipal elections.

Table 1 shows that relatively hot cantons (with temperature deviations above the median) have a higher average number of demands for institutional change (1.3 compared to 0.9) compared to relatively cold cantons (with temperature deviations below the median). The share of cantons with individual demands for institutional change are higher among cantons with temperature deviation above median for five out of six demands.

Lists of grievances are available for 608 out of 3666 cantons. Figure 3 shows the geographic distribution of the lists of grievances. It is relatively even across France with two clusters around Paris and Aix-en-Provence. Later in the paper, I show results including and excluding these two clusters from the sample.

3.4 Data on control variables

I collect data on an array of factors that may have affected outcome variables. If these were also correlated with the weather variables, then excluding them would bias results. I include information on population density in 1789, routes of postal and other forms of communication in 1789, salt tax rates in 1789, literacy in the 17th century, whether a canton is located close to Paris in the Ile-de-France region, literacy before 1789, and seven region fixed effects based on the distribution of language groups within France that proxy for an array of socio-cultural and economic characteristics.

More densely populated areas may have been more likely to experience peasant revolts or to establish a political society because communication costs between peasants or citizens was lower. In pre-industrial times, population density is also a useful proxy for an area's affluence. I collect information on population density in 1789 from Clout (1977, 217). The measure is provided in seven categories: below 500 inhabitants per square league, between 500 and 750 inhabitants per square league, between 750 and 1000 inhabitants per square league etc., until above 1750 inhabitants per square league.

Cantons closer to routes of postal and other forms of communication may have received more information on the political situation which may have affected their political actions. In areas with very low population density, it may have been difficult to establish a political society. It is defined as the distance to the closest postal route or other routes that could have facilitated communication: navigable rivers, canals, or well-paved roads. This variable is also an important control variable for a canton's economic situation. Relatively affluent areas are likely to be better connected than relatively poor ones. Information on the routes of communication in

1789 is available for four categories: postal routes, navigable rivers, canals, and other important routes (Bonin and Langlois, 1987, 15). I digitize the map and compute each canton's distance from the closest route.

A canton's level of education may also have affected outcomes. More educated inhabitants may have been more aware of the importance of institutions and may have been more likely to demand institutional changes in their list of grievances. They may also have been more aware of the importance of citizen political engagement and may therefore have founded political societies. I obtain information on literacy in 1690 from Clout (1977, 150). This information is provided in ten literacy categories.

The high salt tax was a particularly important burden to French citizens before and during the French Revolution. In 1789, tax rates varied substantially across provinces within France. The highest tax rate applied to the northern center of France. Other provinces, such as Brittany, were exempt. These tax rates are reflected in the salt prices that are approximately thirty times higher in northern central France compared to Brittany. As citizens in areas with higher salt tax rates may have been more likely to engage in uprisings, I include a control variable on the salt tax rate in all specifications. I digitize information on the distribution of salt tax rates in 1789 from Shepherd (1926).

I add an indicator variable that is one if a canton is located within the Ile-de-France, the region around Paris. The special political status of the Ile-de-France as royal domain (as opposed to being subjected to a ruler from the nobility) and the proximity to Paris may have affected the area's general economic situation and political activity in 1789.

Finally, I include seven region fixed effects in all main specifications. I define seven regions based on the distribution of language groups in France: the region of the *Langues d'Oil* in northern France and the region of the *Langues d'Oc* in southern France, Brittany (Breton), the Savoy region in the East of France (Italian), the Basque region in the southwestern France, the Catalan region in southern France, and Alsace in Northeastern France (German). These languages were spoken by a majority of inhabitants in the corresponding region in 1789 and were an observable characteristic that proxy for an array of cultural, economic, and political particularities.

4 Empirical analysis and results

In this section, I examine the impact of drought in 1788 on two political outcomes: the outbreak of peasant revolts in the summer of 1789 and the demand for institutional change as expressed in the lists of grievances in the spring of 1789.

4.1 Peasant Uprisings

First, I examine the relationship between the drought of 1788 and peasant uprisings in the summer of 1789. To estimate whether the drought impacted the outbreak of peasant revolts I estimate the following equation:

$$\begin{aligned} PeasantRevolt_{cr} &= \alpha + \beta Temperature_{cr} + \gamma Precipitation_{cr} \\ &+ \delta Temperature * Precipitation_{cr} \\ &+ RegionFE_r + X_{cr} + \epsilon_{cr} \end{aligned} \tag{3}$$

where $PeasantRevolt_{cr}$ is an indicator variable that is one for canton c if an uprising took place in this canton, and zero otherwise. Drought conditions are captured by the interaction of the two following weather variables: growing-season temperature (deviation of the growing-season temperature of 1788 from the long-term mean), and growing-season precipitation (deviation of the growing-season precipitation of 1788 from the long-term mean, see section 3.1). $RegionFE_r$ is a full set of region fixed effects; X_{cr} is a set of control variables (see section 3.4 for a detailed description of control variables) and ϵ_{cr} is the error term. Standard errors are adjusted for 299 clusters at the grid level of the underlying temperature data set.

I show results in Table 2. In column 1, I estimate the specification without any controls, and then introduce controls one by one. Results show a significant relationship between drought conditions in the growing season 1788 and the outbreak of peasant revolts. The coefficient sizes and significance levels remain similar with the introduction of the control variables.

Figure 4 depicts the relationship between temperature and precipitation and outcomes in a contour plot. The contour plot shows the predicted effect of temperature on precipitation on the outcome. It illustrates that the combination of high temperature deviations with low precipitation deviations predicts an increase in revolt incidence. The coefficients indicate that an increase in growing-season temperature by one standard deviation where precipitation is low (at the 25th percentile) raises the probability of peasant revolt by 5 percentage points (an increase of 51 percent

from the sample mean of 8 percent, significant at 1 percent).

Lefebvre and White (1973) discribe that revolts first broke out in a small number of places and then spread from there all over France. In Table 3, I examine whether the drought had a role in triggering these early revolts. The data on revolt outbreaks in Lefebvre and White (1973) include information on the relative timing of the revolt. I create two indicator variables. $EarlyPeasantRevolt_{cr}$ is an indicator variable that is one for canton c if it experienced one of the 50 percent earliest revolts. $LatePeasantRevolt_{cr}$ is an indicator variable that is one for canton c if it experienced one of the 50 percent later revolts. Table 3 shows that the overall effect that we observe in Table 2 is driven by the drought's effect on the earlier revolts.

The result that the drought impacted peasant uprisings is consistent with findings from other settings on the relationship between weather shocks and political violence (Dell, 2012; Spoerer and Berger, 2001; Chaney, 2013; Belloc et al., 2016; Zhang et al., 2006; Brückner and Ciccone, 2011; Burke and Leigh, 2010; Miguel et al., 2004; Burke et al., 2009; Bai and Kung, 2011) and with economic theory. Acemoglu and Robinson, (2001; 2006) show that a negative economic shock increases the probability of revolt among the disenfranchised by decreasing opportunity costs of revolt.

The peasant revolts were a significant event in the course of the French Revolution. They were one of the factors that finally - after months of discussions - coerced the political elite at the National Assembly into committing to comprehensive institutional reform. In August 1789, "[...] in an effort to appease the peasants and to forestall further rural disorders", the National Assembly formally abolished the feudal regime (Merriman, 2010, 447; Neely, 2008, 80).

4.2 The *Cahiers de Doléances* and demand for institutional change

Then, I analyze the impact of drought of 1788 on demand for institutional changes as expressed in the lists of grievances.[11] I examine this relationship by using the following specification:

$$\begin{aligned} Demands_{cr} &= \alpha + \beta Temperature_{cr} + \gamma Precipitation_{cr} \\ &+ \delta Temperature * Precipitation_{cr} \\ &+ RegionFE_r + X_{cr} + \epsilon_{cr} \end{aligned} \tag{4}$$

where $Demands_{cr}$ represents six outcome variables. The first variable is the number of demands for institutional change in canton c.

[11] Shapiro et al. (1998) shows the usefulness of the lists of grievances as a historical source.

The other five indicator variables capture five types of demands for institutional change: 1) to improve the political representation of the Third Estate and grant access of commoners to all professions, 2) to establish a free press and end royal-censorship, 3) to introduce municipal elections, 4) to abolish feudal privileges of the nobility, 5) to abolish the King's right to issue *lettres de cachet* (see section 3.3 for a description of these demands). The indicator variable *Political Representation* takes a value of one for canton c if a location in canton c demanded better political representation of the third estate and acces of commoners to all professions in their list of grievance, and zero otherwise. The indicator variable for demands 2) to 5) are defined accordingly. I base the analysis only on lists produced by the Third Estate. Except for the outcome variable, the specification is identical to specification 3 in Section 4.1.

Column 1 of Table 4 shows a significant relationship between drought conditions and the number of demands for institutional change. Areas with more severe drought conditions listed more demands for democratic change in their lists of grievances. In Figure 5, I visualize the estimated effects of temperature and precipitation deviations in a contour plot. It shows that the interaction between high temperature deviations and low precipitation deviations predicts a higher number of demands for institutional change to be included in the lists of grievances. This is consistent with results in the previous section showing that the drought increased peasant revolts. A smaller increase in the number of demands is also predicted for areas with high precipitation and low temperatures, which seems surprising. On the other hand, this could reflect the effects of a hail storm that hit France on July 13, 1788. Hail is a form of precipitation and is accompanied by low temperatures. While historians have argued that the effects of the hailstorm were much less detrimental than the effect of the drought (Le Roy Ladurie, 1971), it could explain why areas with relatively high precipitation and low temperatures saw a rise in demands for institutional change.

The coefficient sizes estimated in Table 4 indicate that an increase in growing-season temperature by one standard deviation in areas where precipitation was low (at the 25th percentile) is associated with an increase in demands by .4 demands (an increase of 32 percent from the sample mean of 1.28 demands significant at 10 percent).

I then examine the relationship between drought and the frequency of demands for change in different types of institutions. Results in Table **??** show that areas with more severe drought conditions had significantly higher demand for change in the political rights of the third estate, in particular for better political representation

and access of commoners to all professions (column 1), for a free press (column 2) and for the introduction of elections at the municipal level (column 3). Demands for abolishing privileges of the nobility are also significantly more frequent in areas more affected by the drought. There is no significant effect of weather conditions on the king's right to issue *lettres de cachet*. These results are consistent with historical accounts that, in the spring of 1789, the common population blamed primarily the nobility, the excessive amounts of taxes that they owed to them, and their lack of political participatory rights, and not so much the king, for their dire economic situation.

The geographic origin of the lists of grievances in my sample is quite uniform across space except for two clusters in Paris and Aix-en-Provence (see Figure 3). In Table 10, I show that point estimates and significance levels remain very similar when excluding all lists of grievances from these two regions.

These results provide evidence that the drought, possibly in combination with the hail storm, increased demand among French commoners for more participatory political institutions. This effect may have operated through an information channel: Those more affected by the drought had better information on the inadequacy of existing institutions to protect citizens from such calamaties as the drought and its consequences.[12]

The content of the lists of grievances was an important contribution to the political developments in 1789. It gave the representatives of the Third Estate at the Estates General[13] a clear mandate to fight for more participatory institutions and a more equitable distribution of political and economic rights.

4.3 Temperature and precipitation in earlier years

In this section, I present results of a placebo test and examine whether temperature and precipitation deviations in years before the French Revolution predict the outbreak of peasant revolts in 1789 and demand for institutional change. In particular, I test whether temperature and precipitation deviations in the years 1700, 1720, 1740, 1760, and 1780 predict outcomes. For each specification, temperature and precipitation deviations from the long-term mean are defined as before (see section 3.1 for a detailed definition of the weather variables).

[12]Those more affected by the drought may in addition have had lower opportunity costs of contributing to the lists of grievances. The opportunity cost channel, however, is likely to be less relevant here because including demands for institutional reform in the lists of grievances was of low cost. It was not punishable by law nor are there any historical accounts of commoners being punished for including such demands in the lists of grievances.

[13]later at the National Assembly

Results in Table 6 and 7 show the estimated effects of weather in 1700, 1720, 1740, 1760, and 1780 on the outbreak of peasant revolts and the number of demands for institutional change. The paper's main results for temperature and precipitation in 1788 are shown in column 1 to facilitate comparison. Except for the weather variables, the specifications are identical to the main specification. Results show that deviations in growing-season temperature and precipitation and winter temperature in years other than 1788 do not predict outcomes. The signs are insignificant or opposite to the main estimates.

4.4 Alternative long-term means

In the main specification, I define deviations in temperature and precipitation from the long-term mean. In the main specification, long-term temperature and precipitation is defined as temperature and precipitation between 1750 and 1800. In Table 8, I show that results are robust to the use of alternative long-term means, in particular the periods 1600 to 1800 and 1700 to 1800.

5 Conclusion

Results indicate that the drought had political impacts: 1) Those more affected by the drought more often participated in peasant revolts against the feudal system; and 2) they had higher demand for institutional change as expressed in the 'lists of grievances'. The results provide evidence on specific ways in which the drought impacted the French Revolution, a milestone in the democratization of Western Europe. They also contribute to our understanding of the political impacts of weather shocks, one of the defining features of climate change.

The paper studies whether a severe drought in 1788 affected political outcomes that were relevant to the course of the French Revolution. I show that those more affected by the drought more often participated in peasant revolts against the feudal system; and that they had higher demand for institutional change as expressed in the 'lists of grievances'. The revolts increased the pressure on the National Assembly in Paris to abolish the feudal system. The demand for institutional change in the lists of grievances gave representatives of the Third Estate at the Estates General a mandate to push for more participatory institutions. While the root causes of the French Revolution are of long-term political, economic, and social nature, the results of this paper illustrate that a short-term weather shock mattered to the

political developments in 1789.[14]

Short-term weather shocks are predicted to occur more frequently under any scenario of future climate change (Field et al. 2012; Field 2014; An 2018). The literature on the political impacts of weather shocks has documented weather's effect on conflict in a multitude of settings (Miguel et al., 2004; Burke et al., 2009; Bai and Kung, 2011; Jia, 2014; Dell, 2012; Hsiang and Burke, 2014). My results show that drought also played a role for the French Revolution, a milestone in the democratization of Western Europe. In addition, my results show that the drought not only increased revolts but also demand for institutional change itself, a cornerstone of transitions towards democracy. It is important to keep in mind, however, that a necessary pre-condition for such an effect was without any doubt the gradual spread of Enlightenment ideals in France over more than a century.

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[14] There might very well be other political impacts of the drought that I am not observing in my data.

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Table 1: Summary Statistics

1) Weather variables	Mean	Min	Max
(in deviations from the long-term mean:)			
Growing-season temperature in 1788	1.05	1.026	1.149
Growing-season precipitation in 1788	0.894	0.752	1.037

	All cantons		
	All	hot areas	cold areas
Number of observations	3666	1837	1829
		Mean	
2) Probability of peasant revolt	0.082	0.093	0.07

3) Demands for Institutional Change from Lists of Grievances	*Cantons with cahiers*		
	All	hot areas	cold areas
Number of observations	608	300	308
		Mean	
No. of demands for institutional change	1.28	1.5	1.05
Type of demands:			
Improve rights of the third estate	0.22	0.28	0.162
Free press	0.21	0.28	0.146
Introduce municipal elections	0.164	0.227	0.104
Abolish feudal privileges of the nobility	0.382	0.38	0.383
Abolish Lettres de cachet	0.299	0.343	0.256

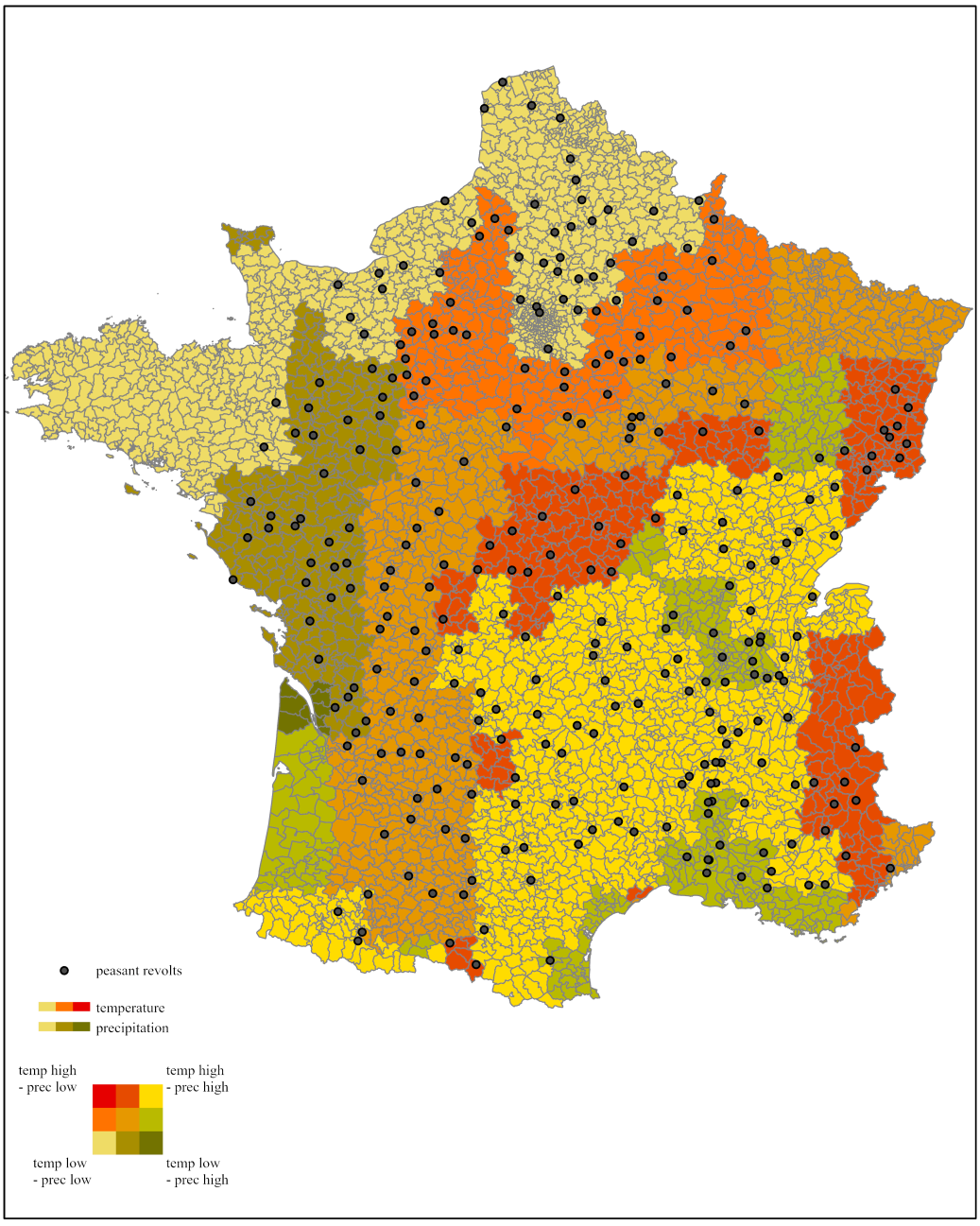
Notes: This table presents mean, minimum and maximum of the weather variables. The weather variables are: deviation in growing-season temperature in 1788 from the long-term mean and deviation in growing-season precipitation in 1788 from the long-term mean. Then, the table presents summary statistics for outcome variables: mean for all cantons (column 1), mean for cantons with above median growing-season temperature deviation (column 2; "hot areas"), and mean for all cantons with below median growing-season temperature deviation (column 3, "cold areas"). The outcome variables are the share of cantons that experienced a peasant revolt, and the mean number of demands for institutional change as expressed in the lists of grievances.

6 Tables

A Appendix

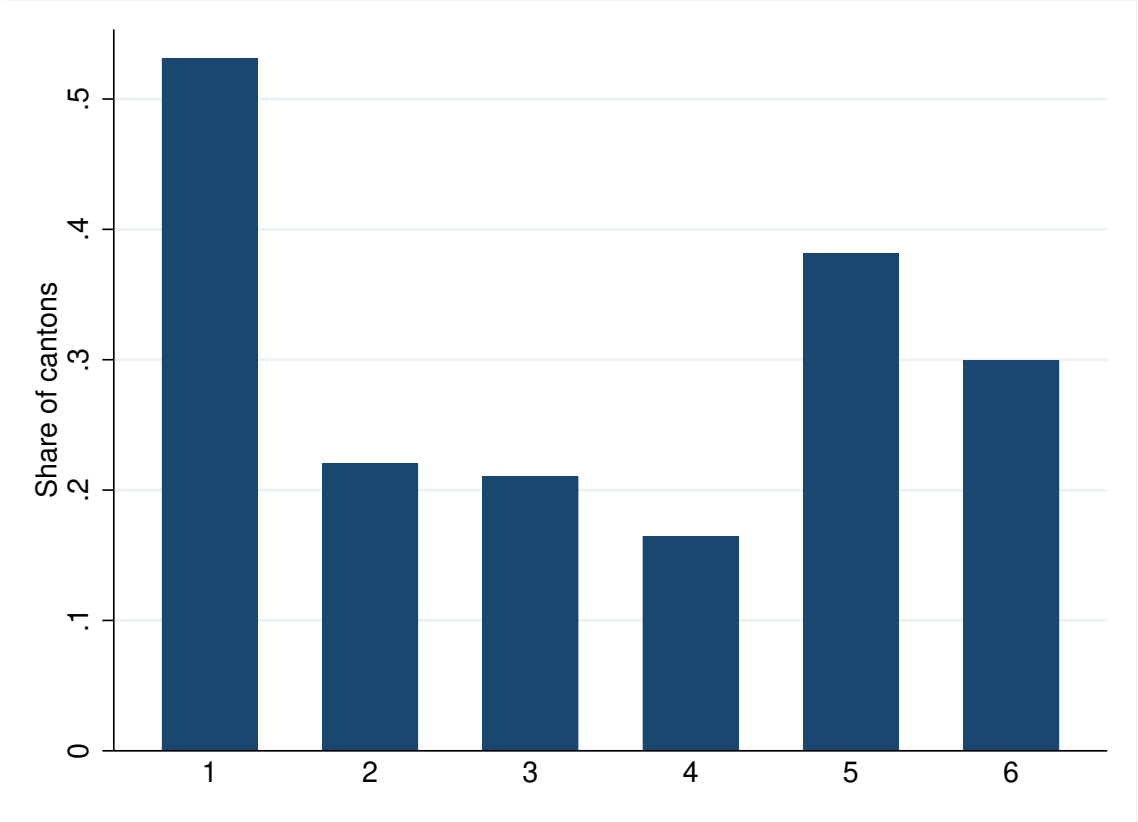
A.1 Tables

Figure 1: Drought in the growing season of 1788 and peasant revolts



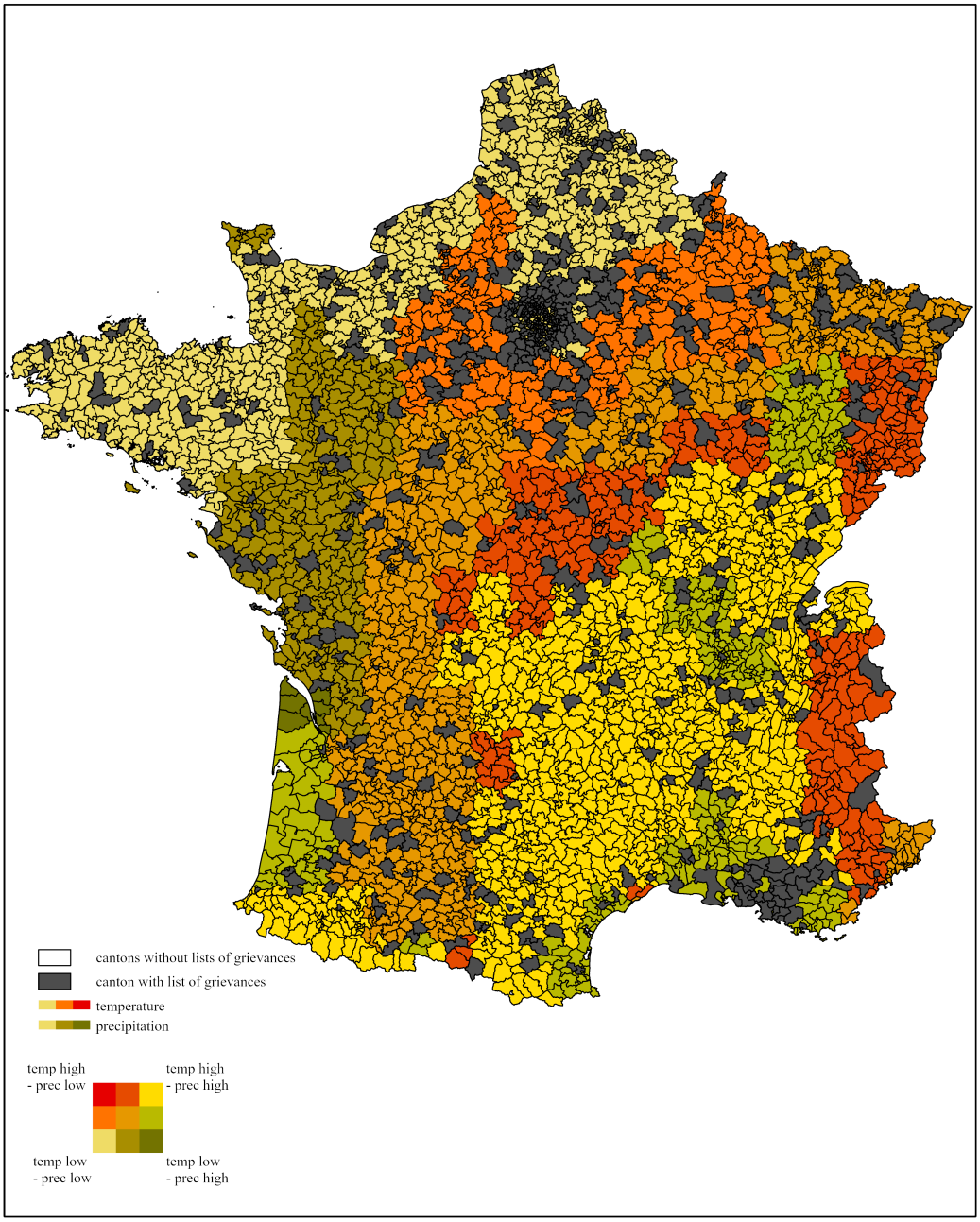
Notes: This map is a bivariate map of the geographic distribution of temperature and precipitation in the growing season of 1788 in France. Areas with high temperature and low precipitation are shown in red, areas with low temperatures and high precipitation are shown in green. Areas with low temprature and low precipitation are shown in yellow and areas with high temperature and high precipitation are shown in bright yellow. The map also shows the locations of peasant revolts in the summer of 1789.

Figure 2: Share of cantons with demands for institutional change



Notes: The graph shows the share of cantons for which a cahier exists (608 in total) that demand a specific institutional change. 1 = the share of cantons that demand at least one institutional change; 2 = the share of cantons that demand better political representation of the third estate and access to all professions; 3 = the share of cantons that demands a free press and the end of censorship; 4 = the share of cantons that demand the introduction of municipal elections; 5 = the share of cantons that demand to abolish feudal privileges of the nobility; 6 = the share of cantons that demand to abolish lettres de cachet.

Figure 3: Cantons with list of grievances



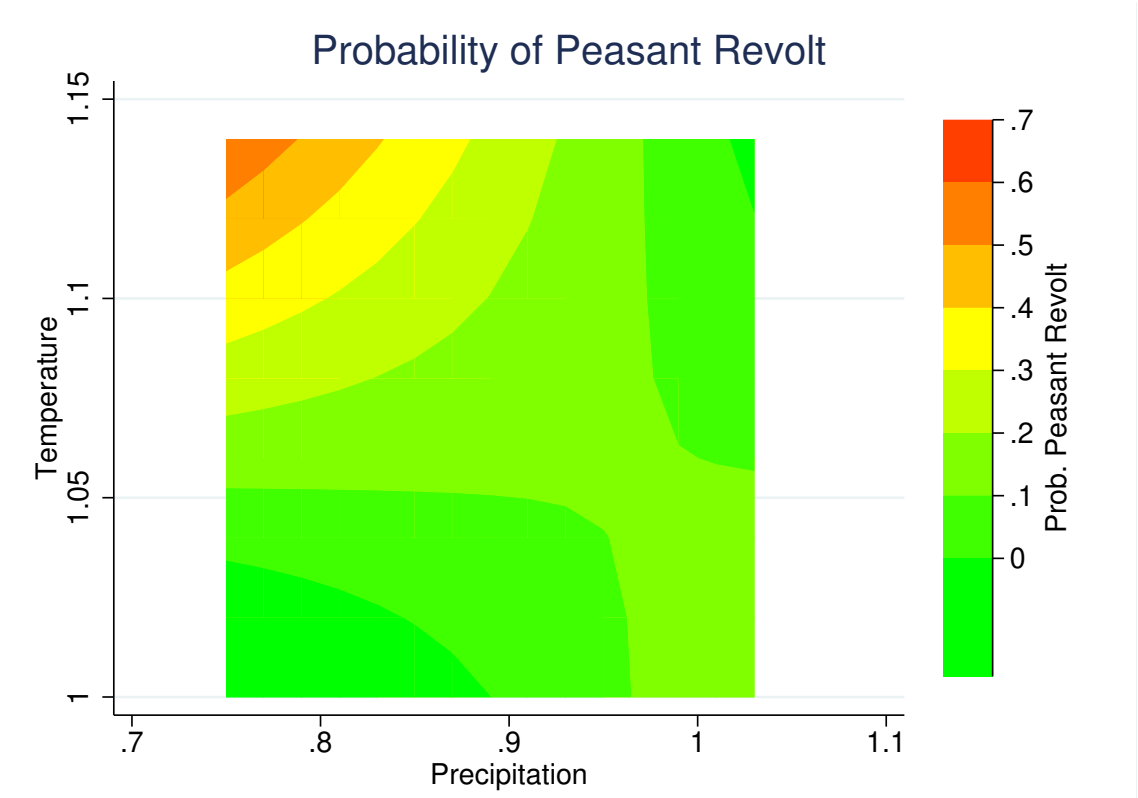
Notes: This map is a bivariate map of the geographic distribution of temperature and precipitation in the growing season of 1788 in France. Areas with high temperature and low precipitation are shown in red, areas with low temperatures and high precipitation are shown in green. Areas with low temprature and low precipitation are shown in yellow and areas with high temperature and high precipitation are shown in bright yellow. The map also shows the locations of peasant revolts in the summer of 1789.

Table 2: Drought and Peasant Uprisings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growing-season	24.62***	23.28***	28.67***	30.38***	30.59***	31.02***	31.86***	24.64***
temperature	(4.892)	(5.125)	(5.697)	(5.677)	(5.864)	(5.768)	(5.996)	(5.658)
Growing-season	26.54***	25.19***	31.04***	32.76***	33.01***	33.59***	34.28***	26.84***
precipitation	(5.387)	(5.603)	(6.164)	(6.126)	(6.358)	(6.235)	(6.478)	(6.141)
GS temperature*	-25.38***	-24.09***	-29.59***	-31.22***	-31.47***	-31.98***	-32.71***	-25.49***
GS precipitation	(5.158)	(5.356)	(5.874)	(5.841)	(6.066)	(5.955)	(6.189)	(5.873)
Control variables								
Regions fixed effects		yes	yes	yes	yes	yes	yes	yes
Population density			yes	yes	yes	yes	yes	yes
Canton area				yes	yes	yes	yes	yes
Distance to routes of communication					yes	yes	yes	yes
Literacy in 1690						yes	yes	yes
Paris							yes	yes
Great salt tax								yes
Observations	3,666	3,666	3,666	3,666	3,666	3,666	3,666	3,666
R-squared	0.006	0.007	0.008	0.009	0.010	0.010	0.012	0.016

Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. Peasant Revolt is an indicator variable that is 1 if a canton experienced peasant revolt in the summer of 1789. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for p<0.01, ** for p<0.05, * for p<0.1.

Figure 4: Marginal effects of temperature and precipitation on peasant uprisings



Notes: This contour plot visualises the estimated marginal effects of growing-season temperature deviation and growing-season precipitation deviation on the probability of peasant revolts. Yellow and orange indicate higher effect sizes, green shades indicate lower effect sizes.

Table 3: Early Peasant Uprisings

	Peasant Revolt	Early Peasant Revolt	Late Peasant Revolt
	(1)	(2)	(3)
Growing-season	24.41***	21.55***	2.863
temperature	(5.622)	(5.807)	(3.717)
Growing-season	26.54***	23.84***	2.697
precipitation	(6.093)	(6.334)	(4.100)
GS temperature*	-25.20***	-22.87***	-2.325
GS precipitation	(5.827)	(6.049)	(3.930)
Region fixed effects	yes	yes	yes
Control variables	yes	yes	yes
Observations	3,666	3,666	3,666
R-squared	0.016	0.024	0.044

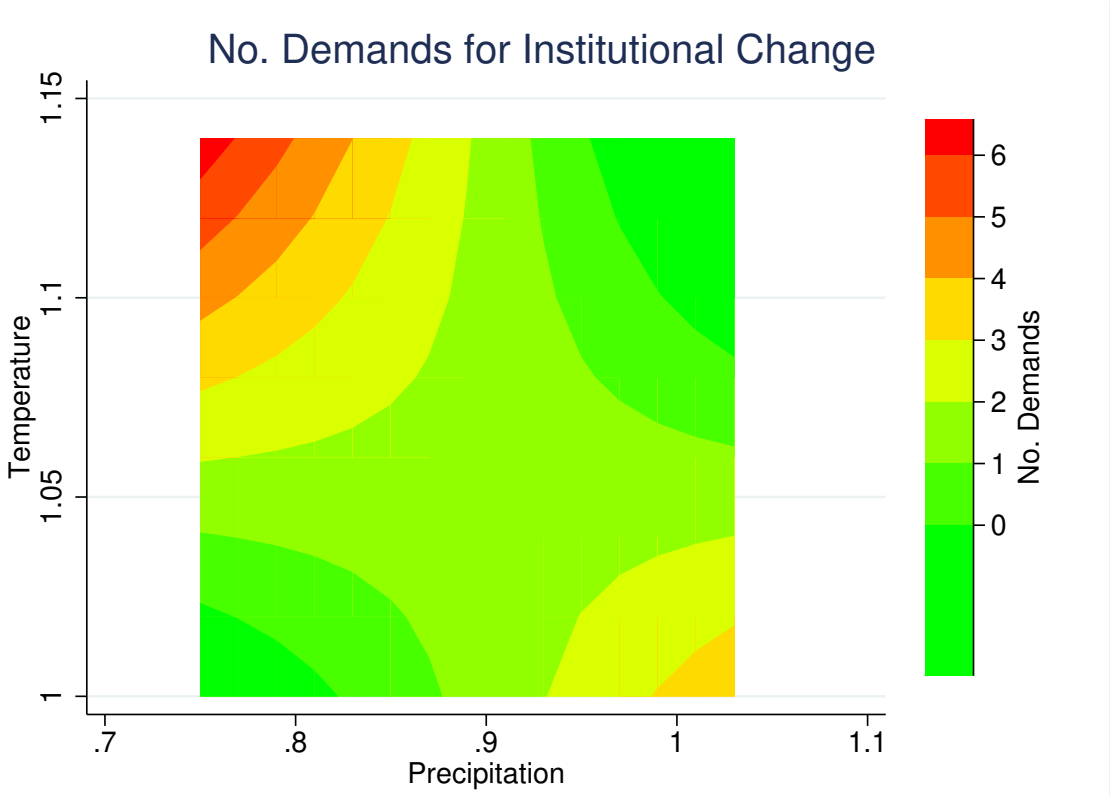
Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. Peasant Revolt is an indicator variable that is 1 if a canton experienced peasant revolt in the summer of 1789. 'Early Peasant Revolt' is an indicator variable that is 1 if a canton was among the 50 percent earliest places who experienced peasant revolt. 'Late Peasant Revolt' is an indicator variable that is 1 if a canton was among the 50 percent latest places who experienced peasant revolt. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Table 4: Drought and Demands for Institutional Change from Lists of Grievances

	Total number of demands for institutional change							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growing-season temperature	252.0**	214.8*	308.8**	332.4***	315.0**	315.1**	331.1**	327.0**
	(107.1)	(113.5)	(122.4)	(124.1)	(128.5)	(128.9)	(127.7)	(132.2)
Growing-season precipitation	314.6***	273.1**	372.5***	397.0***	372.1**	372.2**	383.1***	379.0**
	(119.9)	(126.5)	(135.9)	(137.6)	(143.3)	(144.0)	(142.0)	(145.8)
GS temperature*	-297.0**	-258.4**	-352.4***	-375.5***	-351.7**	-351.8**	-364.7***	-360.8**
GS precipitation	(114.5)	(121.1)	(129.8)	(131.5)	(136.9)	(137.5)	(135.6)	(139.5)
Control variables								
Cultural regions fixed effects		yes	yes	yes	yes	yes	yes	yes
Population density			yes	yes	yes	yes	yes	yes
Canton area				yes	yes	yes	yes	yes
Distance to routes of communication					yes	yes	yes	yes
Literacy in 1690						yes	yes	yes
Paris							yes	yes
Great salt tax								yes
Observations	608	608	608	608	608	608	608	608
R-squared	0.040	0.051	0.058	0.061	0.065	0.065	0.095	0.095

Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. The dependent variable is the number of demands for institutional change included in the list of grievances in canton c. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Figure 5: Marginal effects of temperature and precipitation on demands for institutional change



Notes: This contour plot visualises the estimated marginal effects of growing-season temperature deviation and growing-season precipitation deviation on the number of demand for institutional change as expressed in the lists of grievances. Yellow to red shades indicate higher effect sizes, green shades indicate lower effect sizes.

Table 5: Demands for institutional change - Excluding Paris and Aix-en-Provence

		Institutions - Third Estate		Institutions - Municipality	Institutions - Nobility	Institutions - King
	Total number of demands for institutional change	Political representation	Free press	Introduce municipal elections	Abolish feudal privileges of the nobility	Abolish *lettre de cachet*
	(1)	(2)	(3)	(4)	(5)	(6)
Growing-season temperature	275.7**	82.69**	67.68*	102.0***	96.58**	-7.891
	(106.9)	(35.73)	(39.04)	(32.61)	(39.00)	(39.85)
Growing-season precipitation	333.0***	98.13**	80.51*	113.4***	109.0***	-2.013
	(117.4)	(38.86)	(42.11)	(34.90)	(41.69)	(43.19)
GS temperature* GS precipitation	-316.3***	-92.91**	-77.31*	-107.6***	-104.5***	2.815
	(112.4)	(37.15)	(40.41)	(33.45)	(39.94)	(41.41)
Regions fixed effects	yes	yes	yes	yes	yes	yes
Control variables	yes	yes	yes	yes	yes	yes
Observations	385	385	385	385	385	385
R-squared	0.031	0.081	0.111	0.086	0.067	0.059

Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. The dependent variable in column 1 is the number of demands for institutional change included in the list of grievances in canton c. The dependent variables in columns 2 to 6 are the demand for better political representation of the third estate (column 2), the demand for a free press and the end of censorship (column 3), the demand to introduce municipal elections (column 4), the demand to abolish feudal privileges of the nobility (column 5), and the demand to abolish the king's lettre de cachet (column 5). Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Table 6: Placebo Test for an Effect of Weather Deviations In Earlier Years

	1788	**1700**	**1720**	**1740**	**1760**	**1780**
			Peasant revolts			
	(1)	(2)	(3)	(4)	(5)	(6)
Growing-season	24.64***	-5.61	-14.24***	0.55	5.86	1.38
temperature	(5.658)	(6.67)	(4.11)	(1.26)	(6.70)	(4.51)
Growing-season	26.84***	-4.82	-9.38***	0.45	6.85	1.19
precipitation	(6.141)	(5.74)	(2.76)	(1.04)	(8.27)	(4.95)
GS temperature*	-25.49***	5.15	10.45***	-0.80	-6.84	-1.04
GS precipitation	(5.873)	(6.26)	(3.04)	(1.29)	(7.98)	(4.60)
Observations	3,666	3,666	3,666	3,666	3,666	3,666
R-squared	0.016	0.01	0.02	0.02	0.01	0.01

Notes: The table presents placebo estimates. Estimates in column one show the main results to facilitate comparision. Columns 2 to 6 show results for the estimated relationship between weather in 1700, 1720, 1740, 1760, 1780 and outcomes in 1789. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. Peasant Revolt is an indicator variable that is 1 if a canton experienced peasant revolt in the summer of 1789. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Table 7: Placebo Test for an Effect of Weather Deviations In Earlier Years

	1788	**1700**	**1720**	**1740**	**1760**	**1780**
	Demands for Institutional Change					
	(1)	(2)	(3)	(4)	(5)	(6)
Growing-season temperature	327.05**	20.71	-28.82	-2.85	20.09	-34.03
	(132.19)	(141.66)	(78.61)	(23.94)	(112.34)	(64.81)
Growing-season precipitation	379.03**	8.88	-22.55	-5.84	27.41	-27.29
	(145.80)	(120.26)	(52.32)	(20.50)	(141.25)	(72.17)
GS temperature*	-360.76**	-12.19	27.19	5.14	-29.71	26.96
GS precipitation	(139.52)	(130.62)	(56.70)	(24.67)	(136.83)	(67.34)
Observations	608	608	608	608	608	608
R-squared	0.09	0.08	0.08	0.08	0.08	0.08

Notes: The table presents placebo estimates. Estimates in column one show the main results to facilitate comparision. Columns 2 to 6 show results for the estimated relationship between weather in 1700, 1720, 1740, 1760, 1780 and outcomes in 1789. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. Demands for Institutional Change is the number of demands for institutional change included in the list of grievances in canton c. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Table 8: Alternative weather variables

	1750 to 1800	**1600 to 1800**	**1700 to 1800**	**1750 to 1800**	**1600 to 1800**	**1700 to 1800**
	main specification	**Peasant Revolt**		main specification	**Demands for Institutional Change**	
	(1)	(2)	(3)	(4)	(5)	(6)
Growing-season temperature	24.41***	17.72***	14.42***	327.05**	273.11**	353.76***
	(5.62)	(5.64)	(4.32)	(132.19)	(116.59)	(114.06)
Growing-season precipitation	26.54***	19.92***	15.85***	379.03**	315.31**	401.71***
	(6.09)	(6.35)	(4.79)	(145.80)	(128.35)	(123.78)
GS temperature*	-25.20***	-18.25***	-14.69***	-360.76**	-292.83**	-377.36***
GS precipitation	(5.83)	(5.91)	(4.51)	(139.52)	(120.26)	(117.16)
Observations	3,666	3,666	3,666	608	608	608
R-squared	0.02	0.02	0.02	0.09	0.09	0.10

Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from different long-term means: 1750 to 1800 (as in the main specification), 1600 to 1700m, and 1700 to 1800. Peasant Revolt is an indicator variable that is 1 if a canton experienced peasant revolt in the summer of 1789. Demands for Institutional Change is the number of demands for institutional change included in the list of grievances in canton c. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Table 9: Conley Standard Errors

	main specification	100 km	150 km	200 km	main specification	100 km	150 km	200 km
		Peasant Revolt				**Demands for Institutional Change**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Growing-season temperature	24.41***	24.41***	24.41***	24.41***	327.05**	327.0***	327.0***	327.0***
	(5.62)	(5.599)	(4.303)	(3.934)	(132.19)	(110.0)	(111.6)	(85.39)
Growing-season precipitation	26.54***	26.54***	26.54***	26.54***	379.03**	379.0***	379.0***	379.0***
	(6.09)	(6.071)	(4.320)	(3.965)	(145.80)	(120.2)	(121.7)	(101.1)
GS temperature*	-25.20***	-25.20***	-25.20***	-25.20***	-360.76**	-360.8***	-360.8***	-360.8***
GS precipitation	(5.83)	(5.837)	(4.276)	(3.909)	(139.52)	(115.4)	(116.3)	(96.17)
Observations	3,666	3,666	3,666	3,666	608	608	608	608
R-squared	0.02	0.016	0.016	0.016	0.09	0.095	0.095	0.095

Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. Peasant Revolt is an indicator variable that is 1 if a canton experienced peasant revolt in the summer of 1789. Demands for Institutional Change is the number of demands for institutional change included in the list of grievances in canton c. Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. In columns 1 and 5, robust standard errors are clustered at the grid level of the underlying temperature data. In columns 2, 3, and 4 as well as 6, 7, and 8, spatial correlation of the error term is assumed within 100, 150, and 200 km from each canon. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.

Table 10: Demands for institutional change - Excluding Paris and Aix-en-Provence

		Institutions - Third Estate		Institutions - Municipality	Institutions - Feudal privileges of the nobility and clergy	Institutions - King
	Total number of demands for institutional change	Political representation	Free press	Introduce municipal elections	Abolish feudal privileges of the nobility	Abolish *lettre de cachet*
	(1)	(2)	(3)	(4)	(5)	(6)
Growing-season temperature	275.7**	82.69**	67.68*	102.0***	96.58**	-7.891
	(106.9)	(35.73)	(39.04)	(32.61)	(39.00)	(39.85)
Growing-season precipitation	333.0***	98.13**	80.51*	113.4***	109.0***	-2.013
	(117.4)	(38.86)	(42.11)	(34.90)	(41.69)	(43.19)
GS temperature* GS precipitation	-316.3***	-92.91**	-77.31*	-107.6***	-104.5***	2.815
	(112.4)	(37.15)	(40.41)	(33.45)	(39.94)	(41.41)
Regions fixed effects	yes	yes	yes	yes	yes	yes
Control variables	yes	yes	yes	yes	yes	yes
Observations	385	385	385	385	385	385
R-squared	0.031	0.081	0.111	0.086	0.067	0.059

Notes: The table presents OLS estimates. Observations are at the canton level covering mainland France. Growing-season temperature is the growing-season temperature deviation in 1788 from the long-term mean. It measures average growing-season temperature in 1788 (March to August) as a percentage of long-run average growing-season temperature. Growing-season precipitation is defined accordingly. GS temperature*GS precipitation is an interaction term of the two weather variables. The dependent variable in column 1 is the number of demands for institutional change included in the list of grievances in canton c. The dependent variables in columns 2 to 6 are the demand for better political representation of the third estate (column 2), the demand for a free press and the end of censorship (column 3), the demand to introduce municipal elections (column 4), the demand to abolish feudal privileges of the nobility (column 5), and the demand to abolish the king's lettre de cachet (column 5). Control variables are population density, canton area, distance to closest road, whether a canton is subject to the great salt tax, literacy in 1690, whether a canton is part of the Paris region Ile-de-France, and region fixed effects. See section 3.5 for detailed information on control variables. Robust standard errors are clustered at the grid level of the underlying temperature data. Significance levels are indicated as *** for $p<0.01$, ** for $p<0.05$, * for $p<0.1$.