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DROUGHT DECLARATIONS AND VOTING OUTCOMES: EVIDENCE FROM TUNISIA

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Drought Declarations and Voting Outcomes: Evidence from Tunisia*

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Abstract

Using a novel dataset in a difference-in-differences framework, I study the political implications of the change in policies protecting drought-impacted communities in Tunisia in 3088 districts. In 2016, the Tunisian government had drastically reduced support to farmers affected by droughts. I show that this resulted in lower vote share for the incumbent candidate in the second round of the 2019 presidential elections. The magnitudes are substantial: a one standard deviation increase in the district-level damage caused by droughts after the policy change leads to a decline in the incumbent's vote share by 10 percentage points. I show that the likely mechanism is the rise of public discontent: the drought-affected districts had a higher number of riots or violent protests relative to the policy change. I find no significant effects either on voter turnout, closeness to incumbent party at the parliamentary elections or on trust in political parties at the parliament.

Keywords: Drought, Elections, Political Economy of Environmental Policies and Climate Change

JEL: D72, H84, N57, P16,P28, Q54

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1 Introduction

Climate change and environmental challenges have long been a topic of intense debate for researchers and policymakers in developed countries, but more so in developing countries that face the negative effects while lacking the necessary natural disasters coping and prevention mechanisms.[1] A major climate change issue, characterized by its gradual-onset is drought (rainfall deficiency occurring over an extended period of time, (NASA Earth Observatory, 2024). Droughts are considered to be the most serious threat negatively affecting 55 million people worldwide on a yearly basis (WHO, 2024). It is true that droughts are exogenous shocks in nature, but their heavy economic disturbances spark an immediate call – from the citizens side – for governmental interventions.

Tunisia serves as a notable example of a country that has been grappling with recurrent droughts for decades. Despite the severity of the Tunisian drought phases, the Tunisian government has implemented measures since the 1980s that have helped in managing and mitigating their negative effects. One of the key forms of government support is the issuance of drought declaration decrees, which are officially published in government journals. These decrees are essential as they provide a formal acknowledgment of the extent to which agricultural lands in various districts have been impacted by drought. For farmers, these declarations are particularly critical. They provide access to government assistance aimed at alleviating the financial burdens that drought impose. Specifically, farmers who are directly affected by these drought conditions benefit from a favorable rescheduling of their existing loans. The government provides large banks in Tunisia with the needed resources. This process is facilitated by these banks, which extend the repayment period of these loans up to five years, while maintaining the original interest rates.[2]

This financial relief is vital for farmers, as it provides them with the necessary breathing space to recover from the losses incurred by prolonged periods of insufficient rainfall. Through these measures, the Tunisian government has played a pivotal role in helping its agricultural sector withstand recurrent challenges posed by drought. As for the rest of the Tunisian districts' residents, they are indirectly-benefiting from the governmental drought declarations given that this allows for an estimate of districts' degree of exposure to drought. If the residents of the districts know the degree of exposure of their districts to droughts (i.e. the detrimental effects of drought on their districts), they would be able to keep track of the food shortages they will face thus, will be able to anticipate the needed imports and can prevent potential price hikes as a result.

From 2016 to 2019, Tunisia has experienced severe drought spells; that is lack of rainfall leading to agricultural output losses. This severe drought was coupled with the suspension of drought declaration decrees due to government's financial constraints, leading to a rise in discontent among the Tunisian people, that manifests itself in the form of violent protests and a decline in incumbent vote share during the presidential elections. However, the government resumed the release of drought decrees as of 2020. The reason for the removal of the drought decrees during the three consecutive years prior to 2020 was unannounced to the people. In other words, the removal of drought decrees is considered to be an unexpected event facing the inhabitants of the Tunisian districts – farmers and the rest of the inhabitants alike – despite the severe drought that hit

[1] According to the World Health Organization WHO (2023), around 2 billion people don't have access to drinking water and 600 million are subject to foodborne diseases on a yearly basis, with 30% children under 5 bearing more prone to foodborne fatalities. It is estimated that in 2020, 770 million people faced famine in Africa and Asia. Climate change has a negative impact on food availability, quality leading to nutrition and health crises.

[2] This is a case by case situation that depends on the profile of the farmer at the bank.

Tunisia during these years.[3]

Furthermore, the removal of the drought declaration policy coincided with a pivotal transitional period towards democracy. Tunisia held the second parliamentary and presidential elections in 2019. Following the Arab Spring wave in the Middle East, Tunisia held the first elections in 2014. While the first elections were being held in Tunisia in 2014, the drought declarations were still available to the public and compensations were granted to farmers. In 2019 however, drought declarations and relevant compensations were already cut as of the year 2016. This setting provides an ideal opportunity for the public to hold their political leaders accountable for the consequences of drought neglect through voting at the polls during elections.

Therefore, I study in this paper the impact of the abandonment of a drought declaration policy – an unanticipated policy change at the district level – on the within district within period change in presidential elections results in Tunisia. I extract from the drought declaration decrees the percentage of damage happening to agricultural land areas in order to create an intensive margin drought damage variable, as a proxy of drought at the district level indicating the percentage of agricultural area damage. The drought damage variable is my main explanatory variable in a difference-in-differences framework where incumbent's vote share is the main outcome variable.

For the purpose of this study, I use a novel dataset on drought declarations from Tunisia's official journals along with l'Instance Supérieure Indépendante pour les Élections (ISIE) for the voting data for the years 2014 and 2019. I further use geospatial datasets for district level characteristics from AidData's geospatial data repository. The channels explaining the results consist of looking at the impact of the removal of drought declaration on citizens' public discontent.

I use riots as a proxy of people's discontent. Datasets on riots in Tunisia are from the Armed Conflict Location and Events data (ACLED). The results are robust to changing the drought damage variable – that is the main continuous treatment variable in the diff-in-diff framework – from a pre-removal variable to a post-removal variable. Moreover, the results are robust to changing the drought damage treatment variable altogether to using the Normalized Difference Vegetation Index (NDVI) variable that is another proxy of drought damage.

I find that a one standard deviation increase in drought damage following the policy removal would lead to a decline in incumbent's vote share by 10.24 percentage points in districts more prone to drought spells compared with the less prone ones. The mechanisms driving the results pertain to people's public discontent with the performance of the government with regards to drought management. I use riots as a proxy for public discontent and find that drought damage leads to a rise in riots by all residents per district by 3 percentage points as well as a rise in farmers' riots by 6 percentage points. The results are in line with the premise that in a hybrid democracy, the president is held accountable for the performance of the government.[4]

Using the parliamentary elections as a placebo, I find no impact of drought declarations removal on parliamentary elections results. I further investigate the impact of the drought declaration removal on whether the

[3] Serrano (2023), Al-Estiklal Newspaper (2022) and Gafrej (2021) shed light on the on-going debates in the media on the severity of droughts, the role of the government in producing drought declarations, people's discontent with the removal of these declarations and blaming the president for the negligence of drought issues in Tunisia.

[4] This may be due to the weakly-preforming and unrepresentative political parties that push voters towards punishing the incumbent at the presidential elections level, disregarding the parliamentary one as in Conconi et al. (2024).

Tunisians perceive people to be trustworthy[5] and their satisfaction with the performance of the government. I find no impact of the policy removal shock on perceptions of interpersonal trust. However, I find that a one standard deviation increase in drought damage post policy removal reduces satisfaction with the incumbent government's performance by 2.2 percentage points in districts more likely to have droughts compared with the ones with less frequent droughts.

The results are robust to using drought damage post shock - extracted from official drought decrees for the years 2020 and 2021.[6] Some important policy implications of this study relate to the importance of ensuring information transparency especially when a governmental support policy such as the drought compensation policy is being removed. In addition, the role of the private sector, when it comes to drought compensations and insurance, needs to be increased under the auspices of the government.

The rest of the paper is organized as follows: Section 2 summarizes the related literature and the contribution of this paper to it, Section 3 describes the institutional context: mainly the political situation in Tunisia, the drought situation and the governmental policies to support drought-impacted communities. Section 4 and Section 5 present the empirical strategy and data sources respectively, Section 6 discusses the results, analyzes the mechanisms driving the results and provides a number of robustness checks. Finally, Section 7 concludes.

2 Literature Review

There is a growing body of research focused on understanding the relationship between natural disasters compensation policies and election outcomes, particularly how experiencing a climate-related event influences the vote share of incumbents. Studies have produced varying results, with some suggesting that natural disasters can significantly impact electoral outcomes, while others find the effects to be minimal or inconsistent. This lack of agreement highlights the complexity of the issue and the numerous factors that can influence how voters perceive and respond to their government's handling of climate-related challenges. A number of papers show results on voters favouring the incumbent in some cases, while they can also be against him in others.

The political economy literature on climate change shows that following a natural disaster and conditional on having disaster relief, voters tend to reward the incumbent in elections as in (Cavalcanti, Francesco, 2018; Bastos and Miller, 2013). In their paper, Bastos and Miller (2013) use a parametric framework, where they add a three order polynomial on the regression of the relative margin of candidate's victory in elections. They show that releasing drought declarations 2 years before elections in Brazil leads to a higher probability of the incumbent being reelected. Using rainfall as an instrumental variable for a disaster compensation policy in Japan, Fukumoto and Kikuta (2024) find that disaster compensation increases support for the political party in power in line with the "egotropic retrospective voting" behavior. According to Achen and Bartels (2004) and Bovan et al. (2018) "egotropic retrospective voting" stipulates that incumbents' vote share increase (decline) during elections because the voters benefiting (suffering) from the provision (removal) of climatic events relief packages tend to reward (punish) them during election times. In other

[5] More information on cabinet change can be found in Section 6.
[6] More information on the NDVI variable can found in Section 8.

words, the phenomena of "egotropic retrospective voting" fuels a general satisfaction (dissatisfaction) with the incumbent and occurs when the governmental response is deemed efficient (inefficient) in compensating the losers following a natural disaster. Ashworth et al. (2018) further highlights that this is the case given that voters tend to vote less for the incumbent when facing exogenous climate shocks. My results overlap with that of the "egotropic retrospective" literature. Furthermore, the drought declaration policy removal studied in this paper is another addition to the literature that has mostly been focusing on targeting drought relief around election times.

My contribution to the literature extends to the data that I am using for this study; I use a novel dataset as a proxy for drought damage using drought declaration decrees extracted from official Tunisian journals. In particular, I use the percentage of agricultural land damage due to drought before the policy removal as my main continuous treatment variable. The data used in the literature to study the impact of droughts on voting outcomes are either drought indices or rainfall average variation over a long period of time at least 30 years as in Tarquninio (2022). I abstract from using rainfall and resort to using a proxy for lack of rainfall closely reflecting Tunisia's main problem that is severe drought spells that negatively impact agricultural output.

To the best of my knowledge, this is the first paper that attempts to look at possible mechanisms linking a climate policy shock with voting outcomes. I show that the lack of adequate policy response to droughts results in public discontent (which I proxy for by riots). I contribute to the literature on climate and conflict stipulating that drought shocks coupled with drought declaration removals result in the rise of riots or violent protests as in the work of Decet and Marcucci (2023) and Adhvaryu et al. (2021). In this paper, riots increase from both the farmers and the rest of the residents living in the districts impacted by drought because of citizen's general public discontent with the persistence of drought spells while drought relief is no longer provided for them. According to Decet and Marcucci (2023), droughts in Africa are correlated with violent conflicts in rural areas due to precipitation scarcity that renders river and lake water access essential.

In addition, strong developed democratic institutions are capable of mitigating such conflicts by developing the needed water redistribution and infrastructure. Adhvaryu et al. (2021) and McGuirk and Burke (2017) provide evidence from Africa that presents the correlation between natural resources and conflicts. They provide a model that explains that economic prosperity is only possible in case of equilibrium conflict prevalence depending on a region's own resources and those of their neighboring regions. The better the institutional qualities, the less likely there will be a conflict equilibrium. The results of this paper confirm the findings of Adhvaryu et al. (2021) and McGuirk and Burke (2017) by showing that democracy can channel people's public discontent – riots also increase – during election times. This discontent manifests itself in the form of a decline in incumbent's vote share. It is expected that the better the democratic institutions are, the less likely that riots or conflicts occur.

The literature on the determinants of voting attitudes has focused on either climate change mitigation or prevention policies specifically designed around election times to gain people's support as in Tarquninio (2022). Tarquninio (2022) studies the impact of drought relief targeting on ruling party incumbency and electoral competition in a number of Indian states using a regression discontinuity design and an instrumental variables approach. This paper studies the removal of a compensation policy following a drought shock, which is considered as a contribution to the literature mostly focused on time-targeting drought policies before elections rather than their complete removal.

3 Institutional Background

3.1 Political Situation

Table 1: Tunisian Presidential Elections in 2014 and 2019

Pres. Election Year	**2014**	**2019**
Winning Candidate's Name	Beji Caid Essebsi	Kaies Saied
Winning Candidate's Party	Nidaa Tounes	Non-partisan
Winning Candidate's Pol. Spectrum	Center to Center-left	Center to Center-left
Opponent's Name	Moncef Marzouki	Nabil Karoui
Opponent's Party	Congress for the Republic	Heart of Tunisia
Opponent's Pol. Spectrum	Center-left to Left	Center

Tunisia's democratic transition started with the revolution triggered by a young street vendor's self-immolation on December 27, 2010. This pivotal moment in history rippled across the Middle East, inspiring people to demand better living conditions. On the macroeconomic level, the Tunisian economy was performing well right before the revolution thanks to improved harvests, an increase in exports and investments. However, the economics gains were highly concentrated among the upper and upper-middle classes of the capital Tunis as well as some other coastal regions, leaving a large group of population of different regions and classes behind (World Bank, 2023; Observatoire National de l'Emploi et des Qualifications (ONEQ), 2013).

Agriculture policies were aimed at Coastal crops while leaving the south with little investment creating major disparities between the Coastal and Southern regions in terms of public services and infrasturcture (Masri, 2017). Additionally, unemployment rates were above 30 percent in the decade prior to the revolution; an unprecedented level compared with Tunisia's average that is around 14 percent. It is estimated that around 50 percent of the unemployed hold either master's degrees or technical degrees, 31 percent were engineers and 70 percent were technicians (Honwana, 2013).

Following the revolution, Tunisia turned into a semi-presidential regime where the president is the head of state and the prime minister is responsible for the government. Tunisia is a pioneer country in the region in embracing political pluralism resulting in the creation of more than 70 parties belonging to a representative range of political spectrum.[7] According to the Economist Democracy Index 2022, Tunisia is classified as a "hybrid regime" indicating that it is a democracy with weaknesses pertaining to the state capacity, the rule of law and the strength of political parties.[8]

Tunisia's presidential elections take place every five years. The president is elected by universal suffrage for a five year term. A first round of elections is being held and if no candidate gets more than 50% of the vote in the first round, then there would be a second-round for the top two finishers. A president can only serve two terms. The parliamentary elections are also held every five years using party-list proportional representation

[7] Following the 2011 revolution, political parties started to develop at a high pace. The parties formed were either small in size and fragmented or big parties with structural and leadership issues deeming the functioning of the parties below the expectations of the citizens (Ottaway, 2021).

[8] This is explained in further details in Gherib (2012).

on closed lists and seats are distributed on the constituencies on the basis of the largest remainder method (The Elecoral Knowledge Network, 2014b,a). The first fair presidential and parliamentary elections were held in 2014.

The 2014 presidential elections consisted of two rounds; none of the candidates got more than 50% of the vote shares. In the first round, the two candidates who got the majority of the votes were: Beji Caid Essebsi and Moncef Marzouki, with 39% and 33% vote shares respectively. In the second round, Essebsi got 55.7% of the vote shares to become the president of Tunisia until 2019.[9] This paper focuses on the presidential elections of 2014 and 2019 in Tunisia. The president from 2014 to 2019, Beji Caid Essebsi, was a prominent figure from the political party *Nidaa Tounes*, which is positioned from the center to the center-left on the political spectrum.

Essebsi's tenure was marked by policies and ideologies aligned with this centrist stance. His opponent Moncef Marzouki was part of the *Congress for the Republic* party that is a secular leftist party. The political landscape shifted in 2019 with the election of Kaies Saied, an independent, non-partisan candidate. Despite his independence from any political party, Saied's policies and rhetoric indicate a continuation of the center to center-left political spectrum, similar to his predecessor. Saied's references are drawn from leftist ideologies of Councilism as well progressive populist movements in the west and South America according to Nafti (2024).

Saied's priorities have been further reflected on his policy decisions and public statements, signaling his alignment with the broader principles of social justice and equity that characterized his predecessor's administration. The president's political inclinations are evident in his consistent advocacy for workers' rights and his strong commitment to preserving social equality following his predecessor. A number of social protection policies have been carried out under the incumbency of Essebsi and continued to do so under that of president Saied. A prominent example is the social assistance program aiming at supporting the vulnerable groups in Tunisia as well as poverty alleviation. The social assistance program involves health care, pension schemes and food subsidy provisions (Carnegie Endowment for International Peace, 2022).

In addition, Essebsi and Saied both carried out policies that enhance public sector employment as a main priority to overcome the rise of unemployment in Tunisia (International Monetary Times, 2023). Therefore, the main outcome variable in this paper is based on the alignment of Saied's political spectrum with that of Essebsi, it represents the vote share for the convergence of the political spectrum of both the 2014 and the 2019 presidents in Tunisia. It is worth noting that the opponent to president Saied, Nabil Karoui, was part of the *Heart of Tunisia* party that is of a centrist nature.

Following the death of Essebsi in 2019, presidential elections had to take place within 90 days after his death as per the Constitution. In the second round of the newly called elections, Kais Saied won to become president with a 72.7% while Nabil Karoui got 27.3% of the total vote shares. Kais Saied was running for the 2019 presidential elections as an independent candidate; he was not part of any political party at the time of the elections. Table 1 provides a comparison between the 2014 and the 2019 incumbent as well as opponent presidents in terms of their political parties and political spectrum. As for the first round of the 2019 presidential elections, there were 26 candidates, belonging to different political parties, running for the first round of the 2019 presidential elections. 8 candidates out of the 26 were independent – were not part of

[9] Markey et al. (2023) provide the details of the events surrounding the elections.

any political party – Kais Said is one of them. Among the 8 independent candidates, 2 were supported by some political parties: Safi Said who was supported by *the People's movement* party and Abbdelkrim Zbidi who was backed up by *Nidaa Tounes* (Fanack, 2019; Wikipedia, 2019).[10]

3.2 Droughts in Tunisia and Drought Declaration Decrees

Tunisia is a North-African country, covering around 16 million hectares or 63,170 square miles. Its North-East side overlooks the Mediterranean sea, with Libya and Algeria are located on its South and East sides respectively. Rainfall is an essential factor for Tunisia's agricultural sector. It is estimated that on average, precipitation is below 100 millimeters a year in the Southern parts while it is above 1000 millimeters a year in the Northern regions. Tunisia's summer weather is hot and dry while in the winter, it is cool and humid (Thabet et al., 1994; Kayouli, 2000).

According to the International Fund for Agricultural Development (IFAD), agriculture remains a pivotal sector, contributing nearly 10% to GDP and providing employment for around 16% of the workforce in Tunisia. However, agriculture remains a core sector in the economy. An agricultural land area that is considerably small (less than 10 percent of the total area) of a given crop would lead to around 35% of agricultural production, 20% exports and a workforce not less than 27% according to Mansour and Hachicha (2014). Agricultural land in Tunisia is divided by crop type where grains such as wheat and barley as well as olives together cover around 87% of the total: grains with 43% and olives with 44%. The remaining 17% is allocated between forage crops, vegetable crops, legumes that have 7%; 3% and 2.5% respectively.

Projections indicate that by 2025, drought is expected to decrease crop cultivation by approximately 30 percent. Drought conditions in Tunisia have recently worsened, affecting the entire country with increasing severity. The Food and Agricultural Organization (FAO) reports a particularly high frequency of severe droughts in the Northern-Central regions of Tunisia. Severe drought is defined as a prolonged period of insufficient rainfall that results in significant agricultural output losses. In other words, Tunisia's agriculture sector is impacted by drought but at varying degrees depending on the region where the agricultural land is located and on the cultivated crop's dependency on rainfall. Agricultural land area where grains are cultivated is heavily dependent on rainfall and is mostly concentrated in the Northern-Central regions of Tunisia where 47% of the total land area cultivated is located in the Northern regions, while 53% is in the Central ones. As for the cultivation of olives, it is located in the Central and Southern regions of Tunisia contributing to 87% of the total cultivated land area (Atlas, 2024).

Since the 1980s, the Tunisian Ministry of Agriculture has addressed these droughts by issuing official drought declaration decrees, that are published in the country's Official Journal. These decrees are made accessible to the public both online and in print copies. When the government declares a drought through these decrees, it formally identifies the total agricultural areas within each district that have been adversely affected by drought spells. This declaration indicates government intervention aimed at mitigating the economic impact on farmers. The primary form of support comes from banks, which restructure the loans of farmers whose

[10]The most recent presidential elections took place on October 6th, 2024. There were 3 main candidates: Kais Said (independent candidate), Zouhair Maghzaoui (People Mouvement paty) and Ayachi Zammel (Azimou party and a strong opponent of Kais Said). Kais Said won the elections with a 90,69% vote share followed by Ayachi Zammel who got 7,35% and Zouhair Maghzaoui with a 1,97% vote share (Wikipedia, 2024; ISIE, 2024).

lands have been damaged by drought. The restructuring extends the loan repayment period by five years, while maintaining the original interest rates. A sudden removal of the drought declaration decrees took place for three consecutive years that happened to be years of severe drought from 2016 to 2019. Severe drought spells are recurrent and government support in the form of drought declarations are provided to alleviate their negative impact. However, the 2016-2019 severe drought spells were unexpectedly not covered by the governmental financial relief.[11]

This financial relief is crucial for farmers, helping them cope with the significant challenges posed by recurrent drought spells. Some local Tunisian newspapers have been complaining about this unexpected abandonment of the policy when it was needed the most due to the persistence of drought.[12] Meanwhile, there are a few private insurance companies to substitute for these governmental interventions. On one hand, the removal of this policy constitutes a shock to farmers, who cannot quantify the extent of agricultural losses they are incurring. On the other hand, this is a shock to all the inhabitants of the district given that there will be difficulties in quantifying the extent of damage caused by drought at the district levels. This would result in food shortages and eventually price hikes. Thus, the removal of drought declarations was an unanticipated event to both the farmers and locals per district.

4 Empirical Strategy

This paper aims at studying the impact of the drought declaration removal in 2016 in Tunisia on the 2019 presidential election outcomes. More precisely, I test the hypothesis that the exposure of districts to low rainfall coupled with a removal of drought declarations will lead to a greater decline in incumbent's vote share.

There are several endogeneity concerns. First, the dependent variable might be correlated with unobserved shocks at the district level. An example of such shocks would be internal immigration. Internal immigration happening across Tunisian districts is likely to be due to droughts; district inhabitants might move across districts to escape drought consequences – Thus, impacting voting outcomes at the district level.

A second endogeneity problem would be the omitted variable bias; the data might not be capturing all the confounding factors impacting voting behavior at the district level. Among the relevant confounders not accounted for in the data, there is the varying governance quality per district that differentially impacts the structure of the local economy as well as its performance. Another important confounder may be the influence of access to internet and social media platforms which may have an impact on citizens' perception of their government, thus on their voting behavior, see Guriev et al. (2021).

In order to address these endogeneity issues, I use a standard difference-in-differences framework where the treatment variable is the pre-shock percentage of agricultural land area damage at the district level in Tunisia as a drought proxy. Other diff-in-diff specifications include district and year fixed effects akin to a two-way fixed-effects model as in Callaway et al. (2024).

[11] Serrano (2023) further highlights people's discontent with the removal of the policy.

[12] Gafrej (2021) highlights this drought management problem that culminated in the sudden removal of the drought declaration decrees without providing the beneficiaries with either alternative compensations or the reason for the unexpected shift in this particular governmental policy.

The empirical strategy is as follows:

$$Y_{d,t} = \alpha + \beta_1 DroughtDamagePre2016_d \times Post2016_t + \gamma_d + \delta_t + X_{d,t} + \epsilon_{d,t} \quad (1)$$

The unit of observation is the district level. $Y_{d,t}$ is incumbent's vote share in district d at time t (Essebsi's in 2014 and Saied's in 2019). $DroughtDamagePre2016_d$ is a standardized continuous treatment variable indicating the extent of damage driven by drought at the district level, using data from before 2016 as decreed in the drought declarations. The treatment variable is standardized to be able to interpret the results, however, it does not have an impact on the structure of the treatment variable. Figure A1 is a histogram of the drought damage at the finest district level in Tunisia variable before and after standardization. The figure shows a high frequency of the districts with ones and zeros as percentage of damage and a lot of variation in the frequency of exposure among the rest of the districts between one and zero. $Post2016_t$ is a dummy equals 1 if the year is 2019 given that the study includes 2 election years: 2014 and 2019. $X_{d,t}$ is a vector of controls including the GDP per 1km grid cell, distance to road and water, the precipitation level and the population count all at the grid cell level. The total number of observations is 3,088.

In some specifications, γ_d and δ_t, that are district and year fixed effects respectively, are added which absorbs $DroughtDamagePre2016_d$ as well as $Post2016_t$. In other specifications, no fixed effects are added which allows to estimate the impact of each of $DroughtDamagePre2016_d$ and $Post2016_t$ on vote share before interacting them. Finally, $\epsilon_{d,t}$ is the error term clustered at the district level. The maps presented in Figure A2 compare the districts voting for Kaies Saied and the extent of drought damage per district, a slight negative correlation exists. In order to test the mechanisms driving the result, we use the same regression with a different dependent variable, namely, riots as a measure of public discontent.[13]

5 Data

The voting data are from the Instance Supérieure Indépendante pour les Élections (ISIE). ISIE is a Tunisian autonomous public body responsible for all operations related to the organization, management and supervision of elections following the Tunisian electoral legislations. ISIE is responsible for vote counting, announcing preliminary and final election results. In compliance with Tunisian electoral laws and constitution mandates, ISIE also provides and oversees election calendars, in addition to other administrative roles aiming at preserving fair elections.

The ISIE data consist of the number of votes per president for the presidential elections and the number of votes per political party for the parliamentary elections. I use these data for the years 2014 and 2019 to build a voting share variable that will be the outcome variable. The final dataset includes 3088 observations at the finest district level available. A timeline of the voting data is presented in Figure A3 in the Appendix, showing that the first presidential elections took place in 2014. This is followed by the drought declaration removal, the main event of this paper that spans the years 2016 to 2019 then, the 2019 presidential elections were held.

The drought decrees are extracted from the " Official Journal of Legal Announcements" for the years 2015

[13] See more details in the data and mechanisms sections.

and 2016 to build a novel dataset that includes the percentage of agricultural areas damaged by drought as a proxy of drought damage at the district level. The Journal has as a main aim to publish legal texts. It is available in an online version and in a pdf format downloadable from the official website (Tunisia Government, 2024). Figure A4 in the appendix provides an example of a drought decree. It includes the names of the districts exposed to droughts at the finest level as well as the percentage of agricultural area damage caused by drought.

The ministry of agriculture declares the percentage of areas damaged per district in these drought decrees. Consequently, the farmers living on the damaged areas will be eligible for a governmental intervention consisting of easing their financial constraints. Banks mediate the governmental funds by rescheduling loans for farmers whose lands are impacted by drought. The rescheduling allows farmers to have loans at the initial interest at which they were granted. This is a case by case process only concerning farmers living in areas impacted by droughts.

I couple this dataset with AidData. AidData is a research lab that provides precise spatial data not only on aid projects but also on practical applications and on investment development. The sources of AidData's geospatial data are: Population Density and Counts (CIESIN), Precipitation and Temperature (UDEL) and Gross Domestic Product (CIRES) as indicated in Goodman (2019). I use the data for the years 2014 and 2019 which include 1 km grid cell data on precipitation, GDP at the grid cell level (proxied by nighttime lights using the methodology of Goodman 2019), distance to water, distance to road as well as population density. The average number of grid cells per district in Tunisia is 20.

The Armed Conflict Location and Event Data Project (ACLED) is another data source used for this project. According to Raleigh et al. (2010), the data consist of a geospatial mapping of political events and conflict. The ACLED data include the location of the events and the dates of their occurrence, the participants and whether violent events lead to fatalities. For the purpose of this project, I use the "riots" variable as a proxy of people's public discontent at the district level. According to ACLED (2019) the variables' definition of ACLED, riots refer to events where conflict is prevalent among their demonstrators. I make use of the riots variable along with the "actors" variable that refers to the category of individuals involved in the riots. The actors of the riots are the residents per district that happen to be workers or farmers.

I use the ArabBarometer data, that provide individual level cross-sectional public opinion surveys in the Middle East and North Africa (MENA) region, to explore the impact of the policy removal on the general public opinion of the Tunisian people. In particular, I use the third, fourth and fifth waves of the Arab-Barometer data for the years 2013, 2016 and 2018 respectively. I collapse the data to get averages of variables at the district-year level. My focus is on two main variables trust in parliament and closeness to incumbent party at the parliamentary level. Table A1 provides the descriptive statistics of the variables used to produce Table 2.

The average drought damage is around 52% in the South regions while it is around 23% in the Northern-Central regions. In addition, the mean log precipitation in the Northern-Central regions is 3.49 slightly less than in the Southern regions that is 3.52. Furthermore, Figure A5 shows a weak and negatively significant correlation of -0.15 between declared drought damage and rainfall. This correlation indicates that the declared drought damage is not only a function of rainfall but also agricultural losses per district.

6 Results

6.1 Main Results

Table 2: The impact of drought declaration removal on the second round of the presidential elections

Vote Share	(1)	(2)	(3)
Drought Damage × Post	-0.129***	-0.163***	-0.163***
	(0.023)	(0.025)	(0.025)
Observations	3088	3088	3088
Mean DV	0.64	0.64	0.64
R^2	0.348	0.592	0.597
Controls	No	No	Yes
Year FE	No	Yes	Yes
District FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was subject to by drought, as decreed in the drought declarations."Post" is a dummy equals 1 if the year is the 2019 election year. The controls include yearly precipitation per district, the GDP per grid cells (1 km each), the distance of grid cells to roads and water as well as the population count at the grid cell level. The standard errors are clustered at the district level.

Table 3: The impact of drought declaration removal on voter turnout rate

Voter Turnout	(1)	(2)	(3)
Drought Damage × Post	0.051	-0.022	-0.020
	(0.048)	(0.015)	(0.016)
Observations	2145	2140	2140
Mean DV	0.62	0.62	0.62
R^2	0.161	0.712	0.713
Controls	No	No	Yes
District FE	No	Yes	Yes
Year FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was subject to by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The controls include yearly precipitation per district, the GDP per grid cells (1 km each), the distance of grid cells to roads and water as well as the population count at the grid cell level. The standard errors are clustered at the district level.

Table 2 presents the results of estimating equation (1). Column 1 depicts the results without any controls, district or year fixed effects. The results of column (1) indicate that a one standard deviation increase in drought damage post 2016 lead to a decline in incumbent vote share by 8.3 percentage points that is

64% of the mean vote share in districts more likely to have droughts compared with the ones less likely to experience them. Column (2) presents the results with district fixed effects aiming at capturing unobserved characteristics not accounted for in the dataset at the district level. Column 3 includes controls, district and year fixed effects which translates into a higher R-squared compared to the other two columns. The results of columns 2 and 3 are the same. Both columns have a result with a magnitude of -0.163 indicating that a one standard deviation increase in drought damage post the 2016 shock leads to 10.24 percentage points decrease in Saied's vote share in districts that are more damaged compared with the ones that are less damaged due to drought, that is 64% of the dependent variable mean.[14]

It is important to note that the only difference between column (2) and (3) is that column (3) includes a year fixed effect and the dataset has only 2 years: 2014 and 2019. The results of Table 2 confirm the correlation depicted in Figure A6, that is an attempt to find if there exists a correlation between declared drought damage and delta incumbent vote share – where incumbent here refers to the winning candidate in the 2019 presidential elections, Kaies Saied. This figure does show a weak and negative correlation of -0.31, significant at the 5% significance level.

Column 3 of Table A3 in the appendix presents the coefficients of the controls added in the regression, log GDP per grid cell and log precipitation are both positively and significantly impacting Kaies Saied's vote share. Table 3 investigates if the drought declaration removal would impact voter turnout. Voter turnout is calculated as the number of signing voters on the day of the election over that of registered voters. I find no significant results on voter turnout at the district level. Table A4 shows that none of the controls have a significant impact on voter turnout either.

6.2 Additional Results: Trust in Government and Parliamentary Parties.

Table 5 further looks at the impact of the removal of the drought declarations on people's perception of the performance of the government. The results indicate that a one standard deviation increase in drought damage post-2016 leads to a decline in the perceived to be satisfactory government performance by 2.2 percentage points in the highly susceptible districts to droughts compared with the less susceptible ones. Drought decrees are usually publicly declared within the months between August and November every year. It is as of the year 2016 that drought decrees were not produced for the year 2016 and the three years to follow. The reason for the removal was not publicly declared to the people. This unanticipated abandonment of the drought policy coincided with the 2016 cabinet change.

[14]Table A2 illustrates the impact of rainfall on vote results at the presidential elections level. Column(3) shows that there are no significant results after adding year and district fixed effects. These results indicate that the presence of rainfall in itself is not a driver of voting outcomes and that the results of Table 2 are rather caused by the removal of drought declarations not by precipitation levels.

Table 4: The impact of drought declaration removal on government performance

Government Performance	Unsatisfactory	Satisfactory
Drought Damage × Post	0.041	-0.132**
	(0.095)	(0.063)
Observations	2994	2994
Mean DV	2.46	1.70
R^2	0.186	0.090
District FE	Yes	Yes
Year FE	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The standard errors are clustered at the district level.

In August 2016, a new government was formed under the prime minister Youssef Chahed.[15] Chahed's predecessor, Habib Essid, was dismissed because of the government's inability to deliver economic reforms (France 24, 2016). I rerun the main regression on Tunisian people's trust in the government formed post-2016 as presented in Table 5. Column 3 includes controls and district fixed effects and highlights that a 1 standard deviation increase in drought declarations post removal leads to an increase in Tunisian people's trust in the 2016 government by 4 percentage points. This result reflects people's high expectations of the new government formed. The results of Table 4 and 5 highlight the negative performance of the government in power prior to the 2016 governmental change, lead to an increase in people's trust in the newly established government post-2016. However, it is important to note that despite the high trust in the post-2016 government, the decline in Saied's vote share in the 2019 presidential elections in Table 2 indicates that the performance of the new government was still not up to the expectations of the people.

[15]The prime minister stated that his top priority would be to tackle security issues and to fight corruption. In addition to merging the ministry of Environment with that of Local Affairs but no details on drought management under this new government were stated according to Business News (2016).

Table 5: The impact of drought declaration removal on trust in the post-2016 government

Trust in the post 2016 Government	(1)	(2)	(3)
Drought Damage × Post	0.138***	0.154***	0.153***
	(0.046)	(0.052)	(0.051)
Observations	2994	2994	2994
Mean DV	2.80	2.80	2.80
R^2	0.055	0.127	0.128
District FE	No	Yes	Yes
Controls	No	No	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was subject to by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The controls include yearly precipitation per district, the GDP per grid cells (1 km each), the distance of grid cells to roads and water as well as the population count at the grid cell level. The standard errors are clustered at the district level.

Table 6: The Impact of the drought declaration removal on interpersonal trust

Interpersonal Trust	High Trust	Little to No Trust
Drought Damage × Post	0.015	-0.018
	(0.016)	(0.016)
Observations	2994	2994
Mean DV	0.15	0.15
R^2	0.098	0.105
District FE	Yes	Yes
Year FE	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The standard errors are clustered at the district level.

Table 6 presents the results for interpersonal trust. The aim of running this regression is to check if citizens' discontent against the government has been affecting trust between the people themselves, not only their trust in their government. The removal of drought declarations has no significant impact on trust between people. Regression 1 is run on the parliamentary elections sample to check if voters would punish political parties at the parliamentary elections. Some of the prominent political parties among others are Ennahda, Nidaa Tounes and Popular front. Ennahda is a non-secular Right-wing party emphasizing religious references for democratic rule. Ennahda won the majority of seats in the 2019 parliamentary elections, while it was the second party to win seats in the 2014 parliamentary elections.

Table 7: The impact of drought declaration removal on parliamentary elections

Vote Share	Ennahda		Nidaa		P.Front	
	(1)	(2)	(3)	(4)	(5)	(6)
Drought Damage × Post	-0.062	-0.040	-0.019	-0.010	0.003	0.005*
	(0.044)	(0.032)	(0.012)	(0.009)	(0.004)	(0.003)
Observations	2740	2734	2741	2735	2664	2658
Mean DV	0.19	0.19	0.13	0.13	0.02	0.02
R^2	0.134	0.174	0.280	0.415	0.173	0.226
District FE	No	yes	No	Yes	No	Yes
Year FE	No	yes	No	Yes	No	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year.

Table 8: The impact of the removal of drought declarations on parliament trust and closeness to incumbent

Outcome Variable	Parliam. Trust	Close to Incumbent
Drought Damage × Post	-0.005	-0.007
	(0.095)	(0.020)
Observations	1432	1961
Mean DV	2.45	0.10
R^2	0.118	0.116
Controls	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The standard errors are clustered at the district level.

Table 7 shows the results of the regression on the vote share for Ennahda, Nidaa Tounes, and the Popular front that constitute around 39% of the vote shares in the 2019 parliamentary elections. The rest of the vote shares are distributed among the other existing and emerging political parties, as well as the independent lists. Each of these parties and lists received a vote share ranging from 0.20% to 4.5%, not exceeding the 5% shares.[16] There is no impact of the removal of the drought policy on parliamentary elections. This result reinforces the idea that the incumbent president is the one to blame in case of an inadequate government response to a climate shock in a context where political parties are institutionally weak. Table 8 repeats the regression 1 to check if the removal of drought declarations has an impact on trust in parliament or closeness to the incumbent party at the parliamentary level. The drought declaration policy removal shock does not have a significant impact on either of them. Therefore, it can be deduced that the impact of the policy shock is only relevant at the presidential election level.

[16] The International Foundation for Electoral Systems (2023) extensively shows the share and seats of votes per party in the 2019 parliamentary elections.

6.3 Mechanisms

Table 9: The impact of drought declaration removal on riots

Riots	(1)	(2)	(3)	(4)
Drought Damage × Post	0.094**	0.149**	0.267**	0.081
	(0.038)	(0.068)	(0.133)	(0.092)
Observations	1793	660	363	295
Mean DV	0.28	0.40	0.39	0.42
R^2	0.712	0.766	0.831	0.704
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Farmers riots	No	Yes	Yes	Yes
Region	All	All	North-Center	South

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The standard errors are clustered at the district level. All regressions include log rainfall, distance to water, distance to road and mean GDP per capita at the grid cell levels as controls.

In this section, I study the mechanism driving the impact of the policy change on presidential elections. Table 9 presents the results for riots as a proxy of public discontent. Column 1 illustrates the impact of dropping the drought declarations on the prevalence of riots in all Tunisian regions; a one standard deviation increase in drought damage post the 2016 abandonment of the policy leads to an increase in riots by 2.6 percentage points, accounting for 28 percent of the mean dependent variable, in the districts highly-exposed to droughts. It is important to note that column 1 focuses on riots driven by not only farmers but the different sectors of the population within the districts.

The rioters are groups of individuals or mobs not belonging to any organization but who engage in violent demonstrations in a spontaneous way. Column 2 limits the sample to farmers' riots in all the Tunisian regions, the results indicate that a one standard deviation increase in drought damage post removal in the drought-prone regions leads to an increase in farmers' riots by 6 percentage points, that is 40 percent of the mean dependent variable. Column 3 further restricts the sample to riots driven by farmers in the Northern-Central regions; the results of column 1 and 2 are maintained with a much stronger impact in the Northern-Central regions that are more agriculture as well as more densely-populated than their Southern counterparts.[17]Other variables that impact riots are shown in column 4 Table A5, where log grid cell GDP as well as log distance to road both negatively and significantly impact riots per district.

[17]To reconcile these results with that of Table 11, the high prevalence of agricultural lands in the Northern-Central Tunisian districts coupled with the high density of population living there increases riots events. In the Southern Tunisian regions, the negative impact of drought spells on cultivated crops are more prevalent than in the Northern-Central regions but it does not spark enough riots because of the low population density. According to the Institut National de la Statistique (INS) (2022), the Center-Eastern and North-Eastern Tunisian regions had around 2.8 million and 1.7 million inhabitants respectively in 2022 that is around 40% of the total population.

6.4 Robustness Checks

Table 10: The impact of drought declaration removal on voting outcomes: using a drought damage treatment post removal and a pre-period variable

Vote Share	(1)	(2)	(3)
Damage2020 × Pre	0.080***	0.075***	0.074**
	(0.028)	(0.028)	(0.029)
Damage2020	-0.042***	-	-
	(0.010)	-	-
Pre	-0.186***	-0.219***	-
	(0.026)	(0.030)	-
Observations	2910	2910	2830
Mean DV	0.64	0.64	0.64
R^2	0.268	0.523	0.532
Controls	Yes	Yes	Yes
Year FE	No	No	Yes
District FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations covering the agricultural years 2020 and 2021. "Pre" is a dummy equals 1 if the year of election is 2014. The standard errors are clustered at the district level.

Table 11: The impact of drought declaration removal on vote share in round 2 of the presidential elections after restricting the sample to the Northern-Central areas.

Vote Share	North-Center			South		
	(1)	(2)	(3)	(4)	(5)	(6)
Drought Damage × Post	-0.082***	-0.132***	-0.132***	-0.255***	-0.258***	-0.258***
	(0.029)	(0.034)	(0.034)	(0.020)	(0.023)	(0.023)
Observations	1414	1414	1414	1674	1674	1674
Mean DV	0.66	0.66	0.66	0.63	0.63	0.63
R^2	0.127	0.437	0.439	0.709	0.800	0.800
Controls	No	No	Yes	No	No	Yes
District FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is post the year 2016 (the last drought declaration year). The controls include yearly precipitation per district, the GDP per grid cells (1 km each), the distance of grid cells to water and the population count at the grid cell level. The standard errors are clustered at the district level.

Table 12: Impact of Normalized Difference Vegetation Index (NDVI) on Incumbent Vote Share

Vote Share	(1)	(2)	(3)
NDVI pre × Post	-0.206***	-0.212***	-0.212***
	(0.022)	(0.030)	(0.030)
Observations	2581	2581	2581
Mean DV	0.63	0.63	0.63
R^2	0.528	0.679	0.680
Controls	No	No	Yes
District FE	No	Yes	Yes
Year FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. "Post" is a dummy equals 1 if the year is the 2019 election year. The standard errors are clustered at the district level. The NDVI variable is created by aggregating daily data to monthly ones by taking the maximum value. The average of the monthly maximum value is used to calculate the yearly values. The NDVI negative values are truncated to 0 according to aiddata's description of the NDVI variable.

Table 10 presents the results of running regression (1) after changing the treatment variable to have it as a post-treatment instead of a pre-treatment as well as having a pre-period variable instead of a post one. I use drought declaration decrees for the years 2020 and 2021 to create the continuous treatment variable. The results of this table are comparable with that of Table A3 in the appendix. The interaction term of this table would be translated as the impact of drought damage in the years 2020 and 2021 during the pre-period (that are years before the policy removal takes place) on vote share for president Essebsi, the 2014 winning presidential candidate. The magnitude of interaction term means that a one standard deviation increase in drought damage post removal would lead to 5.1 percentage points increase in vote share for Essebsi. The interaction term in the first column shares the same magnitude of drought damage of Table A3 which means that the results are robust to changing the years of the drought declarations policies. The overlap of the magnitude of the interaction term with that of this table with that of A3 supports the pre-trends assumption deemed necessary for differences-in-differences regressions.[18]

Tunisia's agriculture is mostly concentrated in the country's Northern-Central regions. For this reason, I rerun the main regression after splitting the sample into two: the Northern-Central regions and the Southern regions. Table 11 column 3 and 6 show that an increase in damage caused to agricultural land by 1 standard deviation post the 2016 removal shock, is likely to cause a decrease in Saied's vote share by 8.5 and 16.5 percentage points respectively in the Northern-Center and Southern districts. Despite the fact that agricultural lands are more prevalent in the Northern-Central districts than in the Southern ones, the impact of the policy removal in the Southern districts is more pronounced than in the Northern-Central counterparts. This is likely the case given that the Northern-Central regions have more agricultural lands and more densely-populated therefore, the drought mitigation is more concentrated in this region rather than the Southern ones.

[18]The dataset used for this paper consists of two main data points that hinder a testing of the pre-trends assumption. However, this table serves as a possible pre-trends test in the same spirits of the robustness checks regression of Akhmedov and Zhuravskaya (2004).

Table 12 is an additional attempt to check if having the Net Vegetation Index (NDVI), as a treatment variable - proxy of drought - replacing the main drought damage, would change the results we get. The NDVI variable is created by aggregating daily data to monthly ones by taking the maximum value. The average of the monthly maximum value is used to calculate the yearly values. The NDVI is used to assess the vegetation greenness and density as well as to monitor plant health. For this reason, the NDVI is considered to be a proxy of drought damage. The results are consistent with the main results in Table 2, where a one standard deviation increase in NDVI pre-shock would lead to a decrease in Saied's vote share by 14.4 percentage points. It is worth noting that the results support the claim that drought declarations were not targeting specific districts or farmers but they were actually targeting the districts that were facing drought spells that led to agricultural output losses at the district level.

7 Conclusion

Droughts pose a threat to countries in terms of agricultural output losses, food insecurity, conflicts and has implications on elections as well. Inability to protect vulnerable communities may have political implications. This paper establishes a causal link between a drought policy change in Tunisia in 2016 and the results of 2019 presidential elections in a diff-in-diff framework. Tunisia suffers from severe droughts which lead to significant crop losses. Before 2016, the affected farmers were eligible for financial relief. However, as of 2016, this relief was no longer provided to farmers for three consecutive years of severe drought. The damage induced by drought not only concerns farmers but extends to Tunisian residents in the different districts prone to drought. These residents can no longer quantify the extent of agricultural output losses they incurred thus, are unable to track potential food shortages.

Furthermore, Tunisia's political landscape is characterized by a hybrid democratic regime with a multitude of political parties that exert relatively weak influence and exhibit a wide ideological gap from the demands of the populace. The year 2019 marked the second presidential as well as parliamentary elections in Tunisia's history after the revolution and coincided with the removal of the drought declaration and compensation decree. Following the removal of the drought declaration decrees in Tunisia, people's general disapproval of the policy abandonment manifested itself in the rise of riots in the agricultural districts by 2.8 percentage points following a 1 standard deviation increase in district-level damage following the policy change. This general disapproval is partly-driven by farmers who are no longer eligible for compensations of their agricultural losses, while the rest of residents per district cannot keep track of the impact of drought thus, cannot anticipate potential food shortages they are likely to face. Tunisians discontent went beyond rioting in districts to polling centers during election times; by punishing the presidential candidate politically-aligned with his predecessor. These results highlight that despite the fact that democracy in Tunisia is flawed to a great extent. However, Tunisians still believe that democracy is the best way to govern.

Therefore, the Tunisian people would rather punish the incumbent president - by voting for the opponent during presidential elections - than the incumbent party at the parliament if they deem governmental policies inefficient. Interestingly, the voters have not punished the incumbent parties in the parliamentary election; nor there has been any impact on trust in parties or closeness to them. These results show that in Tunisia's hybrid democratic regime, the public believes that the real policy accountability belongs to the president rather than to the parliament.

Additional findings indicate that the drought policy removal shock did not affect voter turnout or interpersonal trust. However, it did erode trust in the post-2016 government, with a one standard deviation increase in drought damage after the policy change leading to a 4 percentage points decline in trust in the newly-formed government. This decline in trust helps explain the reduction in incumbent's vote share during the presidential elections. It is worth noting that this result explains to a great extent the decline in incumbent's vote share at the presidential elections level. Furthermore, the results are robust to changing the main treatment variable to another variable proxy of drought damage as well as to changing the drought damage variable to a post treatment - for drought spells taking place in 2020 and 2021 - instead of the conventional pre-variable. The study highlights important policy implications, emphasizing the need to ensure information transparency in case of removing government policies that target vulnerable groups of the population such as drought relief policies as well as strengthening the role of the private sector in drought relief provisions.

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8 Appendix

8.1 Tables

Table A1: Descriptive Statistics

	(1) All	(2) North-Center	(3) South
Kais Saied V.S.	0.64	0.66	0.62
	(0.189)	(0.140)	(0.221)
Voter turnout	1.09	1.26	0.95
	(1.713)	(2.083)	(1.329)
Log precipitation	3.50	3.49	3.52
	(0.438)	(0.436)	(0.439)
Percentage of drought damage	38.67	22.98	51.93
	(39.12)	(31.75)	(39.86)
Log grid cell GDP	-0.06	0.18	-0.25
	(1.523)	(1.549)	(1.473)
Log grid cell population	10.60	10.70	10.52
	(0.649)	(0.624)	(0.657)
Log distance to road	7.99	7.79	8.15
	(0.812)	(0.673)	(0.878)
Log distance to water	10.13	9.82	10.39
	(1.335)	(1.187)	(1.396)
Drought dec. dummy	0.60	0.47	0.71
	(0.490)	(0.499)	(0.453)
Observations	3088	1414	1674

mean coefficients; sd in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A2: The impact of rainfall on voting outcomes at the presidential elections level

Vote Share	(1)	(2)	(3)
Log Rainfall	-0.015	-0.055	-0.051
	(0.012)	(0.047)	(0.036)
Observations	3088	3088	3088
Mean DV	0.64	0.64	0.64
R^2	0.001	0.222	0.470
Year FE	No	No	Yes
Ind. FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The controls include yearly precipitation per district, the GDP per 1km grid cell, the distance of grid cells to water and the population count at the grid cell level. The standard errors are clustered at the district level. Log grid cell GDP, log distance to water, log distance to road and log grid cell population are not absorbed by the district fixed effects because these are cell-level variables.

Table A3: The impact of drought declaration removal on vote share in round 2 of the presidential elections

Vote Share	(1)	(2)	(3)
Drought Damage × Post	-0.129***	-0.163***	-0.163***
	(0.023)	(0.025)	(0.025)
Drought Damage	0.074***	-	-
	(0.017)	-	-
Post	0.173***	-	-
	(0.022)	-	-
Log grid cell GDP			-0.189***
			(0.067)
Log distance to water			0.037
			(0.044)
Log distance to road			-0.171*
			(0.096)
Log grid cell population			0.058
			(0.086)
Log precipitation			0.091***
			(0.030)
Observations	3088	3088	3088
Mean DV	0.64	0.64	0.64
R^2	0.348	0.592	0.597
Controls	No	No	Yes
Year FE	No	Yes	Yes
District FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The controls include yearly precipitation per district, the GDP per 1km grid cell, the distance of grid cells to water and the population count at the grid cell level. The standard errors are clustered at the district level. Log grid cell GDP, log distance to water, log distance to road and log grid cell population are not absorbed by the district fixed effects because these are cell-level variables.

Table A4: The impact of drought declaration removal on voter turnout rate

Voter Turnout	(1)	(2)	(3)
Drought Damage × Post	-0.021	-0.062	-0.066
	(0.069)	(0.083)	(0.080)
Drought Damage	-0.034	-	-
	(0.056)	-	-
Post	-0.410***	-	-
	(0.062)	-	-
Log grid cell GDP			-6.784***
			(0.227)
Log population			-10.006***
			(0.141)
Log distance to road			0.194**
			(0.081)
Log distance to water			-7.991***
			(0.172)
Log precipitation			-0.069
			(0.186)
Observations	2458	2453	2453
Mean DV	0.63	0.63	0.63
R^2	0.019	0.177	0.179
Controls	No	No	Yes
District FE	No	Yes	Yes
Year FE	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The controls include yearly precipitation per district, the GDP per grid cells (1 km each), the distance of grid cells to water and the population count at the grid cell level. The standard errors are clustered at the district level. Log grid cell GDP, log distance to water, log distance to road and log grid cell population are not absorbed by the district fixed effects because these are cell-level variables.

Table A5: The impact of drought declaration removal shock on riots

Riots	(1)	(2)	(3)	(4)
Drought Damage × Post	0.061	0.100**	0.045	0.094**
	(0.058)	(0.040)	(0.049)	(0.038)
Drought Damage	-0.041	-	-0.025	-
	(0.055)	-	(0.046)	-
Post	-0.219***	-0.231***	-	-
	(0.065)	(0.037)	-	-
Log rainfall	-0.119**	0.034	-0.133**	0.015
	(0.056)	(0.044)	(0.053)	(0.038)
Log grid cell GDP	0.024	0.339***	0.029	0.370***
	(0.025)	(0.066)	(0.023)	(0.119)
Log grid cell population	0.033	-0.454**	0.022	-0.263
	(0.035)	(0.179)	(0.034)	(0.280)
Log distance to road	-0.043	0.517***	-0.034	0.526**
	(0.043)	(0.134)	(0.042)	(0.237)
Log distance to water	0.076***	-0.140***	0.070***	-0.159
	(0.026)	(0.050)	(0.023)	(0.097)
Observations	1793	1793	1793	1793
Mean DV	0.28	0.28	0.28	0.28
R^2	0.101	0.642	0.249	0.712
Controls	Yes	Yes	Yes	Yes
District FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.10. The regression includes vote shares for the second round of the presidential elections years 2014 and 2019. "Drought Damage" is a standardized continuous treatment variable indicating the percentage of damage a district was affected by drought, as decreed in the drought declarations. "Post" is a dummy equals 1 if the year is the 2019 election year. The standard errors are clustered at the district level. All regressions include log rainfall, distance to water, distance to road and mean GDP per capita at the grid cell levels as controls. Log grid cell GDP, log distance to water, log distance to road and log grid cell population are not absorbed by the district fixed effects because these are cell-level variables.

8.2 Figures

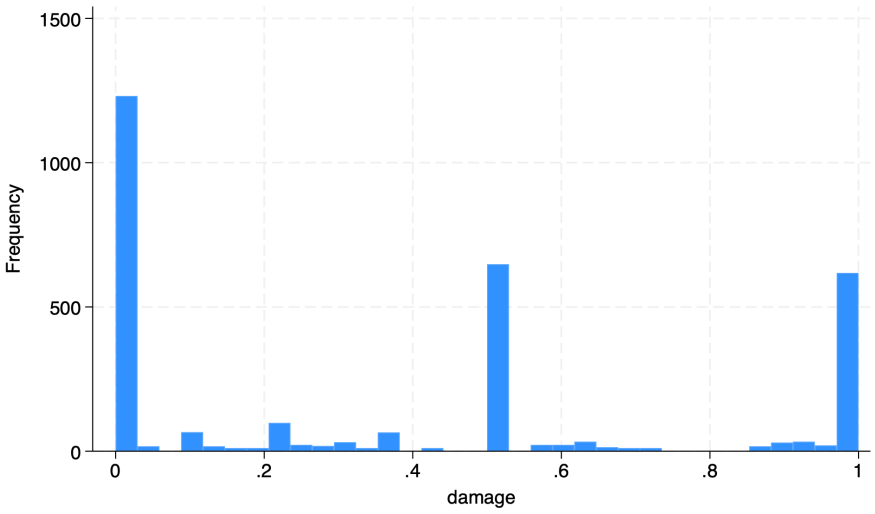
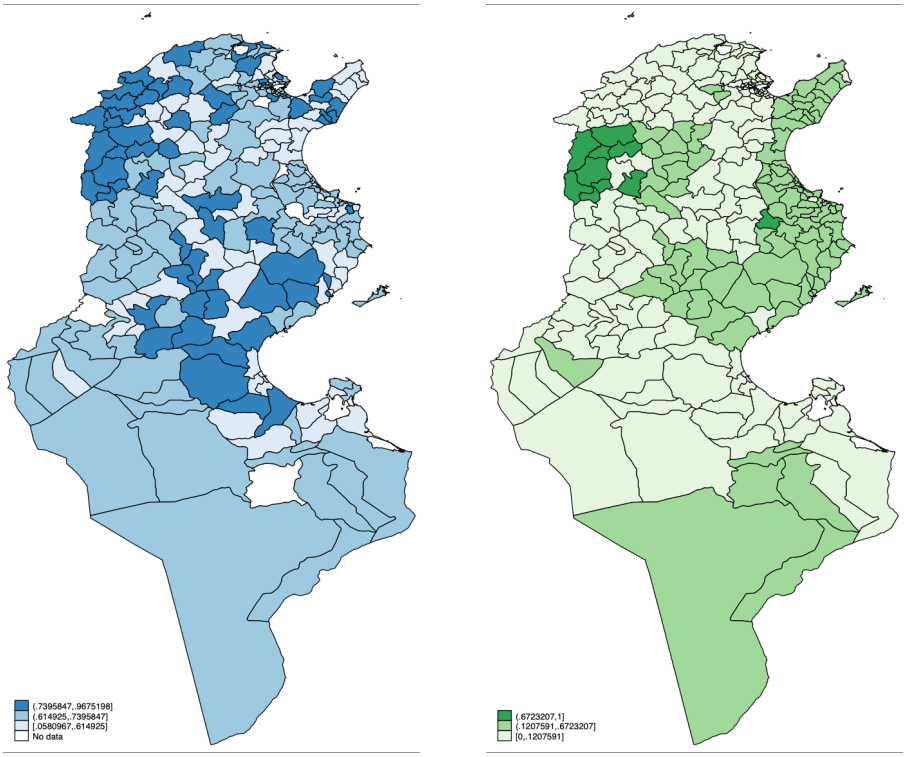


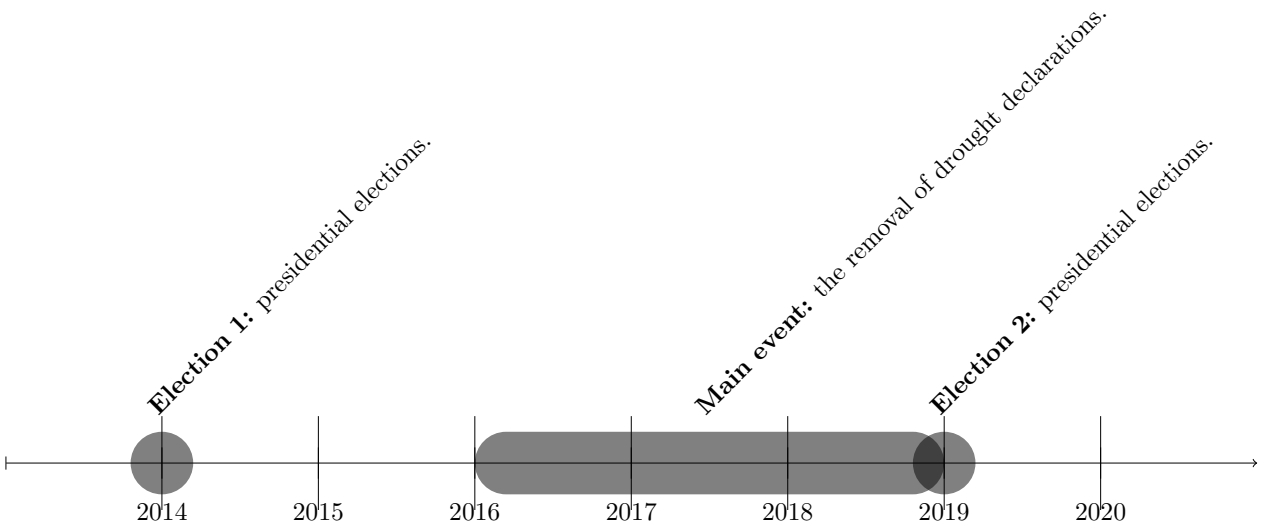
Figure A1: Histogram of drought damage prior to its standardization.

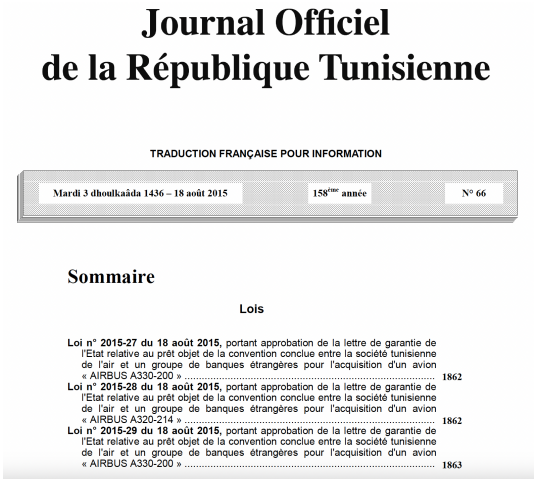


(a) The 2019 Presidential Vote Share (b) The Percentage of Drought Damage

Figure A2: Vote Share and Drought Damage Maps.

Figure A3: Timeline of the Voting Data and Main Event





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Mardi 3 dhoulkaâda 1436 – 18 août 2015 | 158ème année | N° 66

Sommaire

Lois

(a) The First Page of the Journal

BEN AROUS	**MORNAG**	SIDI SALEM EL GARSI	**75**
		EL KABOUTTI	**87**
		EL KANA	**100**
		AIN RKAD	**62**
		ELKSIBI	**47**
		OUDNA	**57**
		ERRISALA	**20**
		JBEL ERSASS	**38**
	MHAMDYA	SIDI FREJ	**45**
		MONJI SLIM	**85**
		CITE SAADA	**100**
		CITE NASSIM	**100**
	FOUCHANA	NAASSEN	**80**
		DOUAR EL HOUCH	**88**
		CHBEDDA	**56**
		EL MGHIRA	**71**
		FOUCHANA	**100**
	BOUMHEL	BOUMHEL	**100**
	HAMMAN CHATT	HAMMAN CHATT	**100**

(b) The Percentage of Agricultural Area Damage at the finest District Level

Figure A4: The Tunisian Official Journal of Legal Announcements

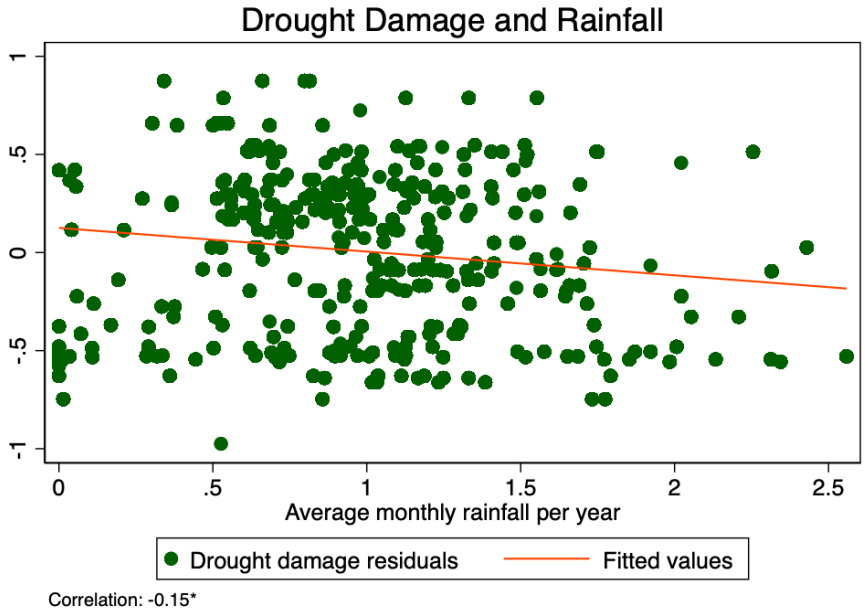

Figure A5: Correlation between Drought Damage and Rainfall

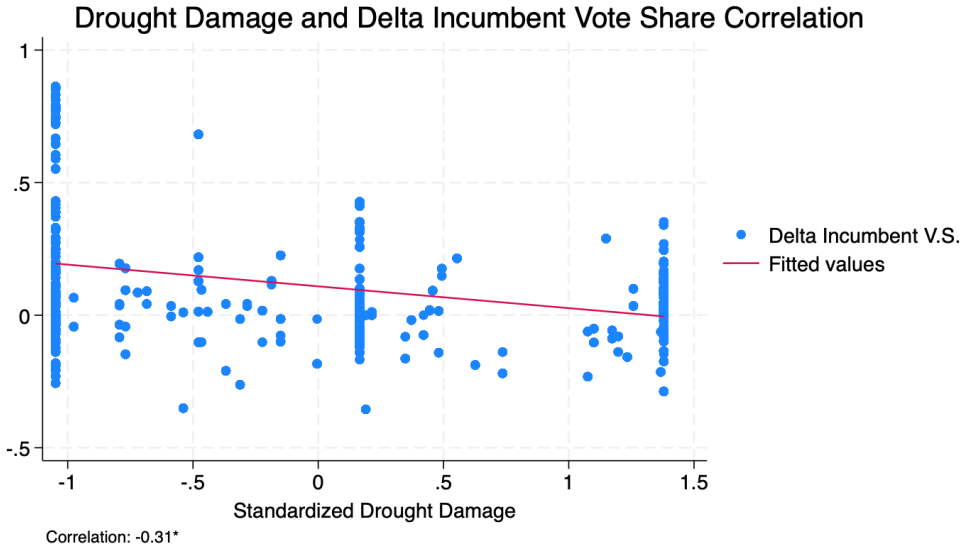

Figure A6: Correlation between the Standardized Drought Damage and Delta Incumbent Vote Share.