# Weak States: Causes and Consequences of the Sicilian Mafia*

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**Abstract**

We document that the spread of the Mafia in Sicily at the end of the 19th century was in part shaped by the rise of socialist Peasant Fasci organizations. In an environment with weak state presence, this socialist threat triggered landholders, estate managers and local politicians to turn to the Mafia to resist and combat peasant demands. We show that the location of the Peasant Fasci is significantly affected by an exceptionally severe drought in 1893, and using information on rainfall, we establish the causal effect of the Peasant Fasci on the location of the Mafia in 1900. We provide extensive evidence that rainfall before and after this critical period has no effect on the spread of the Mafia or various economic and political outcomes. In the second part of the paper, we use the source of variation in the location of the Mafia in 1900 to estimate its medium-term and long-term effects. We find significant and quantitatively large negative impacts of the Mafia on literacy and various public goods in the 1910s and 20s. We also show a sizable impact of the Mafia on political competition, which could be one of the channels via which it affected local economic outcomes. We document negative effects of the Mafia on longer-term outcomes (in the 1960s, 70s and 80s) as well, but these are in general weaker and often only marginally significant. One exception is its persistent and strong impact on political competition.

**Keywords:** criminal organizations, economic development, Mafia, political competition, weak states.
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# 1 Introduction

The criminal syndicate known as the Mafia has played a defining role in the Sicilian economy and politics over the last 150 years, and has often been proffered as one of the prime reasons why Sicily has lagged behind the rest of Italy in economic and social development.[1] Though the Sicilian Mafia has significantly weakened after the Maxi trials of the 1980s and its further confrontation with the Italian state in the 1990s, it is still active in many Sicilian municipalities; between 2001 and 2014, 43 municipalities were put under external administration to weed out the extensive involvement of the Mafia in local governments and public procurements (Ministero dell'Interno, 2015).

Though many aspects of the Sicilian Mafia are unique to the economic and social conditions of the island and its particular history, there are also several commonalities between the Sicilian Mafia and other organized crime syndicates in Italy (such as the Camorra in Naples and 'Ndrangheta in Calabria) as well as the various drug gangs in Mexico, Colombia and Central America. All of these organizations appear to have partly filled the void created by a weak state, and may have contributed to the continued weakness of state institutions and to economic underdevelopment. In this paper, we seek to contribute to the literature on the causes and consequences of the Sicilian Mafia and other criminal organizations.

The first part of the paper proposes an explanation for the Mafia's expansion throughout Sicily in the second half of the 19th century. Though the Mafia's roots extend back to the 1860s and the organization was certainly well established by 1885 in the capital Palermo and its rich suburbs as well as some mining areas such as Favara and Grotte in the Girgenti province, its major expansion in rural areas did not take place until the early 1890s. This was preceded by the rise of the Fasci (*Fasci dei Lavoratori*), the first mass socialist movement in Italy, which articulated demands for better pay, greater security (longer-term contracts), land redistribution, and lower local indirect taxes for staples.[2] The Fasci gained significant momentum following the very severe droughts of 1893, which caused massive drops in agricultural output and amplified the hardships of peasants. In the absence of a strong state capable of countering the rise of the socialist movement and its demands, landowners and the managers of large agricultural estates turned to the Mafia. The involvement of the Mafia in the suppression of peasants was not a new phenomenon in Sicily. As the former chief prosecutor at the Palermo Court of Appeal, Diego Tajani, noted in a parliamentary debate in 1875, "The Mafia in Sicily is not dangerous or invincible in itself. It is dangerous and invincible because it is an instrument of local government." (Quoted in Dickie, 2004, p. 73). But this role of the Mafia grew beyond recognition around 1893. John Dickie (2004, p. 136) describes this as

> "Over the 60 years and more that followed the flowering of the Fasci movement, mafiosi would intimidate and murder countless socialists, Communists and trade union leaders — so

[1] In 2015 GDP *per capita* in Sicily was €17,100 compared to €27,000 for Italy as a whole. Child mortality in Sicily was 0.48% compared to a national average of 0.35% (see ISTAT, 2016).

[2] Despite their common etymological root, which comes from the word *fascio* meaning bundle, there is no link between the Peasant Fasci movement and the subsequent fascist movement.

many, in fact, that it came to seem as if the Mafia's very purpose was to batter the organized working class in the countryside into submission."

In line with this theory, we document that the Peasant Fasci were much more likely to emerge in parts of Sicily where the 1893 drought was more severe, and crucially the Mafia was much more likely to spread to municipalities with more severe drought in 1893 as well. This relationship is robust to controlling for various determinants of the Fasci movement, other potential causes of the Mafia (such as its previous locations, the presence of sulfur mines or citrus groves) and various geographic factors. More importantly, we show that weather conditions before 1892 and after 1893 do not have a similar effect on either the Fasci's location or on the Mafia, bolstering the case that it was the effect of the severe drought of 1893 in the midst of the ongoing mobilization of the Fasci that prepared the conditions for the spread of the Mafia throughout Sicily.

The second part of the paper exploits the relationship between the drought of 1893 and the spread of the Mafia to estimate the crime syndicate's effects on local economic development and other economic and political outcomes. Formally, we estimate medium-run and long-run effects of the Mafia in a two-stage least squares (2SLS) setup using drought in 1893 as an excluded instrument. We verify that economic and social indicators before 1893 are not correlated with drought in 1893 and rainfall in other years is not related to various subsequent economic and political outcomes, increasing our confidence in this instrumental-variables strategy.

We estimate fairly large effects of the Mafia on economic outcomes in the early 20th century such as literacy rates in the 1920s and 30s. These negative effects could be, in part, reflecting the lower capacity of the local governments to provide public goods. We also identify one of the potential mechanisms via which the Mafia impacts both the local state's capacity and other economic outcomes — the Mafia's dominance over politics. Specifically, we find a striking increase in the concentration of votes across candidates in parliamentary elections. These results suggest that the Mafia became heavily involved in politics, and either prevented some candidates from campaigning in municipalities they controlled, or directly or indirectly manipulated which parties would capture the great majority of the votes.

We estimate similar, though somewhat smaller, and less precise, negative effects of the Mafia on long-term economic outcomes as well: municipalities with the heaviest presence of the Mafia have lower rates of high school education and lower coverage of various public goods in the 1970s. Moreover, we also see the effects of the Mafia on political competition have persisted to the later decades of the 20th century.

Our paper is related to a few literatures. First, a small theoretical literature models lawlessness and the economics of private protection. In addition to general treatments in Dixit (2004), Fiorentini and Pelzman (1995), and Abadinsky (2012), particularly relevant to our context is the seminal contribution of Gambetta (1993) who emphasizes the importance of the Mafia as provider of private protection to landowners and businesses with specific investments in an otherwise lawless environment.

Second, several recent papers investigate the origins of the Sicilian Mafia. Following Gambetta

(1993), a number of studies identified specific features or economic activities whose characteristics and potential profitability may have attracted the Mafia, shaping its early geographic distribution in Sicily. For example, Bandiera (2003) argues that land fragmentation increases the demand for private protection, and provides evidence consistent with this prediction from three Western Sicilian provinces. Del Monte and Pennacchio (2012) document greater presence of the Mafia in areas with greater land productivity and rich mines, which they interpret as reflecting the greater willingness to pay for private protection by more productive landowners. In a similar vein, Dimico et al. (2017) show that areas where citrus fruits are the main crop are more likely to fall prey to the Mafia, which reflects not just the productivity of citrus farming but its greater vulnerability to vandalism and disruptions of litigation. Buonanno et al. (2015), on the other hand, link the development of the Mafia to sulfur mines. As explained in the next section, our theory for the spread of the Mafia at the end of the 19th century and our evidence on the economic consequences of the Mafia are new relative to this literature.

Third, a growing literature has started to investigate the economic consequences of the weakness of local state institutions, focusing on several of the same outcomes as in our paper, such as literacy and the provision of various public goods (e.g., Gennaioli and Rainer, 2007; Dell, 2010; Bandyopadhyay and Green, 2012; Michalopoulos and Papaioannou, 2013; Acemoglu et al., 2015), but has not focused on the role of organized crime.[3]

Finally, and partly related to the origins of state weakness, a recent nascent literature investigates linkages between criminal organizations and political actors (Acemoglu et al., 2013; Fergusson et al., 2013). In the Italian context, De Feo and De Luca (2017) document that between 1946 and 1992, the Mafia supported the Christian Democratic Party, and in return obtained economic advantages in the construction sector. Buonanno et al. (2016) extend this analysis to the 1994-2013 period and show that after the collapse of the Christian Democratic Party, Silvio Berlusconi's party, Forza Italia, obtained a larger share of votes in Mafia-ridden municipalities. Alesina et al. (2016) provide evidence that Italian regions with a strong presence of criminal organizations experience an increase in the number of murders in pre-election years. For Sicily, in particular, they show that the killing of politicians has a negative effect on leftist parties' vote share and on the anti-Mafia activities of elected officials. Daniele and Geys (2015) and Di Cataldo and Mastrorocco (2016) focus on the infiltration of organized crime into local councils and provide evidence of its negative effect on local tax collection, quality of local government expenditure and the education level of elected officials in southern Italy. Similarly, Daniele and Marani (2011) analyze provincial data for Italy and show that the presence of organized crime appears to reduce the flow of foreign direct investments. Relatedly, Pinotti (2015) uses synthetic control methods to estimate the negative effects of organized crime on GDP per capita into southern Italian regions. None of these papers focuses on the historical evolution of the Mafia, which is our main focus and source of variation in this paper.

[3]There are also several papers using fluctuations in rainfall as a source of variation in their analysis of civil wars, democratic transitions, revolutions, protests and other political economy outcomes. See, among others, Brückner and Ciccone (2011); Dell (2012); Dell et al. (2014); Madestam et al. (2013); Miguel et al. (2004); Bonnier et al. (2015); Hsiang et al. (2011, 2013).

The rest of the paper is organized as follows. Section 2 provides a brief historical overview of the situation in Sicily and the development of the Peasant Fasci and the Mafia at the end of the 19th century. Section 3 describes our data sources and provides descriptive statistics on our main variables. Section 4 presents our results on the effect of the Peasant Fasci on the spread of the Mafia after 1893. Section 5 presents our analysis of the effect of the Mafia on economic and political outcomes in the early 20th century, while Section 6 focuses on longer-term outcomes. Section 7 includes concluding comments. Additional results and robustness checks are presented in our online Appendix A.

# 2 Historical Context

In this section, we provide a brief historical context on the Sicilian Mafia, the state of agriculture in Sicily at the end of the 19th century, and the Peasant Fasci.

## 2.1 The Origins of the Mafia

There is a large historical literature on the origins of the Mafia, starting with the important accounts of contemporaries such as Villari (1878), Franchetti (1877), Alongi (1887, 1904) and Cutrera (1900). The consensus view today (e.g., Gambetta, 1993; Dickie, 2004; Lupo, 1996) places the Mafia's origins in the context of the tumultuous process of the fall of the Bourbon Kingdom (which had included much of southern Italy and Sicily) and the unification of Italy. The faraway Italian state was weak and largely incapable of enforcing the law in the aftermath of the unification, and this void was partially filled by the private protection provided by the Mafia.

Early works (e.g., Romano, 1966; Mack Smith, 1968; Brancato, 1976) emphasized the role of the abolition of feudal land relations and identified the origins of the Mafia in the rural areas of Sicily, where a new class of landowners, managers and public administrators used criminal methods to grab land that should have been distributed to the peasants and developed coercive labor relations in latifundia specializing in wheat production. Recent scholarship has, instead, concluded that, despite its archaic rituals, the origins of the Mafia lie in the more urban, richer and export-oriented areas around the former capital, Palermo (e.g., Lupo, 1984; Pezzino, 1985, 1987; Catanzaro, 1988), where the vacuum of law enforcement created demand for protection, especially from smallholders specializing in citrus (lemon and orange trees), which required investment several years before the trees bear fruit, uninterrupted irrigation and extensive protection. Dickie (2004, pp. 38–39) summarizes this recent view as

> "The Mafia emerged in an area that is still its heartland; it was developed where Sicily's wealth was concentrated, in the dark green coastal strip, among modern capitalist export businesses based in the idyllic orange and lemon groves just outside Palermo."

The Mafia was also highly visible in areas with sulfur mines, such as Favara and Grotte in the Girgenti province. The earliest trial against the Mafia was held in 1885 in Girgenti, and involved the Favara brotherhood, which mainly consisted of sulfur miners.

The recent important work by Benigno (2015), instead, emphasizes the systematic use of crime syndicates in both Sicily and Naples by the government and local politicians against political opponents (see also Mosca, 1900). Echoing our quotation from Dickie (2004) in the Introduction, he highlights the common practice of using the Mafia against republicans and then socialists. Indeed, police reports and contemporary observers leave no doubt that the Mafia was not only active in much of Sicily, but had become part of the social and political order by the early 20th century.

In this context, it is useful to note that our work can be viewed as bridging the gap between the three schools of thought mentioned above. We document that in the 1890s the Mafia spread from its original surroundings in the most urban parts of Sicily, as well as some of the mining areas, to the more rural parts of the island, and this was in large part because of more intensive use of the Mafia's coercive capacity by landowners and local politicians against the Peasant Fasci movement.[4]

The Mafia's role in Sicily declined considerably during Mussolini's fascist dictatorship, especially after the administration of Prefect Mori starting in 1925. But it did not disappear, and after the American invasion, former members of the Mafia once again exploited the turbulent environment to reconfigure their crime syndicate. After the war, the Mafia formed close relations with the Christian Democrats, which became the dominant party in Italy (e.g., De Feo and De Luca, 2017). The Mafia's reach appears to have started declining after the Maxi trials of 1986-87 and the subsequent confrontation with the Italian state following its murder of two judges in the Maxi trial, Falcone and Borsellino.

Though information about how the Mafia functioned in the 19th and early 20th centuries is patchy, we have fairly extensive evidence about its more recent practices. Besides the highly profitable business around illicit drug production and trafficking, the Mafia has traditionally focused on private protection and racketeering, and on private and public construction.[5] The well-established reputation of the Mafia for damaging vineyards or orchards and stealing livestock in the past, and for burning down or placing bombs in shops or industrial plants more recently guarantees a high rate of compliance from local businesses (Lorenzoni, 1910a; Pezzino, 1990). A vivid account of a Sicilian citizen, reported by Lorenzoni (1910a, pp. 649–650), describes the extent of the problems faced by the agricultural sector in the province of Trapani at the end of the 19th century:

> "If you care about understanding the conditions of our agriculture in order to improve it, then start by this social plague, the Maffia, which is an unsurmountable barrier on the way to agricultural development. You can introduce new policies aiming at improving economically agriculture. But what will be the use of them, if farmers, constantly scratched by the powerful nails of the maffia, won't be able to farm their land, as their draught animals are stolen or their harvest burned, because they refused to pay the money asked by the maffia?"

Construction activities require close connections with local authorities for obtaining permissions and

[4]This is also consistent with Gambetta's argument that the main driver of Mafia's expansion in rule areas was the demand for policing the peasants, which significantly intensified after the emergence of the peasant fasci (Gambetta, 1993, pp. 90-93).

[5]The discussion in Alongi (1887) suggests that the Mafia's practices in the second half of the 19th century were not much different.

overcoming regulations, which is a well documented feature of the Mafia (e.g., Pezzino, 1990). In return, as we already mentioned in the Introduction, the Mafia appears to have offered support and services to some politicians. As Lorenzoni (1910a) puts it, the Mafia started acting early on as "electoral canvasser, supporting its protector, or a candidate friend of its protector, or whoever paid for its backing". The reasoning reported by Franchetti (1877, p. 190) exemplifies how the illicit deal may come about: "Let's imagine a man, whose name and wealth allow reaching a high position among his citizens. [...] He's got the chance to acquire authority and reputation through administrative, political or other elections. An individual with a known influence on the local population offers him his services; he knows that others exploit similar connections, and that the public opinions does not condemn this. He knows that the man committed some killings, [...] but those homicides only increased the respectability and reputation of its perpetrator. [...] Why not using the tool commonly used by others? So, he accepts the support offered."

There is also evidence that a similar relationship has long existed between the Mafia and the central Italian government, which has had tenuous control in Sicily since unification (Pezzino, 1990, p. 59). Pezzino (1990, p. 74) discusses the range of activities the organization used for manipulating elections:[6]

> "Mafia bosses controlling packages of votes, manipulated electoral lists, stuffed with individuals who do not have the right to be included or conversely precluded to political opponents, rigged municipality elections, implemented without the very creation of an electoral office, or with falsified reports, harsh contests between factions or families leading to assassinations and violence [...]."

Voters intimidation became more widespread whenever direct ballot stuffing was not viable.[7] Hess (1973, p. 148) describes this as: "Time and again we read that *uomini di rispetto* loiter around the polling box, that some of them are even armed, that men known as violent criminals and employees of a mafioso form the so-called *posto del blocco* outside of the polling station or in front of the polling box itself, that they stop the voters, talk to them menacingly, sometimes beat them up and accompany them right to the booth."

Some of the most pernicious effects of the Mafia's involvement in the economy and local politics are well summarized by Lorenzoni (1910a, p. 677), when he writes:

> "In a State in which citizens for any reason do not trust justice and do not trust their own force, it is the evil ones who manage to impose themselves, and the ones who did not want to bow to justice are then forced to bow to them and be enslaved by them. So the Mafia emerges."

[6] See also Hess (1973, pp. 144-150).

[7] Violence appears to become particularly important when various factions compete for the local control. In the words of Franchetti (1877, p. 14): "Each one of the contending factions tries to strengthen by extending its alliance in the endless reservoir of bullies, criminals, and assassins. [...] The fight gets harsher, it spreads, it lights up throughout the municipality, and sometimes to neighbouring ones. It then starts the war of tricks, gunshots, ambushes, which sometimes degenerate into actual skirmishes." The electoral involvement of the Mafia, however, comes at a high cost. Lorenzoni denounced how public authorities were "tolerating that well known mafiosi steered municipalities, acted as petitioners in public offices, and become intermediaries between the authorities and the public." (Lorenzoni, 1910a, p. 682)

## 2.2 The State of Sicilian Agriculture and the Drought of 1893

Sicily provides ideal conditions for various crops, including lemon and oranges mentioned above, grapes, and olive oil. But the crop that has played the most defining role has always been wheat, and in the 19th century, most Sicilian latifundia specialized in wheat production. As US exports of wheat to Europe declined during the American Civil War, prices increased and wheat production spread further throughout Sicily. In 1884, grains occupied 44% of the total area of Sicily (Damiani, 1884, p. 96).

The main wheat variety cultivated in Sicily is the durum, sewed in November and harvested in late June. Production relied on cheap labor and made little use of capital or fertilizers. This made yields heavily dependent on rainfall during the mid-season of the crop, which is between early March and late May.[8] A Parliamentary inquiry on the condition of agriculture in Sicily summarizes the situation as "the level of production depends on the rain that, in order to ensure an excellent harvest has to occur up to the month of May. But if it stops before April the harvest is poor" (Damiani, 1884, p. 26).

The 1880s brought several difficulties for Sicilian agriculture. Spain became the major exporter of oranges to France and the UK, and huge investments in the cultivation of oranges in Florida reduced the demand for Sicilian exports to the United States, which was previously the main market for Sicilian citrus fruits. The same decade also witnessed a steady decline in the price of wheat because of increased competition from the United States and Russia. The demand for Sicilian agricultural products further declined as a result of the protectionist policies adopted in other key markets. In particular, a commercial war between Italy and France starting in 1888 led to the complete shutdown of the largest export market for Sicilian wine.

The conditions of agricultural workers and peasants in Sicily were dismal. Several visitors in the 19th century commented on the extent of poverty of Sicilian peasants (e.g., Sonnino, 1877; Rossi, 1894; Paton, 1898). These workers were either day laborers, recruited daily according to the need in the farm, or farmers renting small plots of land from the managers of the large estates. Day laborers were the largest class of rural workers in Sicily and small farmers also engaged in occasional day work to supplement their income.

Both groups experienced worsening conditions starting in the 1880s as Sicilian agriculture started facing various adverse trends. By this point, sharecropping arrangements had been replaced by short-term fixed rent contracts (of typically one or two years), leaving farmers more exposed to the risk of bad harvests. Day laborers were also vulnerable to bad harvests because of the reduced demand during the harvest season (Sonnino, 1877, p. 32).

It was against this background that the severe drought of 1893 hit. The severity of the drought was quite unprecedented.[9] Extensive cultivation of grains throughout Sicily and their aforementioned de-

[8] Brouwer and Heibloem (1986, chapter 3) identify the crop water needs as the product of a crop-specific coefficient that varies according to growing season and an evapotranspiration coefficient that depends on the climate and temperature. Their calculations indicate that for wheat, the rainfall between March and May is most critical.

[9] In some areas it was so severe that the popular reaction impressed observers, and was described by the famous Scottish anthropologist James George Frazer as "By the end of April 1893 there was great distress in Sicily for lack of water. The drought had lasted six months. Every day the sun rose and set in a sky of cloudless blue. The gardens of the Conca d'Oro,

pendence on weather conditions made the consequences of the drought even more severe. As reported by di San Giuliano (1894), the yield in 1893 was about half of the usual amount, and this came following the already bad harvest in 1892, accentuating the hardship. Wheat was not the only crop that was adversely affected. Olive oil, wine and barley also experienced bad harvests (di San Giuliano, 1894). Using district-level data from Direzione Generale dell'Agricoltura (1891-1895), Figure A1 in the Appendix shows the drop in production in 1893 relative to 1890-1894 across Sicily, and indicates that some areas experienced drops of more than 65% in agricultural production.

Peasants and agricultural laborers felt the full force of the drought of 1893. The newspaper *Il Giornale di Sicilia* described the situation in Carlentini in October 1893 as

> "The state of the countryside is disheartening: the olives fall dried and drenched from the trees, lemon and orange trees are suffering, pasture is most rare, and the poor peasants are unemployed and bear more than anyone else the effect of such calamity. Misery is immense here, as all over the island."

These harsh conditions provided an ideal environment for the Peasant Fasci movement, which started spreading throughout much of Sicily in the early 1890s.

### 2.3 The Peasant Fasci and the Spread of the Mafia

The Peasant Fasci was the first popular socialist movement in Italy. The first leagues were founded in 1891 and organized mainly industrial workers and artisans in the largest cities.

The first peasants' organization emerged late in 1892 but it was the drought of 1893 that, by significantly worsening the conditions of Sicilian peasants, acted as the major impetus to the Fasci movement. The Fasci articulated many of the grievances of the peasants and day laborers of Sicily. Chief among their demands were higher wages, land redistribution, better working conditions, longer-term contracts for land leases, the return to sharecropping arrangements, and the reduction in indirect taxes which fell heavily on peasants (Romano, 1959; Renda, 1977; Casarrubea, 1978a).

The indirect taxation was a longstanding battleground in Sicily and a symptom of the deeper problem of taxation without representation.[10] The Sicilian local elites, who controlled the councils, made a

which surround Palermo with magnificent belf of verdure, were withering. Food was becoming scarce. The people were in great alarm. All the most approved methods of procuring water had been tried without effect. Processions had traversed the streets and the fields. Men, women, and children, telling their beads, had lain whole nights before the holy images. [...] Even the great St. Francis of Paola himself, who annually performs the miracle of the rain and is carried every spring through the market-gardens, either could not or would not help. Masses, vespers, concerts, illuminations, fire-works – nothing could move him. At last the peasants began to lose patience. Most of the saints were banished. At Palermo they dumped St. Joseph in a garden to see the state of things for himself, as they swore to leave him there in the sun till rain fell. Other saints were turned, like naughty children, with their faces against the wall. Others again, stripped of their beautiful robes, were exiled far from their parishes, threatened, grossly insulted, ducked in horse-ponds. [...] At Licata the patron saint, St. Angelo, fared even worse, for he was left without any garments at all; he was reviled, he was put in irons, he was threatened with drowning or hanging. 'Rain or the rope!' roared the angry people at him, as they shook their fists in his face."(Frazer, 1920, pp. 299-300)

[10] De Viti De Marco (1894) describes this problem, as perceived by contemporaries, as: "If a class of citizens who do not pay taxes does not have political representation [in the councils] is something I understand and, as a matter of principle, I consider

disproportionate use of such taxes in order to reduce the fiscal burden on their properties. This made the burden of indirect taxes on staple consumption in Sicily twice as large as in the rest of Italy, while taxes on land and buildings on the island were a third of the Italian average (De Viti De Marco 1894, p. 132). The situation for the peasantry got worst during the drought of 1893, when many Sicilian municipalities obtained the authorization from the central government to further raise indirect taxes above the national statutory upper bound (Romano, 1959, p. 320).

From its headquarters in the Palermo province, the Fasci movement quickly spread to provinces most affected by the drought, including Girgenti, Trapani, and Caltanissetta. By the end of 1893, there were hundreds of thousands of members of the 177 Fasci organizations in 158 municipalities, and the majority of these organizations were affiliated with the Socialist Party. At the first National Congress of the Italian Socialist Party in 1893, half of the party members were from Sicily (Degl'Innocenti, 1984, p. 8).

Though Sicily was no stranger to peasant revolts, the scale and organization of the Peasant Fasci were completely unprecedented, and the threats to landowners and rural estate managers were amplified by the fact that the Fasci were part of the nascent Socialist Party.

The Fasci's demands for better working conditions and lower consumption taxes faced the fierce resistance of the aristocratic landlords and the rural middle class in control of the local administrations. They sought the intervention of the Italian army to suppress the uprisings. But there was no decisive action from the central government, reflecting its weakness in Sicily and its initial ambivalent attitude towards the Socialist Party.[11] As Clark (2014, p. 125) puts it

> "These novel organizations, and the successful strikes over agricultural contracts, naturally alarmed the landowners and larger tenants. [...] The Giolitti government showed little sympathy. Strikes were not illegal, and Giolitti was well aware of the state of local government on the island."

In this context, landowners and the rural bourgeoisie turned to the rural guards, "whom we recognize as manifestations of Mafia power" (Lupo, 1996, p. 183).[12] From this point onwards, the Mafia became heavily involved in violently suppressing peasant uprisings and organizations (Brancato, 1976; Dickie, 2004, p. 232).[13]

The first documented case of Mafia action against peasant uprising is probably the bloodshed in Caltavuturo in January 1893 when a rally of peasants demanding redistribution of the common (municipality-

desirable. But that the class that bears the heaviest burden of local taxes [is not enfranchised and] is at the mercy of a greedy and sectarian minority is intolerable." (De Viti De Marco (Siculus), 1894, p. 135)

[11] This initial ambivalence is confirmed by Giolitti himself in his memoires. For example, Giolitti favored the return of one of the leaders of the Fasci movement to Sicily from his exile in Tunis ensuring him that the jail sentence hanging over him would not be enforced. He also tried to use the Fasci movement to weaken the support for his political opponents in Sicily who controlled the few workers' organizations there. See Romano (1959, p. 244) and Manacorda (1962, p.105).

[12] For the role of rural guards in the Mafia organization, see also Romano (1966, pp. 175–177).

[13] Lupo (1996) discusses a handful of cases of members of the Fasci who joined the Mafia, but this seems to have been not a general pattern, and usually, it was short lived.

owned) land encroached by some of local administrators was met with violence. The incidents were provoked by mafiosi, who started the shooting and prompted the intervention of the military force, which than indiscriminately fired into the crowd, causing 11 deaths and 40 injured among the peasants (Romano, 1959, pp. 168-177; Lupo, 1996, p. 183).

A few months later, peasants demonstrated against local taxes, the administration and rural guards in the central square of Giardinello, a small rural center of the Palermo province. As the demonstrators were leaving at the end of the rally, shots from the mayor's house overlooking the square killed five peasants (Siragusa, 2007). The subsequent intervention of the military force led to the death of two more demonstrators (Romano, 1959, p. 448-454).

In Lercara, a large town in the Palermo province with rich sulfur mines, on 25 December 1893, and in Gibellina in the Trapani province on 2 January 1894, rallies against local administrators and taxes were a violently suppressed by the rural guards. In both cases armed guards hidden in the bell tower overlooking the central square shot on the crowd and then the successive intervention of the army increased the death toll.[14] Similar events were reported in Belmonte Mezzagno where two peasants were killed and several were injured (Siragusa, 2007).

After months of strikes and rallies, in which many peasants lost their lives by the hands of the mafiosi and the army, in early January 1894 the Fasci were declared illegal, their leaders were arrested, and a state of emergency and curfew were declared. In the words of Santino, "The Fasci movement was bloodily repressed by the joint action of the Institutions and the Mafia" (Santino, 2000, p. 24).

# 3 Data and Descriptive Statistics

Our database comprises data from 333 municipalities for which the Sicilian cadastre of 1853 provides information.[15] These municipalities belong to 24 districts in seven provinces. Data for subsequent periods, which are at times more disaggregated, are aggregated back to the 333 original municipalities.

The data on the presence of the *Fasci dei Lavoratori* are taken from Renda (1977, pp. 339-344) who lists all the *Fasci* organizations established in Sicily between 1891 and January 1894. Renda provides information about 177 organizations active in 161 municipalities. Using several additional historical sources, we also distinguish the Peasant Fasci and industrial workers' organizations.[16] Overall, we identify 106 municipalities that had leftist Peasant Fasci, and 58 municipalities with Fasci of industrial workers. In Figure 1 we map the presence of Peasant Fasci organizations in the period 1893-1894.

[14] See Romano (1959, p. 454) on the events in Lercara, and Colajanni (1895, pp. 181–183) for an account of the massacre in Gibellina and the role of the rural guards.

[15] In 1853 there were 348 municipalities in Sicily; however, the data from the Bourbon Cadastre in Mortillaro (1854) were aggregated for several municipalities, while the data for two of them were lost. Other municipalities lost their autonomy in the aftermath of the Italian unification, reducing the number of municipalities by 15.

[16] These additional sources include Colajanni (1895) for the provinces of Enna and Catania, Amato and Battaglia (1976) for the province of Messina, Casarrubea (1978a,b) for the Palermo province, Costanza (1993) for the Trapani province, Miccichè (1981) on Ragusa and Siracusa provinces, Barnabà (1981) for the province of Caltanissetta, Rossi (1894) and Giannone (2014) on the Girgenti province.

The information on historical rainfall are from Eredia (1918), who compiled data from several sources including the weather stations of public institutions like the Ministry of Agriculture, and the Ministry of Public Works, as well as private sources such as the Electric Society of Eastern Sicily, the Society of the Palermo Aqueduct, and the Marquise Casses Eaton. These data include the coordinates and altitude of the weather stations and the monthly rainfall in millimeters. We use 39 stations which were active in Sicily in the early 1890s that could be matched with the data provided in the Hydrological Annals for the Sicilian Hydrological Basins for the period 1916-1941.[17] In order to obtain municipality-level rainfall data we use the standard interpolation method (following the Climatic Research Unite at the University of East Anglia). In particular, we calculate relative rainfall (the percentage difference from mean rainfall between 1881 and 1941) for each weather station, and then interpolate from these weather stations using weights inversely proportional to distance to obtain municipality-level (relative) rainfall.[18] We exclude any weather stations more than 30 km away from the municipality. (In our robustness checks, we also exclude weather stations 25 km or 35 km away or exclude municipalities that do not have at least two weather stations within a 30 km radius). In Figure 2 we report the interpolated relative rainfall for the spring 1893 as well as the locations of the weather stations. We also compute the variance of our relative rainfall measure and average absolute rainfall, which we use as controls for climate characteristics in our regressions.

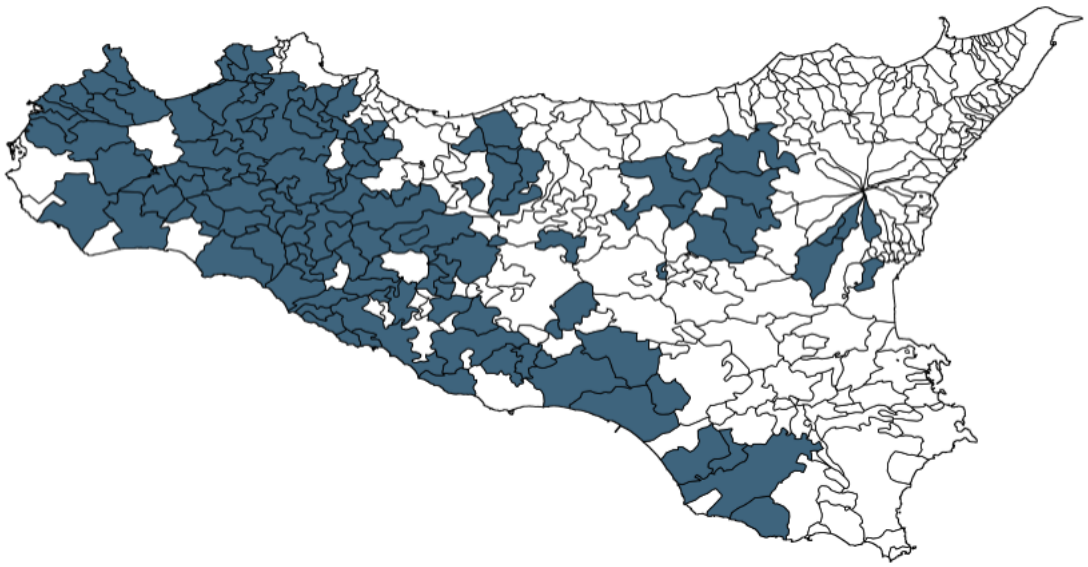


Figure 1: Presence of Peasant Fasci organizations in Sicily in the period 1893-4. Source: Renda (1977).

Our measure of Mafia prevalence by municipality in 1900, a few years after the rise of the Fasci movement, comes from Cutrera (1900). Cutrera was a police inspector in Sicily and put together this information based on his own experience and research, and emphasizes that this information is not based

[17] These publications are available from the website of the ISPRA, Agency of Environmental Protection and Research of the Italian Environment Ministry.

[18] See, for example New et al. (1999, 2000, 2002).

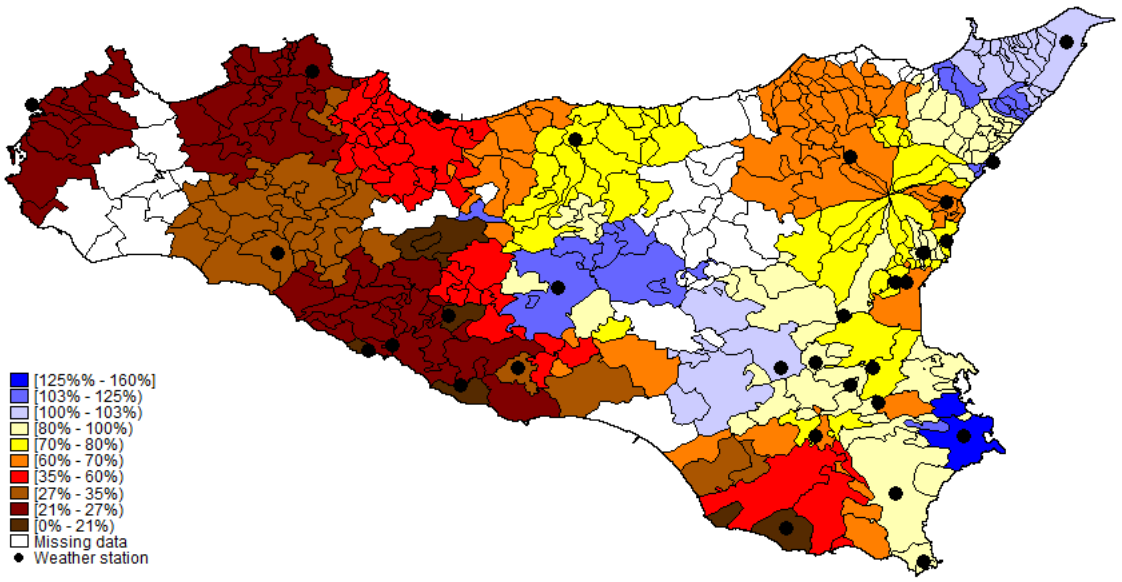



Figure 2: Drought intensity in spring 1893. Ratio of the rainfall in spring 1893 to long-run average spring rainfall.

on the number of crimes or any other criminal statistics, "because I am convinced that the Mafia density cannot be represented with numbers [of crimes]. We have already seen that the Mafia does not always commit crimes, and that the crimes perpetrated by them are not exclusive of the Mafia. [...] For this reason we drew this map using our personal appraisal of the different density of the Mafia from town to town" (Cutrera, 1900, pp. 114–115). We create the variable $Mafia1900$ with values ranging from 0 (no Mafia), to 3 (major Mafia presence). In 1900 Sicily had 357 municipalities organized in 7 provinces. Cutrera identified 84 municipalities where there was no Mafia, 66 where there was little presence, 70 where the Mafia was of some significance, and 69 municipalities with a major presence of the Mafia (68 municipalities were left unclassified). 38% of the municipalities in the Palermo province had a major presence of the Mafia, while this was the case in 44% of the municipalities in the Trapani province, 41% in the Girgenti (the old name of Agrigento) province, 29% in the Caltanissetta province, 15% in the Catania province, and 7% in the Messina province. No municipality was classified as having a major Mafia presence in the Siracusa province. We believe that this is a reliable source for the Mafia intensity, and it is widely acknowledged in the historical literature. The geographic distribution of the Mafia intensity according to Cutrera (1900) is depicted in Figure 3.

To control for the presence of the Mafia before the Fasci movement, we use the information reported in the 1880-85 parliamentary inquest on the Italian agriculture (Damiani, 1885). Damiani requested information about the presence of the Mafia from local state officials in each of the 162 Sicilian judicial districts. We follow Buonanno et al. (2015) and classify all the municipalities in the judicial district according to the intensity of the Mafia. In Figure 4 we depict the resulting variable, $Mafia1885$.

As for our controls, we collected data about the agricultural use of land and rents at municipality

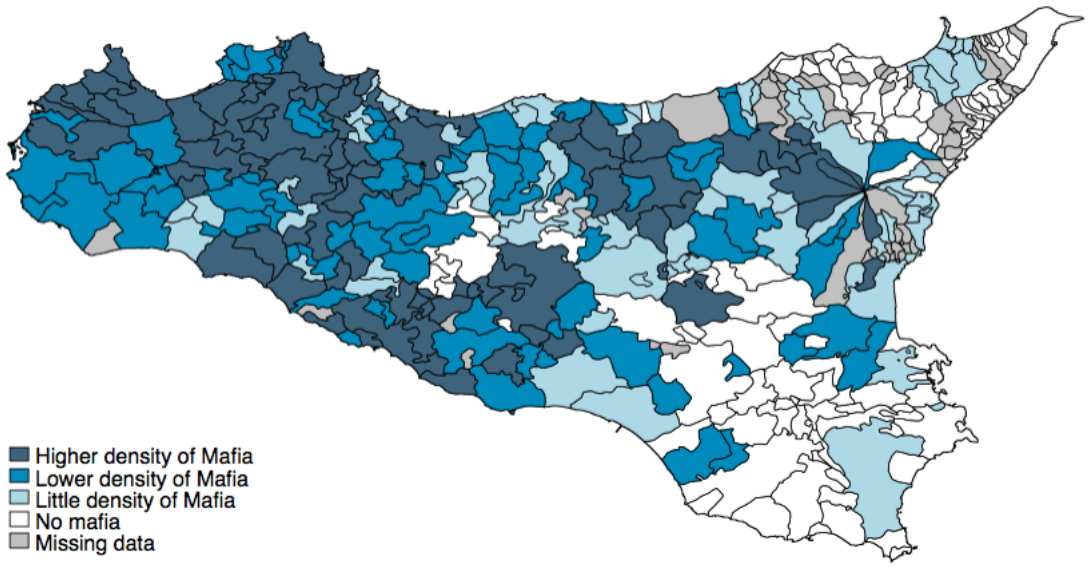



Figure 3: Mafia intensity in 1900 according to the Police inspector Cutrera. Source: Cutrera (1900).

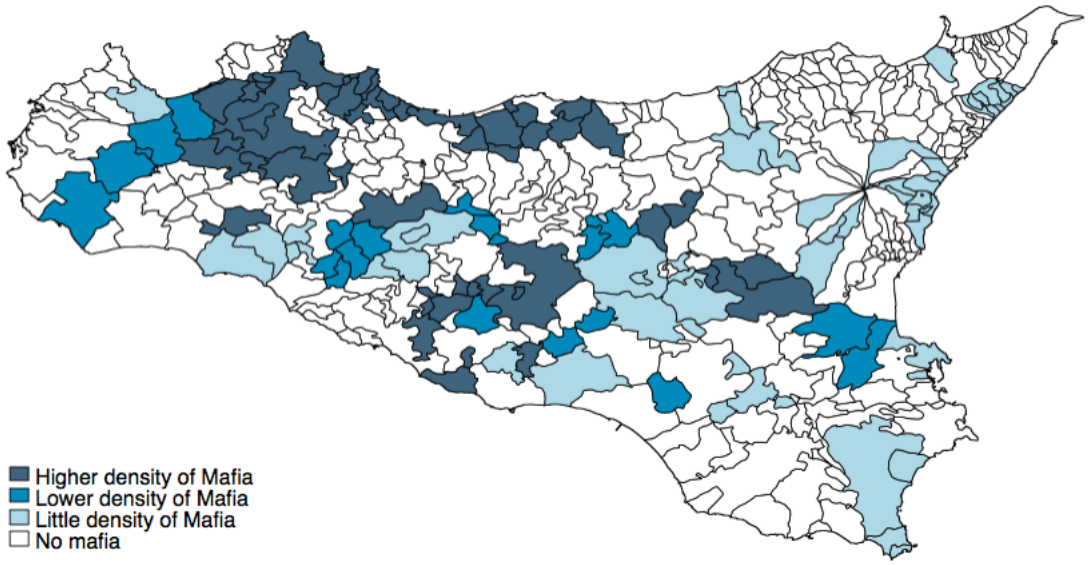



Figure 4: Spatial distribution of the Mafia presence according to its intensity as reported in Damiani (1885).

level from Sicily's Bourbon Cadastre compiled by Mortillaro (1854). The agricultural use of land is based on the *riveli*, declarations made by the landowners to the Royal commission in 1815 and updated in the 1830s.[19] This dataset is particularly relevant because it pertains to a period before the Italian unification and therefore before the emergence of the Sicilian Mafia. From this source we obtain the average agricultural rent per hectare and the urban rent per hectare (for municipalities with more than 3000 residents). We also compute from the same source the share of the total area devoted to cereal cultivation, citrus groves, vineyard, olive groves, the share of agricultural land, and the total area of the municipality.

From the first Italian census in 1861 we gather information on total population as well as of the existence of agro-towns (rural centers) where peasants and farmers were concentrated. These towns are a peculiar characteristic of the Sicilian countryside, often linked to a concentrated landownership structure, which induced landless peasants to concentrate in rural town centers where they could get seasonal or other work in large estates specializing in cereals. The presence of such towns is thus both an indication of the pattern of landownership and, as emphasized by Hobsbawm (1971), a potential direct determinant of peasant organizations, since the presence of so many peasants agglomerated in agro-towns "gave them the opportunity to discuss grievances, formulate unified strategies and act collectively" (Kaplan, 1977, p. 5). We define agro-towns as municipalities that have a center with an agglomerated population of at least 4,000 residents and with more than 40% of the agricultural land devoted to cereal cultivation.

As highlighted in the historical background, another important determinant of the development of the Sicilian Mafia has been the presence of sulfur mines. We rely on data reported in Parodi (1873) to compute the average production of sulfur in each municipality between 1868 and 1870.

We use further geographical variables to control for the distance from the capital, Palermo, and from the closest port using the postal distance as reported by Lo Jacono (1856) which takes into account the availability of roads. A dummy variable for direct access to one of the postal roads is coded from the detailed maps compiled by Cary (1799) and digitized by Buonanno et al. (2015). Information on the maximum and average altitude and the altitude of the town center is provided for each municipality by the 1929 Agrarian Cadastre. Finally, the average temperature is from the website climate-data.org.

Data on political competition in 1865 and 1909 are obtained from the database provided by Corbetta and Piretti (2009). The parliamentary elections in 1865 and 1909 were held under a first-past-the-post system in 55 electoral districts in Sicily. For each municipality we compute the Herfindahl concentration index (or HHI as an abbreviation for Hirschman-Herfindahl index) by looking at the share of votes of each candidate. Using data from the 1913 parliamentary elections, which were the first under universal manhood suffrage, we also compute the share of votes of socialist candidates (defined as those from one of Official Socialist Party, Reformist Socialist Party, and Independent Socialist Party).[20] We collect voting data for the lower chamber of the Italian parliament for the years 1963, 1972 and 1983 from

[19] Information about rents obtained from landowners were updated using market price data by the commission, but their work was interrupted several times and only completed in 1853.

[20] As an alternative measure of the presence of socialist organizations, we also use data on peasant league membership reported in Lorenzoni (1910b).

the Election Historical Archive of the Interior Ministry website. These elections were held under a proportional system with a single national constituency and we compute the HHI from vote shares of all the parties in each municipality.

We measure human capital, our main proxy for the overall level of economic development, using data on literacy in the earlier part of our sample and high school completion rates of the population in later parts. We compute literacy rates for the population above the age of six and the high school completion rate from the population censuses for the years 1911, 1921, 1931, 1961, 1971 and 1981.

To measure state capacity, we constructed from primary sources average infant mortality rate for 1869-70 and 1908-9 for each municipality. Specifically, we counted the number of deaths of residents below the age of one from the death registries of each municipality for 1869, 1870, 1908 and 1909.[21] We then collected data on number of births for the corresponding years and computed the infant mortality rate as the average ratio of deaths below the age of one over the number of births for the years 1869 and 1870, and 1908 and 1909 by municipality of residence.[22] For infant mortality rates in 1969-1970 and 1982 we rely on data provided by ISTAT.[23]

We also computed a measure of per capita development expenditure (in logs) from the 1884, 1912, and 1957 municipality budgets. This measure, which aggregates all spending for development or improvement of local infrastructure, education, security and justice, captures the share of spending for which the local administration retained some discretionary power. We collected these data from official government publications (Direzione Generale della Statistica, 1887; Direzione Generale della Statistica e del Lavoro, 1914; Direzione Generale dell'Amministrazione Civile, 1958).

Information on the quantity and quality of drinking water in 1885 is from Direzione Generale della Statistica (1886), data on aqueducts in 1909 are from Lorenzoni (1910b, pp. 564-586), and data on aqueducts in 1961, 1971 and 1981 are from the Population and Housing Censuses.

Finally, we obtained information about Mafia presence in the 1980s from a report by the military police (*Carabinieri*) submitted in 1987 to a parliamentary committee (CG Carabinieri, 1987). The report analyzes the activities of organized crime in Italy and lists the main Mafia families, providing for each of them the name of the boss and the town in which it was based. We create a dummy variable, which takes the value one when the municipality is listed in the report as a stronghold of a Mafia family.

Tables 1 provides descriptive statistics for all of the variables used in our analysis.

[21] In case one of the registries was not available, we used data from the subsequent year.

[22] For four municipalities (Caltanissetta, Girgenti, Naro and Noto), the mortality data are available for one year only in the period 1869-70 and the mortality rate has been computed accordingly. In two cases (Messina and Catania) the mortality rate for 1908-9 has been based on the data for 1908 only. The data for the number of births by municipality are from the publications of the Ministry of Agriculture, Industry and Commerce "Movimento dello Stato Civile" for the years 1869 and 1870 while for the years 1908 and 1909 we used the data provided by Somogyi (1979).

[23] The data for the years 1969-70 report the deaths by municipality of the event instead of municipality of residence. There is therefore a mismatch between the numerator (deaths by municipality) and denominator (births by municipality of residence) which likely increases the mortality rate for municipalities with hospitals and a health centers.

# 4 The Origins of the 19th-Century Expansion of the Mafia

This section empirically investigates the effect of the drought of 1893 and the Peasant Fasci movement on the spread of the Sicilian Mafia. It provides evidence that the drought of 1893 had a major effect on the presence of Peasant Fasci and also on the spread of the Sicilian Mafia.

## 4.1 First Stage

We start with the following cross-sectional relationship linking the presence of the Peasant Fasci to the drought of 1893:

$$\text{Fasci}_i = \gamma^{\text{Fasci}} \cdot \text{relative rain}_i^{1893} + X_i'\beta^{\text{Fasci}} + \varepsilon_i^{\text{Fasci}}, \tag{1}$$

where $\text{Fasci}_i$ denotes our dummy variable designating the presence of the Peasant Fasci in municipality $i$, relative $\text{rain}_i^{1893}$ is the (relative) rainfall variable capturing the (inverse of the) severity of the drought of 1893, also described above, $X_i$ is a vector of covariates which will be discussed in greater detail below, and $\varepsilon_i^{\text{Fasci}}$ is a random error term, capturing all omitted factors. Equation (1) will be our first stage when estimating the impact of the Peasant Fasci on the development of the Mafia.

Estimates of equation (1) on our sample of 245 municipalities are reported in Table 2.[24] In column 1, Panel A, we show the raw correlation between our Peasant Fasci variable and relative rainfall (without controlling for any covariates). Unless stated otherwise, we report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality (Cameron et al., 2008, 2011). These standard errors take into account the fact that rainfall in a municipality, as well as many of our other variables, might exhibit significant correlation with neighboring municipalities.[25] Moreover, as described in the previous section, and further discussed next in our robustness checks, the fact that rainfall data for many municipalities are interpolated from neighboring weather stations creates additional correlation across observations; the two-way clustering is a simple method to remove this correlation. As we will see below, maximum likelihood estimation taking the exact structure of the error term resulting from interpolation leads to standard errors very similar to the two-way clustered errors.[26] In column 1, we see a coefficient of -1.00 that is significant at 1%.

Column 1, Panel B adds province fixed effects to this specification so that the comparison is between municipalities in the same province (as noted above, we have seven provinces in the data). The relation-

[24] As explained in Section 3, in our source for the Mafia presence in 1900 (Cutrera, 1900) 68 municipalities were left unclassified. Furthermore, 36 municipalities do not have an active weather station within a 30km radius in spring 1893 and their rainfall data are missing. These missing data reduce our sample from 333 municipalities to 245.

[25] We have 24 districts and 30 stations. Nine out of 39 weather stations we have available do not have complete data for all three of the months of March, April and May 1893, which we use to construct our (relative) rainfall measure.

[26] Many of our variables are likely to be spatially correlated. Though clustering at the district level partially corrects for spatial corre, we have also computed spatially-corrected standard errors following Conley's procedure, and in all cases, the standard errors are smaller than the ones we report (see Table A1 in the Appendix). Finally, as a further test to address spatial correlation concerns, we re-estimate equations (1) and (2) at a higher level of aggregation (district). The sign and magnitude of the coefficients of interest remain very similar.

ship is quite similar and has a somewhat smaller magnitude in the presence of province fixed effects; -0.76 (with a two-way clustered standard error of 0.21).

The remaining columns add successively more of the covariates we use throughout the paper — both with and without province fixed effects in the two panels. In column 2, we include various determinants of the presence of the Peasant Fasci, which include: a dummy for the municipality being a rural center ("agro-town"), the levels of rural rents and urban rents, the share of total cultivated land, and the share of land devoted to grains. These variables are expected to affect the presence of the Fasci, which were more likely to organize in places where grain production was important. The inclusion of these covariates has very little effect on the relationship between our drought variable and the presence of the Peasant Fasci, and the estimates of $\gamma^{\text{Fasci}}$ are now -0.95 and -0.84, respectively without or with province fixed effects. Column 3 includes, in addition, various determinants of the presence of the Mafia: sulfur production in 1868-70 (emphasized by Del Monte and Pennacchio (2012) and Buonanno et al. (2015)), citrus groves in 1830s (emphasized by Dimico et al. (2017)), olives and vineyards (discussed by Bandiera (2003)), and Damiani's measure of the strength of the Mafia in 1885. These variables also have very little effect on the coefficient estimates of interest, which now stand at -0.94 and -0.77 without or with province fixed effects. Column 4 adds a range of geographic controls, in particular, log population in 1861, log area of the municipality, maximum and average altitude and the elevation of the town center, distance to Palermo, distance to the closest port, access to postal roads, average temperature, average rainfall and variance of our (relative) rainfall measure, all of these computed over the period 1881-1941. The results are again similar.

Quantitatively, the coefficient estimate in column 4, Panel B, -0.76, implies that a very severe drought (corresponding to the 25th percentile of the rainfall distribution across municipalities in the 1893 drought) increases the likelihood that the Peasant Fasci is organized in a municipality by 37 percentage points (compared to a municipality at the 75th percentile of the distribution which experienced essentially no drought).

Figure 5 shows the residual plot corresponding to column 4, Panel B. In addition to depicting the negative relationship, it also shows that this relationship is not driven by any outliers.[27]

## 4.2 The Impact of Peasant Fasci on the Mafia

We now turn to the main focus of this section, the impact of the Peasant Fasci on the expansion of the Mafia. As explained in the Introduction and in Section 2, our hypothesis is that the Mafia spread to parts of Sicily where the Peasant Fasci was strong, because landowners and rural estate managers turned to the Mafia to combat and limit the influence of the Fasci. Econometrically, this hypothesis can be

[27] We also verified that outliers are not responsible for our results by estimating a robust regression that downweighs outliers following Li's (1985) procedure. This leads to a coefficient estimate that is very similar to our OLS estimate in column 4, -0.87, and is significant at less than 1%.

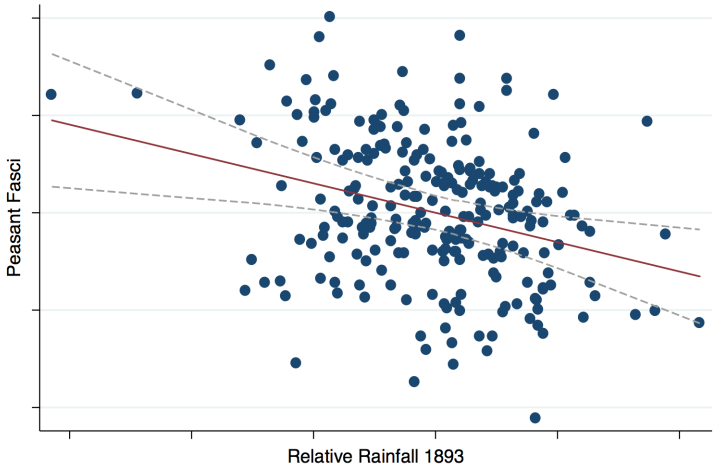



Figure 5: Residual plot of Relative Rainfall against Peasant Fasci from column 4 of Panel B in Table 2. The dashed curves represent the 95% confidence interval.

investigated by estimating the following simple cross-sectional relationship,

$$\text{Mafia}_i = \alpha^{\text{Mafia}} \cdot \text{Fasci}_i + X_i'\beta^{\text{Mafia}} + \varepsilon_i^{\text{Mafia}}, \tag{2}$$

where $\text{Mafia}_i$ is the index of strength of the Mafia in municipality $i$ from Cutrera (1900). Recall that this variable takes a value of 0, 1, 2 or 3, progressively indicating stronger Mafia presence in the municipality. The coefficient of interest is $\alpha^{\text{Mafia}}$, which represents the effect of the Fasci on the Mafia.

Though equation (2) can be estimated by OLS, this is unlikely to lead to consistent estimates of the impact of the Fasci on the Mafia, since despite our detailed controls, areas where the peasant organizations took root might also be particularly vulnerable to the Mafia, leading to an upward bias in $\alpha^{\text{Mafia}}$. Conversely, if the Mafia makes it less likely for the Fasci to successfully organize (as we are essentially hypothesizing), then factors that facilitate the expansion of the Mafia will also make it less likely that the Peasant Fasci are present, potentially leading to a downward bias in $\alpha^{\text{Mafia}}$.

To partially overcome these problems, we use an instrumental-variables (IV) strategy where equation (1) is the first stage for the Peasant Fasci. This IV strategy is valid if the error term in (2), $\varepsilon_i^{\text{Mafia}}$, is orthogonal to the excluded instrument, relative $\text{rainfall}_i^{1893}$. We have already motivated this exclusion restriction in the Introduction and in Section 2. Here we simply note that even though the drought of 1893 was very severe in many parts of Sicily, what made it more consequential was its juxtaposition with the rise of the nascent Fasci movement. We document below that other similar droughts (before or after 1893) did not have any impact on future Mafia or socio-economic outcomes. Our causal channel is thus confined to this specific historical juncture where the drought strengthened the Peasant Fasci and induced landowners to turn to the Mafia as a counterweight to the Fasci's demands.

Table 3 provides two-stage least squares (2SLS) estimates of equation (2). This table has an identical structure to Table 2, except that we also report first-stage F statistics (for our excluded instrument,

relative rainfall), and in Panels C and D we report in addition OLS estimates of the coefficient $\alpha^{\text{Mafia}}$ for comparison. In column 1, Panel A (where we do not include province fixed effects), we see a large and very significant estimate of $\alpha^{\text{Mafia}}$, 2.05 with the two-way clustered standard error of 0.43. In column 1 of Panel B (which also includes province fixed effects), we estimate a considerably smaller coefficient, 0.87, which is still statistically significant at 10%. The difference between these two estimates likely reflects the fact that comparing the presence of the Mafia across different provinces of Sicily is not as informative as within-province comparisons, in part because of the differential success of the Mafia to become established across provinces. Motivated by this reasoning, in what follows we put more emphasis on the specifications that include province fixed effects. In columns 2-4, we again control for the same set of covariates as in Table 2. In Panel B, which includes province fixed effects, the estimates of $\alpha^{\text{Mafia}}$ are stable, ranging between 1.03 and 1.51, and are always significant at less than 1%, though the first-stage F-statistic falls to 7.72 in column 4.

Quantitatively, our estimate from column 4, Panel B indicates that the presence of the Peasant Fasci in a municipality increases the Mafia index in that municipality by 1.5. To put this in perspective, recall that an increase in the Mafia index from 1 to 2 corresponds to a change from little presence of the Mafia in a municipality to significant presence. This quantitative magnitude implies that as much as 37% of the strength of the Mafia in 1900 throughout Sicily may have been due to its deployment against the Peasant Fasci, thus suggesting that the episode we are focusing on may have played a pivotal role in the Mafia's dominant position on the island.

Table 3 also shows that the OLS relationship between the Peasant Fasci and the Mafia is considerably weaker than the 2SLS relationship. We believe this reflects the fact that, as noted above, the Mafia made it difficult for the Fasci to organize in the first place. In Table A2 in the Appendix, we report the coefficients of the prior existence of the Mafia (Mafia 1885) on the emergence of the Peasant Fasci. Consistent with this hypothesis, these coefficients are always negative and always significant at less than 10%.

### 4.3 The Drought and the Mafia

In our investigation of the effect of the Mafia on medium-term and long-term outcomes, we will bypass the causal channel working through the Peasant Fasci, and instead directly use our rainfall variable as a source of variation in the presence of the Mafia at the beginning of the 20th century. To prepare for these specifications, we now show the relationship between our drought variable and the Mafia directly, estimating the regression equation,[28]

$$\text{Mafia}_i = \gamma^{\text{Mafia}} \cdot \text{relative rainfall}_i^{1893} + X_i'\beta^{\text{Mafia}} + \varepsilon_i^{\text{Mafia}}. \tag{3}$$

[28] We should also note that the exclusion restriction when we directly use equation (3) is slightly weaker than when we use (1) and (2). In the former case, we require that the drought has no direct impact on medium-term and long-term economic and political outcomes, while in the latter case, we would additionally require that any effect of the drought on the Mafia works entirely through the Peasant Fasci.

Estimates of this equation are reported in Table 4 , which has an identical structure to Table 2, but also reports the F-statistic for our instrument. Though this F-statistic is small in the first column of Panel B, in columns 2-4, which report the main specifications we will use in our 2SLS estimates, they are between 8 and 11.

Unsurprisingly given the results in Table 3, we see a strong, stable and highly significant relationship in Table 4. Panel A is once again without province fixed effects and is included for completeness; as already noted, we put more emphasis on the estimates including province fixed effects, which are in Panel B. In Panel B, column 1, $\gamma^{\text{Mafia}}$ is estimated as -0.66 (with a two-way clustered standard error of 0.34). As the same covariates as in Tables 2 and 3 are added, this coefficient increases to -1.14 in column 4, and is always significant at less than 1%.

### 4.4 Alternative Correction for Standard Errors

Though the two-way clustered standard errors are fairly conservative, they do not explicitly take into account the fact that measurement error in the rainfall from a weather station will affect the (relative) rainfall variable for several municipalities. In this subsection, we explicitly correct for this potential correlation by developing a maximum likelihood estimation strategy.

Let us denote the number of municipalities by $n$ and the number of weather stations by $k < n$. Suppose that true rainfall is given by the $k$-dimensional vector $R$, but in practice, instead of observing this true rainfall vector, our measurement is subject to error, and we observe

$$\tilde{R} = R + \xi,$$

where $\xi$ is a vector of weather station-level measurement error terms.

As described in Section 3, we construct municipality-level rainfall (or relative rainfall) by using the $n \times k$ weights matrix, denoted here by $W$. This matrix specifies how rainfall in a municipality is related to rainfall measured at the various weather stations across Sicily. Thus our instrument at the municipality level is constructed as

$$\tilde{Z} = W\tilde{R} = Z + W\xi,$$

where

$$Z = WR$$

is the true vector of (relative) rainfall across municipalities.

Thus, once again using vector notation, the relationships of interest for us can be represented as

$$\begin{aligned} y &= X'\beta + \gamma\tilde{Z} + \tilde{\varepsilon} \\ &= X'\beta + \gamma Z + \varepsilon + \gamma W\xi, \end{aligned} \tag{4}$$

where $y$ is one of our left-hand side variables (e.g., Mafia).

In this model, there are $k$ random effects that need to be estimated. These random effects create additional correlation between the residuals of different municipalities, and if they are ignored, this could lead to standard errors that are underestimated.

To estimate (4), we assume that both $\varepsilon$ and $\xi$ are normally distributed (with variance-covariance matrices that allow for arbitrary heteroscedasticity, $\Sigma$ and $\Lambda$). This enables us to specify the likelihood function explicitly and estimate the relevant parameters by maximum likelihood. Notice, in particular, that because the coefficient of interest, $\gamma$, is part of the error term, maximum likelihood estimation can lead to different estimates of this parameter than OLS. (In practice, the estimates will be very similar).

The log-likelihood function of this model is

$$L = -\frac{1}{2}\left[\ln(\det V) + (y - X'\beta - \gamma Z)'V^{-1}(y - X'\beta - \gamma Z) + n\ln(2\pi)\right],$$

where $V = \Sigma + W\Lambda W'\gamma^2$. Using this log-likelihood function, we estimate the relevant parameters by maximum likelihood, and then compute bootstrapped standard errors that allow for additional correlation within a district.

The results are reported in Table 5. We see throughout that the estimates of the relevant parameters are very similar to those reported in Tables 4. More importantly, the standard errors are also very similar to those that allow for two-way clustering conditional on district and the closest weather station. This congruence makes us more confident that our standard errors are not understated. In what follows, we focus on the two-way clustered standard errors in the text, but also show maximum likelihood estimates for our main outcome variables in the Appendix.

### 4.5 Robustness

Tables A3 and A4 in the Appendix investigate the robustness of the results reported so far to different specifications of the relative rain variable. For brevity, we focus on equations (1) and (3), and on the specification with province fixed effects.

In Table A3, we verify that it is (relative) rainfall in the spring of 1893 that matters. In column 1, we show that there is no similar relationship between (relative) rainfall in the spring of 1892 and Peasant Fasci or the Mafia in 1900. In column 2 we include spring rainfall in 1892 and 1893 together. For both Peasant Fasci and Mafia, it is the rainfall in 1893 that is statistically significant at 10% and 5% respectively. In column 3, we include (relative) rainfall in the spring 1893, fall 1892, winter 1893 and summer 1893, and we see that it is indeed the spring rainfall that is statistically significant, while rainfall in other seasons has no effect. This is reassuring because, as explained above, spring is the growing season.[29]

In Table A4 we show that different measures of rainfall lead to very similar results. Recall that our relative rainfall variable measures the rainfall in the spring of 1893 relative to the average spring

[29]Indeed, in Table A5 in the Appendix we show that district-level changes in output per hectare of 11 crops in 1893 are predicted only by spring rainfall in 1893 (and not by rainfall in fall 1892, winter 1892-3 and summer 1893).

rainfall between 1881 and 1941 of the same municipality. In this table, we show similar results using log of relative rainfall and relative rainfall capped at 1 (so that variation coming from some municipalities getting more rain in the spring of 1893 than their historical average does not feature in our variable). We also investigate whether the interpolation of rainfall from the weather stations, described in Section 3, could be responsible for our results. We do this by limiting the sample to municipalities where the interpolation uses at least two weather stations, where we use weather stations within 25 km of the municipality, or going in the opposite direction, where we only use weather stations within 35 km of the municipality. The results are very similar in all cases.

### 4.6 Falsification

The plausibility of our empirical strategy depends on the presumption that weather conditions should not impact the spread of the Mafia absent the rise of the Peasant Fasci. Similarly, for our later results, they should not affect economic and political variables except through the Mafia. In this subsection, we provide evidence to support this presumption using several falsification exercises.

First, we show that weather conditions in 1893 have no impact on pre-1893 variables. In Table 6, we report the relationship between (relative) rainfall in the spring of 1893 and Mafia in 1885, infant mortality in 1869, the quality and quantity of drinking water in 1885, the per capita development expenditure in 1884, and the Herfindahl index of the concentration of votes in the 1865 parliamentary elections. We focus on the specification from column 4 of Tables 2-5, and we estimate these relationships both with and without province fixed effects (the number of observations varies across columns due to data availability).

Overall, this table shows no statistically significant relationship between our rainfall measure and any one of these variables that either measured the presence of the Mafia in the municipality or the economic or political conditions of the municipality. This lack of significant relationship bolsters our interpretation that rainfall in 1893 is not systematically related to other characteristics of the municipality that could explain the patterns shown so far.

Our second falsification exercise checks whether relative rainfall before 1892 had a systematic effect on the emergence of the Peasant Fasci or the Mafia. This might be the case, for example, if weather conditions impacted the emergence of the Mafia through other channels (e.g., they may affect economic conditions, which could then translate into an impact on the Mafia). In Table 7, we look at the potential effects of relative (spring) rainfall between 1882 and 1891 on the Peasant Fasci (in Panel A) and on the Mafia (in Panel B). The results are encouraging for our hypothesis. Consistent with what we should expect based on sample variability, only one out of 20 coefficients is weakly significant.

Third, in the first two rows of Table A6 in the Appendix, we replicate this exercise by looking at the relationship between spring rainfall for the period 1900-1941 and our Peasant Fasci and Mafia variables in the three specifications in columns 2-4 of Tables 2-5.[30] We report the fraction of coefficient estimates

[30]We do not use rainfall between 1894 and 1900 in our falsification exercises, since further droughts during this window could have acted as an additional trigger for peasant organizations and thus the Mafia.

that are statistically significant at 10%, separately for negative and positive estimates. As right-hand side variables, we use our baseline rainfall variable, log rainfall and capped rainfall (as used in Table A4). A spurious relationship between rainfall and the Mafia would lead to over-rejection in this table, meaning numbers that are systematically above 0.05. The numbers are typically less than 0.05 and when they are not, as in the case of the Peasant Fasci, the sign is the opposite of the one in our first-stage regression. These results further increase our confidence in the exclusion restriction used so far.

Finally, we will report more extensive falsification exercises using contemporary variables when we turn to the effects of the Mafia on medium-term and long-term economic and political outcomes. All of these falsification exercises support our exclusion restriction as well.

# 5 The Medium-Term Effects of the Mafia

Having established a plausible source of variation in the Mafia at the turn of the 20th century, we now investigate the effects of the Mafia on various economic outcomes in the early 20th century. We turn to longer-term outcomes in the next section.

## 5.1 Economic Outcomes

Throughout the rest of the paper, we estimate cross-sectional models of the form

$$y_i = \alpha^y \cdot \text{Mafia}_i + X'\beta^y + \varepsilon_i^y.$$

Our main specifications will be estimated by 2SLS using equation (3) as the first stage (with relative rainfall in the spring of 1893 as the excluded instrument). The first stages are essentially identical to those reported in Table 4 (only missing two or three municipalities for some of the outcome variables). In addition to the 2SLS estimates reported in Panel A, we also show OLS estimates in Panel B for comparison. In what follows, we focus on specifications with province fixed effects (especially since there are some notable differences in economic outcomes across provinces).[31]

In Table 8, we investigate the effect of the Mafia on human capital, proxied by literacy. As noted in Section 3, we have literacy data from the censuses of 1911, 1921 and 1931 (for the population above the age of six).

In columns 1-3 we report the results for literacy in 1911, which show no significant effect of the Mafia on this variable, with the exception of column 3 which is weakly significant. This is not surprising in view of the fact that literacy is a stock variable, and thus even if the Mafia influences human capital investments, this would be unlikely to exhibit itself in literacy in 1911.

[31] As the F-statistic of the most demanding specification in Panel B of Table 4 is slightly lower than the usual benchmark defined by Stock et al. (2002), in Table A7 in the Appendix we report the Anderson-Rubin weak-instrument robust 95% confidence intervals for all the medium-term and long-term outcome variables, which are quite similar to our 2SLS estimates. We also report maximum likelihood estimates for all of the medium-term and long-term outcome variables discussed in the text in Tables A8 in the Appendix.

In columns 4-6 we turn to literacy in 1921. For this variable, we see a statistically significant negative relationship in all three specifications. For example, in the specification including all controls in column 6, we have an estimate of -0.10. Columns 7-9 show similar, statistically significant estimates for literacy 1931.

Quantitatively, the effects are large. For example, increasing the Mafia in 1900 variable from 1 to 2 (corresponding to an increase from little presence of the Mafia to significant presence) will lead to about 10 percentage points decline in literacy in 1921 (about 20% of its mean).

It is noteworthy that the OLS estimates, reported in Panel B, are close to zero. We believe that this reflects the selection of the Mafia to municipalities with better economic prospects. Though what would be relevant for the difference between the 2SLS and OLS is selection conditional on unobserved heterogeneity, we verify that there is a similar selection conditional on observables. Specifically, using the parameter estimates for all the covariates from column 4, we compute predicted values of the dependent variable (say literacy in 1921 or in 1931), denoted by $\hat{y}_i$. We then check the correlation between $\hat{y}_i$ and Mafia$_i$. A positive correlation indicates that at the beginning of the 20th century, the Mafia was more likely to be present in municipalities that had better economic prospects on the basis of observable covariates. In all cases we find a substantial positive correlation. For example, for literacy this correlation is 0.41 in 1911, 0.40 in 1921, and 0.17 in 1931. On the basis of this pattern, we interpret the absence of a relationship between Mafia and our various economic outcomes in the OLS as reflecting an upward bias due to this type of selection.

We also investigated whether the endogenous selection of the Mafia to richer municipalities could explain the difference between our OLS and IV estimates using the methodology developed by DiTraglia and García-Jimeno (2016). These authors provide a Bayesian approach for incorporating priors about measurement error affecting the key regressor (which is being instrumented in the IV estimation) and the bias of OLS estimates. Specifically, in the context of a linear model, their method involves the specification of a parameter $\kappa$, measuring the signal-to-noise ratio in the endogenous regressor, and $\rho_{T^*u}$, capturing the correlation coefficient between the error term in the second-stage equation and this aggressor (which is the source of bias in the OLS). Their fully Bayesian procedure then jointly estimates the possible range of correlation coefficient between the instrument and the second-stage error term, $\hat{\rho}_{uz}$ (which is the source of the bias in IV), and the implied value of the causal effect purged of this bias, $\hat{\beta}$. We implemented this procedure for our most demanding specification (e.g., columns 3, 6 and 9 in Tables 8), assuming a signal-to-noise ratio in the range $\kappa \in (0.5, 1]$ in the Mafia variable and a correlation coefficient between the regressor and the second-stage error term $\rho_{T^*u} \in [0.1, 0.9]$. This implies priors over that the extent of endogenous selection that start from a low level and go up all the way to a high level of correlation (for variables that are negatively associated with prosperity, we correspondingly use $[-0.1, -0.9]$). The results from this approach for all of our medium-term and long-term outcome variables are reported in Table A9 in the Appendix, and show that the patterns in the data are consistent with our interpretation — in all cases (with the partial exception of infant mortality in 1982, one of our long-term outcome variables for which we do not find a significant effect of the Mafia), we cannot reject

that the correlation between the instrument and the second-stage error term $\rho_{uz}$ is equal to zero, and the estimates of the coefficients of interest purged from any bias of this form are always similar to our IV estimates.

## 5.2 State Capacity

We conjecture that a proximate reason for the negative effect of the Mafia on economic outcomes is that the Mafia reduces the capacity of the local government to provide public goods and protect its citizens. Though we are not able to establish that this is the main proximate channel, we provide evidence that the Mafia has a negative impact on state capacity in Table 9, where we look at three measures of the local government performance: infant mortality, presence of an aqueduct in 1909 and per capita development expenditure in 1912 (in logs).

Table 9 shows that the relationship between the Mafia and all three of these measures is negative, though with varying degrees of significance. In columns 1-3, the estimates of the effect of the Mafia on infant mortality are statistically and economically significant. Quantitatively, an increase in Mafia presence from 1 to 2 (little presence to significant presence of the Mafia) leads to about 5 percentage points increase in infant mortality (about 30% of its mean). In columns 4-6, the estimates of the effect of the Mafia on the presence of an aqueduct in 1909 are consistently negative, but not significant. Since the presence of aqueducts in the municipalities in 1909 is a stock variable, reflecting investments in several decades, the fact that the Mafia in 1900 does not have a statistically significant effect on this variable may not be entirely surprising. Finally, in columns 7-9 we report the estimates of the effect of the Mafia on per capita development expenditure in 1912. The impact is negative and statistically significant, suggesting a considerable reduction in public spending directed to developmental outcomes in municipalities in which the Mafia was operating.[32]

On the basis of these results, it appears that part of the effects of the Mafia, in line with our discussion in Section 2, is working through reduced capacity of the local government to provide public services.

## 5.3 Mafia and Politics

While the results in the previous subsection suggest that part of the effects of the Mafia might be working through reduced local state capacity, how the Mafia affects local state capacity and other social and economic outcomes is still an open question. In this subsection, we provide evidence on another channel of influence of the Mafia — its impact on politics. Our discussion in Section 2 suggests that the Mafia has typically been involved in politics (see Buonanno et al., 2016; De Feo and De Luca, 2017). The Mafia might impact the political equilibrium in the municipality both by discouraging certain parties and candidates from campaigning or competing in elections and by influencing voters directly using threats and coercion (Alesina et al., 2016).

[32]Interestingly, and perhaps surprisingly, while spending composition is affected by the Mafia, municipality total revenue and total spending are not.

Motivated by this expectation, in columns 10-12 of Table 9 we look at the effects of the Mafia on the distribution of votes across candidates in the 1909 parliamentary elections. Specifically, we focus on the Herfindahl index of vote shares in that election. (We saw in Table 6 that the Mafia in 1900 is unrelated to the same variable measured in 1865). With all three specifications, we estimate a statistically significant and quantitatively very large impact of the Mafia on political competition in 1909. For example, an increase from little presence of the Mafia to significant presence (from 1 to 2) is associated with a 30 percentage points increase in the Herfindahl index of vote shares in 1909 (about 38% of its mean). This very large impact suggests a substantial link between the presence of the Mafia and local politics, most likely because of the inability of certain political candidates to campaign in areas dominated by the Mafia as well as other forms of voter intimidation and fraud (see for example Salvemini, 1910; Hess, 1973; Schneider and Schneider, 1976; Alesina et al., 2016).

### 5.4 Additional Falsification Exercises

We further investigated whether rainfall could be systematically related to outcome variables through other channels. Our exercises here focus on a similar set of issues to our previous falsification checks, and in particular would show significant effects if rainfall shocks have a direct impact on various social and outcomes.[33]

Table 10 shows the relationship between relative rainfall (again in the spring) in the 10 years preceding the 1893 drought and our medium-term outcomes. We report the coefficients of (relative) spring rain in the most demanding specification for all variables considered so far, with each column testing the relationship for each consecutive year starting with 1882. The results are reassuring. Out of 70 coefficients, only five are statistically significant at 10% or less, and there is no clear pattern of systematic negative or positive correlation between relative rainfall and development outcomes.

Table A6, whose first two rows were discussed in the previous section, again directly investigates whether there is any relationship between current rainfall and various economic outcomes. It reports the fraction of coefficient estimates that are statistically significant at 10% (separately for negative and positive estimates) when we look at the relationship between our outcome variables and rainfall in the years between 1900 and 1941. The results are encouraging and show very few numbers above 5% (and those have the opposite sign to the one implied by the reduced form of our main results, reported in Table A10 in the Appendix). These results further bolster our confidence in the exclusion restriction underlying our approach.

The strategy in Table A6 is to look at rainfall in all years. This deals with the most salient concern about rainfall having a direct effect on economic or political variables. A variant of this concern is that only very severe drought experiences would have such effects, and if so, by pooling all data between 1900 and 1941, we might be diluting the possibility of detecting such a problem. To deal with this concern, we focus on the only year, 1906, where there was a drought similar to that of 1893 (in particular, in spring

[33]For instance, Maccini and Yang (2009) document substantial effects of early-life rainfall on subsequent health and education in Indonesia.

1906 more than 40% of municipalities experienced less than 50% of their long term average rainfall). Table A11 shows the effects of the 1906 (relative) rainfall on our outcome variables. In this case, we can directly look at whether there is a correlation between this rainfall measure and outcomes, and we do this in all three of our main specifications. The results are once again encouraging for our exclusion restriction. With the exception of four estimates (out of 66 estimates when we pool both medium-term and long-term outcomes together), we find no statistically significant relationship, and the significant estimates have the opposite sign to that implied by the reduced form of our main results. We therefore interpret these results as further support for our exclusion restriction that the effect of the 1893 rainfall is working through the organization of the Peasant Fasci and the spread of the Mafia which was a response to this.

### 5.5 Other Concerns

Another concern is that our economic outcomes may be partly confounded by the endogenous migration response of locals to the drought, the rise of the

Peasant Fasci and/or the strengthening of the Mafia. For example, if some of the most educated inhabitants leave a municipality because of these factors, this could affect both our literacy results and our other economic outcomes.

We investigate this issue in Panel A of Table 11 by looking at the change in population between 1881 (before the Peasant Fasci and the spread of the Mafia in response) and 1901. The estimates show no significant effects of (relative) rainfall in 1893 on the change in population during this time period, suggesting that there has not been a major migration response to the Mafia or to economic and social forces that led to its rise.

Another related concern may be that as well as (or instead of) the impact of the Mafia, we are capturing the lingering effects of the rise of socialist mass politics, triggered by the drought of 1893. Panel B of Table 11 investigates this question and looks at the effect of the (relative) rainfall in the spring of 1893 on the membership of the Peasant Leagues in 1908 (relative to population) and the share of votes for the three socialist parties in the parliamentary elections in 1913. There is no relationship between the severity of the drought and the strength of these left-wing groups.

## 6 Long-Term Outcomes

In this section, we investigate the effects of the Mafia on long-term outcomes, focusing on variables from the 1960s, 70s and 80s.

### 6.1 Persistence of the Mafia

The spread of the Mafia at the end of the 19th century can have long-term effects through two complementary channels. First, the differential presence of the Mafia at the turn-of-the-century could put

different municipalities onto different trajectories for economic and political development, with important implications for late 20th-century outcomes. Second, the local presence of the Mafia could persist from 1900 to later decades, and the presence of the Mafia in the second half of the century may directly impact contemporary economic and political outcomes. Though we do not have a way of distinguishing between these two channels, we can check whether there is persistence of the Mafia in a municipality from 1900 to later parts of the century. This is done in Table 12, which provides mixed evidence for the second channel — there is a positive relationship between the Mafia in 1900 and the Mafia in 1987, but this is nowhere significant in the 2SLS specification (it is smaller but significant in the OLS shown in Panel B). This weak persistence might reflect the fact that the Mafia spread further in the intervening 87 years and the impact of fascist repression against the organization, which may have reshaped its subsequent distribution. In light of this pattern, we may expect any effects of the Mafia on long-term outcomes to be attenuated relative to its medium-term effects. Our results are consistent with this expectation, though we do find significant correlations between the exogenous variation in the Mafia in 1900 and some long-term outcomes (especially in the political realm), which we interpret as the persistent effects of early Mafia presence on current outcomes.

### 6.2 Economic Outcomes

We next turn to economic outcomes, which we again proxy with human capital variables. We look at both literacy and the fraction of the population with high school education (completion rate) in 1961, 1971 and 1981. Table 13 shows that Mafia in 1900 is negatively correlated with both of these variables in all specifications, though the significance of the estimates disappears after 1971 for literacy and in 1981 for high school education. Quantitatively, the effects are again substantial. For example, an increase in the Mafia index in 1900 from 1 to 2 reduces high school education by 33% in both 1961 and 1971.

### 6.3 State Capacity

In the first nine columns of Table 14, we look at the same three measures of state capacity (aqueduct availability, infant mortality, and development expenditures) we studied for the medium term in Table 9 for the three decades from 1960s to 1980s. The point estimates for all three variables are negative in all specifications, but now the estimates for infant mortality and development expenditures are almost never significant, while aqueduct coverage is significant at 10% or less in all specifications in 1971 and in most specifications in 1961. The reason why our results for aqueduct coverage were not significant in 1909 but are significant for the 1960s and 70s may be related to our observation above that aqueduct coverage is a slowly-varying stock variable, and thus it may have changed significantly only after several decades of Mafia presence.

### 6.4 Mafia and Politics

In the last three columns of Table 14, we turn to the effect of the Mafia on political competition in the longer term, proxied by the Herfindahl index of party votes in parliamentary elections of 1963, 1972 and 1983. We find, once again, that the presence of the Mafia in 1900 leads to a significantly greater concentration of votes. These estimates are significant in all specifications for all the elections. Quantitatively, an increase in the Mafia index in 1900 from 1 to 2 is associated with a 6 percentage points increase in the Herfindahl index of concentration in 1972, for example. These effects are therefore considerably smaller than the impact of the Mafia on medium-term political competition, which is again consistent with the idea that these are the lingering but attenuated effects of the presence of the Mafia in 1900.

### 6.5 Falsification and Other Concerns

Table A12 in the Appendix shows the relationship between relative rainfall in the 10 years preceding the 1893 drought and our long-term outcome variables. (This is similar to the falsification exercises for medium-term outcomes reported in Table 10). We report the coefficients of (relative) spring rain in the most demanding specification for all long-term variables, with each column testing the relationship for the effect of rainfall for a separate year starting with 1882. The results are again reassuring. Out of 150 coefficients, only nine are statistically significant at 10% or less, and there is no clear pattern of systematic negative or positive correlation between relative rainfall and development outcomes. Recall also that Tables A6 and A11 already showed falsification exercises using (relative) rainfall in each year between 1900 and 1941, and for the specific drought in 1906 for the long-term outcomes, verifying the lack of any significant relationship between rainfall and contemporary or subsequent outcomes for any year other than the critical period for the rise of the Peasant Fasci, 1893. Finally, in columns 4-6 of Table 11 we investigate the effects of the Mafia in 1900 on longer-term population changes, and show that migration cannot account for the effect of the Mafia considered in the previous sections.

Thus, overall, we find no evidence indicating that our exclusion restrictions are violated for the longer-term outcomes, even though these results are somewhat weaker, most likely because the distribution of the Mafia across Sicily has changed significantly since 1900 and some of the persistent effects of the presence of the Mafia from the early 20th century appear to have attenuated since then.

## 7 Conclusion

There is growing evidence that state weakness and the lack of state capacity are important roadblocks on public good provision and economic development (e.g., Gennaioli and Rainer, 2007; Besley and Persson, 2011; Bandyopadhyay and Green, 2012; Michalopoulos and Papaioannou, 2013; Acemoglu et al., 2015). One of the many factors holding back the development of local state capacity is the impact of various criminal organizations. None is perhaps as famous as the Sicilian Mafia, which has played

an outsized role in the island's history since the middle of the 19th century. Though anecdotal evidence on how racketeering by the Mafia has impacted the provision of various local public goods is plentiful (e.g., Mosca, 1900; Salvemini, 1910; Pezzino, 1990; Tranfaglia, 2008; Sacco, 2010), and recent work has documented that the Mafia and other criminal organizations have often played an important role in local politics (e.g., Daniele and Geys, 2015; Buonanno et al., 2016; Di Cataldo and Mastrorocco, 2016; De Feo and De Luca, 2017), there is little direct evidence of the Mafia's (or other criminal organizations') impact on local economic development.

In this paper, we proposed a theory of the spread of the Mafia at the end of the 19th century and exploited the source of variation generated by this theory to estimate its medium-term and long-term effects on economics and politics on the island. Though the origins of the Mafia are well studied and emphasize the turbulence created by the collapse of the Kingdom of Two Sicilies and Italian unification, the role of local elites turning to the Mafia in response to the rising socialist threat at the end of the 19th century has been largely overlooked. The first mass socialist movement in Italy, the Peasant Fasci, emerged in Sicily, in part because of the extremely harsh working conditions of the island's peasants. The Peasant Fasci movement received a huge boost because of an exceptional drought in 1893, which cut production of grains and several other crops by as much as 50% throughout Sicily. We start by documenting that this drought — and no other past or future weather event — has a strong predictive power for the location of the Peasant Fasci. We then estimate the causal effect of the rise of the Peasant Fasci on the spread of the Mafia circa 1900. Our results indicate that as much as 37 percent of the strength of the Mafia in 1900 may be related to its involvement in the suppression of the Peasant Fasci.

In the second part of the paper, we use the severity of the drought across Sicily as an instrument for the presence of the Mafia in 1900 and estimate its impact on local economic and political outcomes. We further substantiate the validity of this instrumental-variables strategy by showing that rainfall in other years has no predictive power for economic outcomes — it was only the drought of 1893, in the critical juncture created by the rise of mass socialist politics, that triggered the rise of the Mafia and hence its medium-term and long-term effects on various economic and political outcomes.

Indeed, our empirical work shows fairly large negative effects of the Mafia in the next two decades, significantly reducing literacy, increasing infant mortality and curtailing provision of local public goods. We also find a sizable effect of the Mafia on local politics: in places where the Mafia took root, the distribution of votes in parliamentary elections is highly concentrated. This suggests that the Mafia, in part by preventing parties and politicians not allied with itself from campaigning or even appearing in the municipality, significantly reduced political competition. We conjecture that this might be one of the channels via which the Mafia impacts local economic development (see Besley et al. (2010) for empirical evidence from the United States consistent with such an effect of political competition).

We also document some longer-term effects of the Mafia, though these are weaker, in part because there are significant changes in the local strength of the Mafia in the 20th century, associated with the rise and decline of fascism, and then the subsequent rise of the Christian Democratic Party, which often worked with the Mafia in many parts of Sicily. Nevertheless, the impact of the Mafia in 1900 on local

political concentration appears to be very persistent and robust.

We view our paper to be part of a growing literature on the economic and political consequences of local criminal activities.[34] Future work in this area investigating the exact mechanisms via which different criminal organizations influence the organization of local government, local corruption and local politics would be particularly informative. For instance, our strategy does not reveal whether the Mafia may have reduced local economic development because of local corruption, other effects of local criminal activity, or because of its impact on local political competition.

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[34] In addition to the references already mentioned in the Introduction, see Dal Bó et al. (2006); Dell (2015); Angrist and Kugler (2008); Chimeli and Soares (2017); Mejia and Restrepo (2013); Castillo et al. (2014).

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# TABLES

Table 1: Descriptive Statistics

| Variable | Obs | Mean | SD | Min | Max | Variable | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Main variables:* | | | | | | *Economic and state capacity outcomes:* | | | | | |
| Mafia 1900 | 273 | 1.43 | 1.15 | 0 | 3 | Literacy rate 1911 | 333 | 0.37 | 0.10 | 0.11 | 0.73 |
| Peasant Fasci | 333 | 0.31 | 0.46 | 0 | 1 | Literacy rate 1921 | 333 | 0.48 | 0.09 | 0.23 | 0.80 |
| Relative Rainfall 1893 | 297 | 0.64 | 0.28 | 0.06 | 1.28 | Literacy rate 1931 | 333 | 0.59 | 0.08 | 0.37 | 0.79 |
| *Determinants of Fasci:* | | | | | | Literacy rate 1961 | 333 | 0.83 | 0.04 | 0.69 | 0.93 |
| Rural center in 1861 | 333 | 0.37 | 0.48 | 0 | 1 | Literacy rate 1971 | 333 | 0.88 | 0.04 | 0.74 | 0.99 |
| Rural rent per hectare in 1853 | 333 | 6.85 | 4.75 | 1.17 | 35.15 | Literacy rate 1981 | 333 | 0.93 | 0.03 | 0.81 | 0.99 |
| Urban rent per hectare in 1853 | 333 | 1.56 | 4.30 | 0 | 69.99 | High school rate 1961 | 333 | 0.03 | 0.02 | 0.01 | 0.10 |
| Grains (share in 1830s) | 333 | 0.50 | 0.23 | 0.015 | 0.99 | High school rate 1971 | 333 | 0.06 | 0.03 | 0.02 | 0.22 |
| Share cultivated land in 1853 | 333 | 0.97 | 0.08 | 0.17 | 1 | High school rate 1981 | 333 | 0.09 | 0.04 | 0.03 | 0.30 |
| *Determinants of Mafia:* | | | | | | Infant mortality 1869 | 259 | 0.20 | 0.07 | 0.01 | 0.67 |
| Sulfur production 1868-70 | 333 | 5.59 | 23.50 | 0 | 210 | Infant mortality 1909 | 277 | 0.16 | 0.04 | 0.04 | 0.32 |
| Citrus groves (share in 1830s) | 333 | 0.01 | 0.02 | 0 | 0.16 | Infant mortality 1969-70 | 333 | 0.03 | 0.02 | 0 | 0.11 |
| Mafia 1885 | 333 | 0.57 | 1.01 | 0 | 3 | Infant mortality 1982 | 333 | 0.02 | 0.02 | 0 | 0.11 |
| Olives (share in 1830s) | 333 | 0.04 | 0.06 | 0 | 0.46 | Drink water quantity in 1885 | 333 | 1.69 | 0.51 | 1 | 3 |
| Vineyards (share in 1830s) | 333 | 0.10 | 0.12 | 0 | 0.74 | Drink water quality in 1885 | 333 | 2.75 | 0.59 | 1 | 3 |
| *Geographic controls:* | | | | | | Aqueduct in 1909 | 333 | 0.054 | 0.23 | 0 | 1 |
| Population in 1861 | 333 | 8.37 | 0.95 | 5.88 | 12.19 | Aqueduct coverage 1961 | 333 | 0.66 | 0.24 | 0.01 | 0.99 |
| Area | 333 | 8.194 | 1.25 | 4.41 | 11.19 | Aqueduct coverage 1971 | 330 | 0.77 | 0.12 | 0.11 | 1 |
| Altitude of the town center | 333 | 411.40 | 276.60 | 3 | 1265 | Aqueduct coverage 1981 | 333 | 0.67 | 0.14 | 0.01 | 0.99 |
| Maximum altitude | 333 | 944.20 | 591.70 | 48.00 | 3274 | Development Expenditure 1884 | 333 | 0.82 | 0.85 | -2.15 | 3.28 |
| Average altitude | 333 | 392.10 | 274.90 | 10 | 1627 | Development Expenditure 1912 | 333 | -1.58 | 2.46 | -10.03 | 5.23 |
| Distance from Palermo | 333 | 109.02 | 58.91 | 0 | 229 | Development Expenditure 1957 | 333 | 0.20 | 0.93 | -2.76 | 3.56 |
| Distance from closest port | 333 | 32.49 | 20.13 | 0 | 90 | *Political competition:* | | | | | |
| Average temperature | 333 | 15.93 | 1.54 | 11.00 | 18.45 | HHI 1865 | 289 | 0.77 | 0.20 | 0.45 | 1 |
| Long run average rainfall (1881-1941) | 307 | 156.30 | 29.18 | 70.15 | 253.10 | HHI 1909 | 317 | 0.78 | 0.22 | 0.34 | 1 |
| Long run variance of relative rainfall | 307 | 0.21 | 0.07 | 0.12 | 0.47 | HHI 1963 | 333 | 0.31 | 0.07 | 0.17 | 0.59 |
| Roads in 1799 | 333 | 0.51 | 0.50 | 0 | 1 | HHI 1972 | 333 | 0.31 | 0.07 | 0.18 | 0.65 |
| | | | | | | HHI 1983 | 333 | 0.30 | 0.07 | 0.16 | 0.57 |

*Notes*: The descriptive statistics include the number of observations (Obs), the average (Mean), the standard deviations (SD), the minimum (Min) and the maximum value (Max) for the entire sample of municipalities. See text for variable definitions and sources.

Table 2: The Impact of Relative Rainfall 1893 on Peasant Fasci

| Dependent variable: Peasant Fasci | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: without province fixed effects | | | | |
| Relative Rainfall 1893 | -1.00 | -0.95 | -0.94 | -0.79 |
| | (0.13) | (0.13) | (0.14) | (0.22) |
| Panel B: with province fixed effects | | | | |
| Relative Rainfall 1893 | -0.76 | -0.84 | -0.77 | -0.76 |
| | (0.21) | (0.25) | (0.26) | (0.27) |
| Determinants of Fasci | | ✓ | ✓ | ✓ |
| Determinants of Mafia | | | ✓ | ✓ |
| Geographic controls | | | | ✓ |
| Observations | 245 | 245 | 245 | 245 |

*Notes*: OLS estimates of the impact of relative rainfall in 1893 on the emergence of Peasant Fasci organizations. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The dependent variable is a dummy indicating the presence in the municipality of a Peasant Fasci organization. Panel A does not include province fixed effects which are included in all the specifications of Panel B. The specifications in column 1 include only relative rainfall in 1893. The specifications in column 2 also include other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 3 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 4 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 3: The Impact of Peasant Fasci on Mafia

| Dependent variable: Mafia 1900 | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: IV without province fixed effects | | | | |
| Peasant Fasci | 2.05 | 2.09 | 1.96 | 1.68 |
| | (0.43) | (0.43) | (0.41) | (0.48) |
| First-stage F-statistic | 57.13 | 52.02 | 44.32 | 13.27 |
| Panel B: IV with province fixed effects | | | | |
| Peasant Fasci | 0.87 | 1.03 | 1.31 | 1.51 |
| | (0.49) | (0.31) | (0.38) | (0.52) |
| First-stage F-statistic | 13.43 | 11.26 | 8.61 | 7.72 |
| Panel C: OLS without province fixed effects | | | | |
| Peasant Fasci | 0.99 | 0.89 | 0.92 | 0.47 |
| | (0.29) | (0.33) | (0.26) | (0.18) |
| Panel D: OLS with province fixed effects | | | | |
| Peasant Fasci | 0.27 | 0.22 | 0.40 | 0.37 |
| | (0.26) | (0.25) | (0.18) | (0.16) |
| Determinants of Fasci | | ✓ | ✓ | ✓ |
| Determinants of Mafia | | | ✓ | ✓ |
| Geographic controls | | | | ✓ |
| Observations | 245 | 245 | 245 | 245 |

*Notes*: Estimates of the impact of the Peasant Fasci organizations on the presence of the Mafia in 1900. The dependent variable is an index that takes a value of 0, 1, 2, or 3, progressively indicating the strength of the Mafia in a municipality with 0 denoting no presence of Mafia organizations and 3 highest density of the Mafia according to Cutrera (1900). Panels A and B report the IV estimates where the Peasant Fasci variable is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 2. Panel A does not include province fixed effects which are included in all the specifications of Panel B. Panels C and D report the OLS estimates of the impact of the Peasant Fasci on the Mafia presence in 1900. Panel C does not include province fixed effects which are included in all the specifications of Panel D. The specifications in column 1 include only relative rainfall in 1893. The specifications in column 2 also include other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 3 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 4 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 4: Relative Rainfall 1893 and Mafia

| Dependent variable: Mafia 1900 | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: without province fixed effects | | | | |
| Relative Rainfall 1893 | -2.06 | -1.99 | -1.84 | -1.32 |
| | (0.45) | (0.40) | (0.37) | (0.35) |
| F-statistic | 20.72 | 24.74 | 25.23 | 14.06 |
| Panel B: with province fixed effects | | | | |
| Relative Rainfall 1893 | -0.66 | -0.87 | -1.01 | -1.14 |
| | (0.34) | (0.29) | (0.30) | (0.39) |
| F-statistic | 3.80 | 9.21 | 11.54 | 8.73 |
| Determinants of Fasci | | ✓ | ✓ | ✓ |
| Determinants of Mafia | | | ✓ | ✓ |
| Geographic controls | | | | ✓ |
| Observations | 245 | 245 | 245 | 245 |

*Notes*: OLS estimates of the impact of relative rainfall in 1893 on the presence of the Mafia in 1900. The dependent variable is an index that takes a value of 0, 1, 2, or 3, progressively indicating the strength of the Mafia in a municipality with 0 denoting no presence of Mafia organizations and 3 highest density of the Mafia according to Cutrera (1900). Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. Panel A does not include province fixed effects which are included in all the specifications of Panel B. The specifications in column 1 include only relative rainfall in 1893. The specifications in column 2 also include other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 3 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 4 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 5: Relative Rainfall 1893 and Mafia. Maximum Likelihood Estimates

| Dependent variable: Mafia 1900 | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: without province fixed effects | | | | |
| Relative Rainfall 1893 | -1.94 | -1.87 | -1.63 | -1.32 |
| | (0.60) | (0.58) | (0.56) | (0.51) |
| Panel B: with province fixed effects | | | | |
| Relative Rainfall 1893 | -0.66 | -0.87 | -1.01 | -1.14 |
| | (0.31) | (0.35) | (0.37) | (0.46) |
| Determinants of Fasci | | ✓ | ✓ | ✓ |
| Determinants of Mafia | | | ✓ | ✓ |
| Geographic controls | | | | ✓ |
| Observations | 245 | 245 | 245 | 245 |

*Notes*: Maximum Likelihood estimates of the impact of relative rainfall in 1893 on the presence of the Mafia in 1900 taking into account the correlation induced by the interpolation of rainfall data. The dependent variable is an index that takes a value of 0, 1, 2, or 3, progressively indicating the strength of the Mafia in a municipality with 0 denoting no presence of Mafia organizations and 3 highest density of the Mafia according to Cutrera (1900). Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. Panel A does not include province fixed effects which are included in all the specifications of Panel B. The specifications in column 1 include only relative rainfall in 1893. The specifications in column 2 also include other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 3 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 4 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 6: Falsification Exercise: Relative Rainfall 1893 and Pre-1893 Outcomes

| Dependent variable: | Mafia in 1885 (1) | Infant mortality 1869 (2) | Drink water quantity 1885 (3) | Drink water quality 1885 (4) | Development expenditure 1884 (5) | HHI 1865 (6) |
|---|---|---|---|---|---|---|
| Panel A: no province fixed effects | | | | | | |
| Relative Rainfall 1893 | 0.24 | -0.03 | -0.24 | -0.15 | -0.12 | 0.10 |
| | (0.46) | (0.05) | (0.23) | (0.24) | (0.44) | (0.09) |
| Panel B: province fixed effects | | | | | | |
| Relative Rainfall 1893 | 0.48 | -0.01 | -0.27 | -0.26 | -0.01 | 0.14 |
| | (0.34) | (0.04) | (0.21) | (0.33) | (0.55) | (0.14) |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 297 | 238 | 245 | 245 | 245 | 227 |

*Notes*: OLS estimates of the relationship between relative rainfall in 1893 and the pre-1893 variables. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. All the specifications in the present table include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls). Panel A does not include province fixed effects which are included in all the specifications of Panel B. The dependent variable in column 1 is the index of Mafia presence in 1885 derived from Damiani (1885) and, as in Buonanno et al. (2015), takes a value of 0, 1, 2, or 3, progressively indicating the strength of the Mafia in a municipality with 0 denoting no presence of Mafia organizations and 3 highest density of the Mafia. The dependent variable in column 2 is the infant mortality rate computed for the years 1869 and 1870 as the average ratio of the of deaths below the age of one over the number of births for the years 1869 and 1870. The dependent variable in column 3 is the index for water quantity using information provided by Direzione Generale della Statistica (1886). The index takes value of 1 when the quantity is scarce, value of 2 when the quantity is sufficient, and value of 3 when the quantity is plentiful. The dependent variable in column 4 is the index for water quality using again information provided by Direzione Generale della Statistica (1886). The index takes value of 1 when the quality is poor, value of 2 when the quality is passable, and value of 3 when the quality is good. The dependent variable in column 5 is the per-capita development expenditure in logs of municipalities in 1884, which aggregates all spending for development or improvement of local infrastructure, education, security and justice (e.g. building or upgrading of roads and schools). The dependent variable in column 6 is the concentration index (HHI) computed at municipality level for the 1865 parliamentary elections by looking at the share of votes of each candidate. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 7: Falsification Exercise: Relative Rainfall 1882-1891, Peasant Fasci and Mafia

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Panel A: Dependent variable: Peasant Fasci | | | | | | | | | | |
| Relative Rainfall 18XX | 0.00 | 0.08 | -0.24 | 0.27 | 0.16 | -0.041 | -0.81 | 0.08 | -0.16 | -0.16 |
| | (0.24) | (0.22) | (0.23) | (0.37) | (0.32) | (0.24) | (0.44) | (0.21) | (0.32) | (0.36) |
| Panel B: Dependent variable: Mafia 1900 | | | | | | | | | | |
| Relative Rainfall 18XX | -0.53 | 0.22 | 0.10 | 0.33 | 0.54 | -0.19 | -0.93 | 0.22 | 0.08 | 0.60 |
| | (0.77) | (0.75) | (0.79) | (0.71) | (0.67) | (0.46) | (0.68) | (0.60) | (0.55) | (0.67) |
| Year | 1882 | 1883 | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 197 | 181 | 222 | 204 | 224 | 208 | 224 | 225 | 241 | 244 |

*Notes*: OLS estimates of the relationship between relative rainfall in the years between 1882 and 1891 and the Peasant Fasci or the Mafia in 1900. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. All the specifications in the present table include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. The coefficients of the impact of relative rainfall on the Peasant Fasci are reported in panel A, while the coefficients of the effect on Mafia 1900 is in panel B. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 8: The Impact of Mafia on Human Capital

| Dependent variable: | Literacy in 1911 | | | Literacy in 1921 | | | Literacy in 1931 | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Panel A: IV results | | | | | | | | | |
| Mafia 1900 | -0.06 | -0.05 | -0.09 | -0.09 | -0.08 | -0.10 | -0.07 | -0.06 | -0.08 |
| | (0.04) | (0.04) | (0.05) | (0.05) | (0.05) | (0.05) | (0.04) | (0.03) | (0.04) |
| Panel B: OLS results | | | | | | | | | |
| Mafia 1900 | 0.00 | -0.00 | -0.00 | 0.01 | 0.00 | 0.00 | -0.00 | -0.01 | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Province FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Geographic controls | | | ✓ | | | ✓ | | | ✓ |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 |

*Notes*: Estimates of the impact of Mafia on literacy rates in the years 1911, 1921, and 1931. The dependent variable is the literacy rate of the resident population older than 6 years of age and is computed used data at municipality level reported in the three censuses of 1911, 1921, and 1931. Panel A reports the IV estimates of the effect of Mafia 1900 on literacy rates, where Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 4. Panel B reports the OLS estimates of the impact of the Mafia in 1900 on the literacy rates. Columns 1-3 report the coefficient estimates of the effect of the Mafia on the literacy rate in 1911; columns 4-6 report the same estimates for literacy rate in 1921, while columns 7-9 report the estimates for literacy rate in 1931. The specifications in column 1, 4, and 7 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in columns 2, 5, and 8 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in columns 3, 6, and 9 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 9: The Impact of Mafia on State Capacity and Politics

| Dependent variable: | Infant mortality in 1909 | | | Aqueduct in 1909 | | | Development Expenditure 1912 | | | HHI in 1909 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Panel A: IV results | | | | | | | | | | | | |
| Mafia 1900 | 0.04 | 0.04 | 0.05 | -0.06 | -0.05 | -0.12 | -2.31 | -2.02 | -1.44 | 0.40 | 0.32 | 0.30 |
| | (0.02) | (0.02) | (0.02) | (0.10) | (0.05) | (0.13) | (1.10) | (0.96) | (0.86) | (0.17) | (0.14) | (0.13) |
| Panel B: OLS results | | | | | | | | | | | | |
| Mafia 1900 | 0.006 | 0.006 | 0.004 | 0.01 | 0.00 | 0.01 | 0.04 | 0.01 | 0.02 | 0.03 | 0.03 | 0.03 |
| | (0.002) | (0.002) | (0.002) | (0.02) | (0.02) | (0.02) | (0.16) | (0.16) | (0.14) | (0.02) | (0.02) | (0.02) |
| Province FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Geographic controls | | | ✓ | | | ✓ | | | ✓ | | | ✓ |
| Observations | 243 | 243 | 243 | 245 | 245 | 245 | 245 | 245 | 245 | 242 | 242 | 242 |

*Notes*: Estimates of the impact of the Mafia on various measures of state capacity. Panel A reports the IV estimates of the effect of Mafia 1900 on the different measures of state capacity, where Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 4. Panel B reports the OLS estimates of the impact of the Mafia in 1900 on the different measures of state capacity. The dependent variable in columns 1-3 is infant mortality, computed for the years 1908 and 1909 as the average ratio of the of deaths below the age of one over the number of births for the years 1908 and 1909. The dependent variable in columns 4-6 is aqueduct availability, which is a dummy that takes value 1 if the municipality had an aqueduct in 1909 as reported by Lorenzoni1910b. The dependent variable in columns 7-9 is the per-capita development expenditure in logs of municipalities in 1912, which aggregates all spending for development or improvement of local infrastructure, education, security and justice (e.g. building or upgrading of roads and schools). The specifications in column 1, 4, and 7 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in columns 2, 5, and 8 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in columns 3, 6, and 9 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 10: Falsification Exercise: Relative Rainfall 1882-1891 and Medium-Term Outcomes

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Literacy 1911 | 0.04 | -0.04 | 0.00 | 0.16 | 0.04 | 0.04 | 0.03 | -0.05 | -0.08 | -0.03 |
| | (0.08) | (0.12) | (0.09) | (0.07) | (0.07) | (0.05) | (0.11) | (0.08) | (0.04) | (0.08) |
| Literacy 1921 | -0.07 | -0.04 | -0.03 | 0.04 | 0.01 | 0.06 | 0.02 | -0.05 | -0.03 | -0.02 |
| | (0.05) | (0.11) | (0.09) | (0.07) | (0.07) | (0.05) | (0.11) | (0.05) | (0.05) | (0.07) |
| Literacy 1931 | 0.01 | -0.04 | -0.03 | 0.09 | 0.02 | 0.05 | -0.02 | -0.05 | -0.08 | -0.08 |
| | (0.06) | (0.06) | (0.08) | (0.06) | (0.05) | (0.05) | (0.08) | (0.06) | (0.04) | (0.05) |
| Development Expenditure 1912 | -1.75 | -0.02 | -1.09 | -1.02 | -0.06 | 0.44 | -0.94 | -0.17 | 0.06 | 0.84 |
| | (1.21) | (1.53) | (1.11) | (1.34) | (1.08) | (0.90) | (1.75) | (1.01) | (0.83) | (1.35) |
| Infant mortality 1909 | 0.05 | 0.01 | 0.01 | 0.01 | -0.01 | 0.00 | -0.01 | 0.01 | 0.01 | 0.00 |
| | (0.02) | (0.03) | (0.04) | (0.03) | (0.03) | (0.02) | (0.04) | (0.02) | (0.02) | (0.04) |
| Aqueduct 1909 | -0.12 | -0.12 | -0.07 | -0.08 | -0.15 | -0.10 | -0.00 | -0.04 | -0.04 | -0.10 |
| | (0.14) | (0.18) | (0.11) | (0.12) | (0.17) | (0.13) | (0.12) | (0.10) | (0.10) | (0.19) |
| HHI 1909 | 0.07 | 0.07 | 0.00 | 0.13 | 0.41 | -0.03 | -0.22 | 0.07 | 0.03 | 0.06 |
| | (0.14) | (0.14) | (0.19) | (0.24) | (0.16) | (0.11) | (0.22) | (0.13) | (0.15) | (0.22) |
| Year | 1882 | 1883 | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

*Notes*: OLS estimates of the relationship between relative rainfall in the years between 1882 and 1891 and medium-term economic outcomes, state capacity measures, and political competition. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. All the specifications in the present table include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 11: Migration and Persistence of Socialist Support

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Panel A: Migration | | | | | | |
| Dependent variable: | Δ population 1881-1901 | | | Δ population 1881-1971 | | |
| Relative Rainfall 1893 | 0.01 | 0.00 | -0.07 | 0.11 | 0.09 | -0.04 |
| | (0.08) | (0.09) | (0.09) | (0.26) | (0.27) | (0.29) |
| Panel B: Socialist Support | | | | | | |
| Dependent variable: | Peasant Leagues in 1908 | | | Socialist votes in 1913 | | |
| Relative Rainfall 1893 | 0.00 | 0.00 | -0.01 | 0.31 | 0.30 | 0.17 |
| | (0.01) | (0.02) | (0.02) | (0.24) | (0.25) | (0.26) |
| Province FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ | | ✓ | ✓ |
| Geographic controls | | | ✓ | | | ✓ |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 |

*Notes*: OLS estimates of the impact of relative rainfall in 1893 on medium- and long-term migration, and on the medium-term persistence of peasant organizations and socialist parties. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. In panel A we report the impact on migration. The dependent variable in columns 1-3 is the change in population between 1881 and 1901 computed using census data. The dependent variable in columns 4-6 is the change in population between 1881 and 1971 again computed using census data. In panel B we report the impact on the persistence of peasant and socialist organizations. migration. The dependent variable in columns 1-3 is membership rate of the peasants' leagues in 1908. It is computed using the number of members of peasant leagues reported in Lorenzoni1910b divided by the population in the previous census of 1901. The dependent variable in columns 4-6 is the vote share for candidates belonging to one of the socialist parties (Official Socialist Party, Reformist Socialist Party, Independent Socialist Party) in the parliamentary elections in 1913. The specifications in column 1 and 4 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 2 and 5 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in columns 3 and 6 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 12: The Persistence of Mafia

| Dependent variable: Mafia 1987 | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A: IV results | | | | |
| Mafia 1900 | 0.37 | 0.34 | 0.29 | 0.26 |
| | (0.44) | (0.27) | (0.24) | (0.21) |
| Panel B: OLS results | | | | |
| Mafia 1900 | 0.11 | 0.09 | 0.08 | 0.09 |
| | (0.04) | (0.04) | (0.04) | (0.04) |
| Province FE | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | | ✓ | ✓ | ✓ |
| Determinants of Mafia | | | ✓ | ✓ |
| Geographic controls | | | | ✓ |
| Observations | 245 | 245 | 245 | 245 |

*Notes*: Estimates of the persistence of the Mafia from 1900 to 1987. The information about the Mafia presence in 1980s is taken from a report by the military police (*Carabinieri*) submitted in 1987 to a parliamentary committee (CG Carabinieri, 1987). The dependent variable is a dummy that takes the value of 1 for the municipality which is considered in the report a stronghold of the Mafia. Panel A reports the IV estimates of the persistence of Mafia presence in 1900 on the 1987 measure, where Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 4. Panel B reports the OLS estimates of the persistence of Mafia presence in 1900 on the 1987 measure. The specifications in column 1 include only Mafia 1900 and province fixed effects. The specifications in column 2 include also other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 3 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 4 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 13: The Long-Term Impact of Mafia on Human Capital

| Dependent variable: | High school | | | Literacy | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A: Census 1961 | | | | | | |
| Mafia 1900 | -0.02 | -0.02 | -0.01 | -0.04 | -0.03 | -0.04 |
| | (0.01) | (0.01) | (0.01) | (0.02) | (0.02) | (0.02) |
| Panel B: Census 1971 | | | | | | |
| Mafia 1900 | -0.03 | -0.02 | -0.02 | -0.03 | -0.02 | -0.03 |
| | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) |
| Panel C: Census 1981 | | | | | | |
| Mafia 1900 | -0.04 | -0.03 | -0.02 | -0.02 | -0.01 | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.01) | (0.01) | (0.01) |
| Province FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ | | ✓ | ✓ |
| Geographic controls | | | ✓ | | | ✓ |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 |

*Notes*: IV estimates of the impact of the Mafia in 1900 on high school completion rate and literacy rates in the years 1961, 1971, and 1981. Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 4. The dependent variable in columns 1-3 is the share of the population older that 6 years of age with a high school degree computed using census data at municipality level. The dependent variable in columns 4-6 is the literacy rate of the resident population older than 6 years of age computed using the same census data. Panel A reports the IV estimates of the impact of the Mafia in 1900 on high school and literacy rates in 1961, while panel B and C report the same estimations for the years 1971 and 1981 respectively. The specifications in column 1 and 4 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in columns 2 and 5 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in columns 3 and 6 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table 14: The Long-Term Impact of Mafia on State Capacity and Politics

| Dependent variable: | Aqueduct availability | | | Infant mortality | | | Development Expenditure | | | HHI | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Panel A: 1961 | | | | | | | | | | | | |
| Mafia 1900 | -0.13 | -0.13 | -0.18 | | | | -0.56 | -0.51 | -0.05 | 0.09 | 0.08 | 0.09 |
| | (0.10) | (0.08) | (0.09) | | | | (0.35) | (0.30) | (0.34) | (0.03) | (0.03) | (0.02) |
| Panel B: 1971 | | | | | | | | | | | | |
| Mafia 1900 | -0.13 | -0.10 | -0.07 | 0.00 | 0.00 | 0.00 | | | | 0.08 | 0.07 | 0.06 |
| | (0.06) | (0.06) | (0.04) | (0.01) | (0.01) | (0.01) | | | | (0.03) | (0.03) | (0.03) |
| Panel C: 1981 | | | | | | | | | | | | |
| Mafia 1900 | -0.14 | -0.12 | -0.09 | 0.00 | 0.00 | 0.00 | | | | 0.08 | 0.07 | 0.05 |
| | (0.08) | (0.07) | (0.07) | (0.01) | (0.01) | (0.01) | | | | (0.03) | (0.03) | (0.03) |
| Province FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Geographic controls | | | ✓ | | | ✓ | | | ✓ | | | ✓ |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 | 245 |

*Notes*: IV estimates of the impact of the Mafia in 1900 on state capacity measures and politics in the years 1961, 1971, and 1981. Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 4. The dependent variable in columns 1-3 is the share of the households receiving drinking water from an aqueduct using census data at municipality level. The dependent variable in columns 4-6 is the infant mortality rate computed as the ratio between the deaths below the age of one over the number of births in the same years using data provided by ISTAT at municipality level on deaths by age and sex and on population change. The dependent variable in columns 7-9 is the per-capita development expenditure in logs of municipalities, which aggregates all spending for development or improvement of local infrastructure, education, security and justice (e.g. building or upgrading of roads and schools). The dependent variable in columns 10-12 is the concentration index (HHI) computed at municipality level for parliamentary elections using the share of votes of each party. Panel A reports the coefficients of the effect of Mafia 1900 on the dependent variables for the year 1961 (1957 for development expenditure, and 1963 for HHI). Panel B reports the coefficients of the effect of Mafia 1900 on the dependent variables for the year 1971 (1969-70 for infant mortality, and 1972 for HHI). Panel C reports the coefficients of the effect of Mafia 1900 on the dependent variables for the year 1981 (1982 for infant mortality, and 1983 for HHI). The specifications in column 1, 4, 7, and 10 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in columns 2, 5, 8, and 11 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in columns 3, 6, 9, and 12 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

# 8 APPENDIX

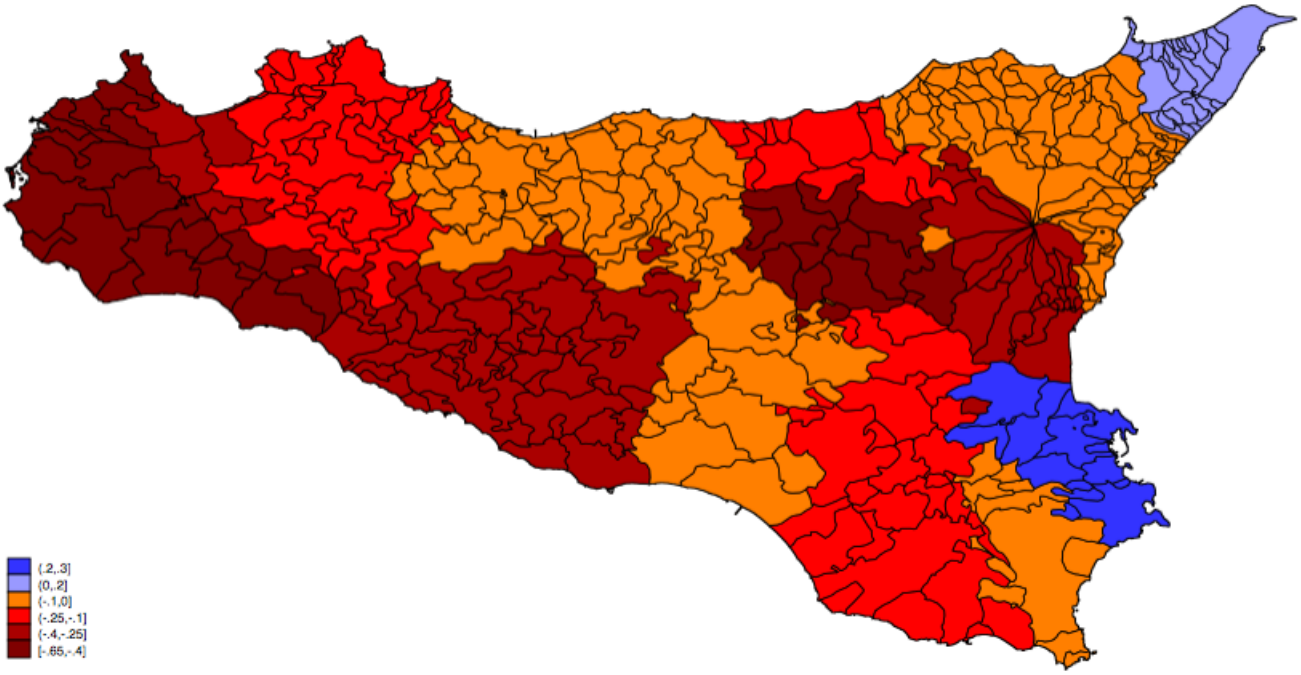



Figure A1: Average change in agricultural production for 11 crops in 1893 with respect to the average of the 1890-94 period in each of the 24 districts. Weighted average using the size of the area devoted to each crop in every district. The crops are barley, beans, broad beans, corn, flax, oat, olive oil, potatoes, rye, wheat, wine.

Table A1: Main Results. Conley Standard Errors

| Dependent variables: | (1) | (2) | (3) |
|---|---|---|---|
| Panel A: The Impact of 1893 Relative Rainfall on Mafia and Peasant Fasci (First Stage) | | | |
| Peasant Fasci | -0.84 | -0.77 | -0.76 |
| | (0.17) | (0.18) | (0.20) |
| Mafia 1900 | -0.87 | -1.01 | -1.14 |
| | (0.26) | (0.24) | (0.26) |
| Panel B: The Impact of Peasant Fasci on Mafia (Second Stage) | | | |
| Mafia 1900 | 1.03 | 1.31 | 1.51 |
| | (0.35) | (0.42) | (0.50) |
| Panel C: Medium- and Long-Term Impacts of Mafia (Second Stage) | | | |
| Literacy 1911 | -0.06 | -0.05 | -0.09 |
| | (0.03) | (0.03) | (0.04) |
| Literacy 1921 | -0.09 | -0.08 | -0.10 |
| | (0.04) | (0.04) | (0.04) |
| Literacy 1931 | -0.07 | -0.06 | -0.08 |
| | (0.03) | (0.03) | (0.04) |
| Literacy 1961 | -0.04 | -0.03 | -0.04 |
| | (0.02) | (0.01) | (0.02) |
| Literacy 1971 | -0.03 | -0.02 | -0.03 |
| | (0.01) | (0.01) | (0.01) |
| Literacy 1981 | -0.02 | -0.01 | -0.01 |
| | (0.01) | (0.01) | (0.01) |
| High school 1961 | -0.02 | -0.02 | -0.01 |
| | (0.01) | (0.01) | (0.01) |
| High school 1971 | -0.03 | -0.03 | -0.02 |
| | (0.01) | (0.01) | (0.01) |
| High school 1981 | -0.04 | -0.03 | -0.02 |
| | (0.02) | (0.01) | (0.01) |
| Development Expenditure 1912 | -2.31 | -2.02 | -1.44 |
| | (0.81) | (0.59) | (0.58) |
| Development Expenditure 1957 | -0.56 | -0.51 | -0.05 |
| | (0.42) | (0.33) | (0.21) |
| Infant mortality 1909 | 0.04 | 0.04 | 0.05 |
| | (0.02) | (0.02) | (0.02) |
| Infant mortality 1969-70 | 0.00 | 0.00 | 0.00 |
| | (0.01) | (0.01) | (0.01) |
| Infant mortality 1982 | -0.01 | -0.01 | -0.01 |
| | (0.01) | (0.01) | (0.01) |
| Aqueduct 1909 | -0.06 | -0.05 | -0.12 |
| | (0.10) | (0.08) | (0.09) |
| Aqueduct coverage 1961 | -0.13 | -0.13 | -0.18 |
| | (0.08) | (0.07) | (0.07) |
| Aqueduct coverage 1971 | -0.13 | -0.10 | -0.07 |
| | (0.07) | (0.06) | (0.03) |
| Aqueduct coverage 1981 | -0.14 | -0.12 | -0.09 |
| | (0.08) | (0.06) | (0.05) |
| HHI 1909 | 0.40 | 0.33 | 0.30 |
| | (0.14) | (0.11) | (0.10) |
| HHI 1963 | 0.09 | 0.08 | 0.09 |
| | (0.03) | (0.02) | (0.03) |
| HHI 1972 | 0.08 | 0.07 | 0.06 |
| | (0.03) | (0.02) | (0.03) |
| HHI 1983 | 0.08 | 0.07 | 0.05 |
| | (0.03) | (0.02) | (0.02) |
| Province FE | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ |
| Geographic controls | | | ✓ |

*Notes*: Panel A reports the coefficients of Relative Rainfall 1893 in our two first stage regressions (Tables 2 and 4); Panel B reports the coefficient of Peasant Fasci in the second stage (Table 3); Panel C reports the coefficients of Mafia 1900 in the second stage for all medium- and long-term economic outcomes, state capacity, and politics. The dependent variables are listed on the left of the Table. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The specifications in column 1 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 2 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 3 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). Spatially-corrected standard errors computed following Conley's procedure are reported in parentheses.

Table A2: Peasant Fasci and Mafia in 1885

| Dependent variable: Peasant Fasci | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Mafia 1885 | -0.05 | -0.05 | -0.03 | -0.04 |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| Province FE | ✓ | ✓ | ✓ | ✓ |
| Determinants of Fasci | | ✓ | ✓ | ✓ |
| Determinants of Mafia | | | ✓ | ✓ |
| Geographic controls | | | | ✓ |
| Observations | 245 | 245 | 245 | 245 |

*Notes*: OLS estimates of the impact of the Mafia presence in 1885 on the emergence of Peasant Fasci organizations. Mafia presence is derived from Damiani (1885) and, as in Buonanno et al. (2015), takes a value of 0, 1, 2, or 3, progressively indicating the strength of the Mafia in a municipality with 0 denoting no presence of Mafia organizations and 3 highest density of the Mafia. The dependent variable is a dummy indicating the presence in the municipality of a Peasant Fasci organization. Panel A does not include which are included in all the specifications of Panel B. The specification in column 1 includes only Mafia strength in 1885 and province fixed effects. The specification in column 2 also include other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specification in column 3 also includes various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 4 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table A3: Robustness Tests on Relative Rainfall

| | (1) | (2) | (3) |
|---|---|---|---|
| Panel A: Dependent variable: Peasant Fasci | | | |
| Relative Rainfall 1892 | -0.26 | -0.22 | |
| | (0.17) | (0.16) | |
| Relative Spring Rainfall 1893 | | -0.54 | -0.75 |
| | | (0.29) | (0.35) |
| Relative Winter Rainfall 1892-3 | | | 0.04 |
| | | | (0.27) |
| Relative Summer Rainfall 1893 | | | 0.00 |
| | | | (0.07) |
| Relative Fall Rainfall 1892 | | | 0.09 |
| | | | (0.28) |
| Panel B: Dependent variable: Mafia 1900 | | | |
| Relative Rainfall 1892 | -0.16 | 0.01 | |
| | (0.42) | (0.52) | |
| Relative Spring Rainfall 1893 | | -1.12 | -1.29 |
| | | (0.57) | (0.43) |
| Relative Winter Rainfall 1892-3 | | | -0.78 |
| | | | (0.77) |
| Relative Summer Rainfall 1893 | | | -0.01 |
| | | | (0.17) |
| Relative Fall Rainfall 1892 | | | 0.05 |
| | | | (0.49) |
| Full set of controls | ✓ | ✓ | ✓ |
| Observations | 210 | 205 | 208 |

*Notes*: Estimates of the impact of rainfall on the Peasant Fasci and the Mafia in 1900. Relative rainfall is measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. Panel A reports the estimates for Peasant Fasci while Panel B reports the estimated for the Mafia. All specifications include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. The specifications in column 1 control for relative spring rainfall in 1892. The specifications in column 2 also include spring rainfall in 1893. The specifications in column 3 also include winter 1892-3, summer 1893, and fall 1892 relative rainfall. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table A4: Alternative Measures for Relative Rainfall 1893

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A: | | | | | |
| Dependent variable: Peasant Fasci | | | | | |
| Relative Rainfall 1893 | -0.40 | -0.99 | -1.18 | -0.77 | -0.88 |
| | (0.19) | (0.42) | (0.55) | (0.39) | (0.37) |
| Panel B: | | | | | |
| Dependent variable: Mafia 1900 | | | | | |
| Relative Rainfall 1893 | -0.47 | -1.18 | -1.45 | -0.94 | -1.00 |
| | (0.23) | (0.50) | (0.42) | (0.52) | (0.37) |
| Measure of Relative Rainfall 1893: | | | | | |
| Log of relative rainfall | ✓ | | | | |
| Relative rainfall capped at 1 | | ✓ | | | |
| Interpolation using: | | | | | |
| Minimum two stations | | | ✓ | | |
| Stations within 25 km | | | | ✓ | |
| Stations within 35 km | | | | | ✓ |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 245 | 245 | 155 | 216 | 251 |

*Notes*: Estimates of the impact of alternative rainfall measures on the Peasant Fasci and the Mafia in 1900. In panel A we report the estimates of the effects on the Peasant Fasci while in panel B the effect on the Mafia. All specifications include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. The specifications in column 1 include the natural logarithm of relative spring rainfall in 1893 measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The specifications in column 2 include instead the relative spring rainfall in 1893 interpolated as above, but capped at 1. The specifications in column 3 include the relative rainfall in spring 1893 for the municipalities where at least two weather stations where used to compute the interpolated measure of relative rainfall within the 30km cutoff. The specifications in column 4 include the relative rainfall in spring 1893 interpolated at municipality level using the inverse of the distances as weights with a cutoff of 25km. Finally, the specifications in column 5 include the relative rainfall in spring 1893 interpolated at municipality level using the inverse of the distances as weights with a cutoff of 35km. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table A5: The Impact of Relative Rainfall on Agriculture Production in 1893. District-Level Data

| Dependent variable: Change in Crop Output per ha in 1893 | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Relative Spring Rainfall 1893 | 0.38 | 0.44 | 0.42 | 0.42 |
| | (0.14) | (0.17) | (0.17) | (0.17) |
| Relative Fall Rainfall 1892 | | 0.10 | 0.11 | 0.11 |
| | | (0.16) | (0.15) | (0.18) |
| Relative Winter Rainfall 1892-3 | | 0.19 | 0.17 | 0.16 |
| | | (0.18) | (0.17) | (0.19) |
| Relative Summer Rainfall 1893 | | -0.07 | -0.07 | -0.07 |
| | | (0.06) | (0.06) | (0.06) |
| Average output per ha 1890-4 | | | 0.00 | 0.00 |
| | | | (0.00) | (0.01) |
| Crop-specific cultivated area in 1893 | | | -0.01 | 0.01 |
| | | | (0.01) | (0.02) |
| Crop fixed effect | | | | ✓ |
| Observations | 205 | 205 | 195 | 195 |
| R-squared | 0.082 | 0.124 | 0.134 | 0.197 |

*Notes*: Estimates of the impact of relative rainfall on the production of several crops in 1893. The dependent variable is the change in output per hectare in 1893 with respect to the average for the years 1890-1894 (excluding 1893) for 11 crops at district level (24 districts). The crops are barley, beans, broad beans, corn, flax, oat, olive oil, potatoes, rye, wheat, wine. Relative rainfall is measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The district-level relative rainfall is the weighted average of municipality-level data using the area as weights. In the first column we include only spring relative rainfall in 1893. In column 2 we add the relative rainfall in Autumn 1892, Winter 1892-3, and Summer 1893. In column 3 we include the average output per hectare of each of the 11 crops computed for the years 1890-94 excluding 1893, and the area devoted to the specific crop in 1893 in logs. Finally, in column 4 crop-specific fixed effects are included. We report bootstrapped standard errors allowing for two-way clustering conditional on the district and the crop.

Table A6: Falsification Exercise: Relative Rainfall 1900-41

| Drought variable: Relative Rainfall 19XX: | original | | logged | | censored | |
|---|---|---|---|---|---|---|
| Share of coefficients significat at 10% | + | - | + | - | + | - |
| Dependent variables: | | | | | | |
| Mafia 1900 | 0.04 | 0.01 | 0.02 | 0.01 | 0.04 | 0.02 |
| Peasant Fasci | 0.12 | 0.04 | 0.11 | 0.04 | 0.10 | 0.04 |
| Literacy 1911 | 0.01 | 0.04 | 0.01 | 0.07 | 0.01 | 0.08 |
| Literacy 1921 | 0 | 0.07 | 0.01 | 0.10 | 0.02 | 0.09 |
| Literacy 1931 | 0.04 | 0.07 | 0.04 | 0.10 | 0.03 | 0.06 |
| Literacy 1961 | 0.02 | 0.06 | 0.02 | 0.09 | 0.02 | 0.06 |
| Literacy 1971 | 0.02 | 0.05 | 0.02 | 0.05 | 0.02 | 0.02 |
| Literacy 1981 | 0.02 | 0 | 0.02 | 0.02 | 0.02 | 0.08 |
| High school 1961 | 0.02 | 0.09 | 0.02 | 0.12 | 0.02 | 0.08 |
| High school 1971 | 0.02 | 0.10 | 0.02 | 0.10 | 0.03 | 0.07 |
| High school 1981 | 0.03 | 0.09 | 0.02 | 0.09 | 0.03 | 0.06 |
| Development Expenditure 1912 | 0.02 | 0.06 | 0.02 | 0.04 | 0.04 | 0 |
| Development Expenditure 1957 | 0.02 | 0.03 | 0 | 0.02 | 0 | 0.02 |
| Infant mortality 1909 | 0.03 | 0.01 | 0.03 | 0.02 | 0.04 | 0.05 |
| Infant mortality 1969-70 | 0.05 | 0.01 | 0.06 | 0 | 0.04 | 0.03 |
| Infant mortality 1982 | 0.03 | 0.02 | 0.05 | 0.02 | 0.05 | 0.01 |
| Aqueduct 1909 | 0 | 0.02 | 0 | 0.02 | 0 | 0.03 |
| Aqueduct coverage 1961 | 0.05 | 0.02 | 0.06 | 0.01 | 0.03 | 0.02 |
| Aqueduct coverage 1971 | 0.03 | 0.06 | 0.04 | 0.04 | 0.04 | 0.05 |
| Aqueduct coverage 1981 | 0.04 | 0.02 | 0.04 | 0.02 | 0.06 | 0.02 |
| HHI 1909 | 0.07 | 0.06 | 0.06 | 0.07 | 0.06 | 0.02 |
| HHI 1963 | 0.02 | 0.02 | 0.06 | 0.03 | 0.03 | 0.03 |
| HHI 1972 | 0.03 | 0.05 | 0.02 | 0.05 | 0.02 | 0.07 |
| HHI 1983 | 0.01 | 0.04 | 0.02 | 0 | 0.02 | 0.02 |

*Notes*: Relationship between relative spring rainfall in the years 1900-1941, the Peasant Fasci, the Mafia in 1900, economic outcomes, and state capacity measures. We report the share of positive and negative coefficients for relative rainfall in the years 1900-1941 which are significant at 10% in the three specifications in columns 2-4 of Tables 2-5 including provincial fixed effects. As in the main specifications, we consider bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality. In the first and second columns we report the share of positive and negative coefficients for the baseline rainfall variable which are significant at 10%. In the third and forth columns we report the share of positive and negative coefficients for the log relative rainfall (as used in column 1 of Table A3) which are significant at 10%. Finally in columns 5 and 6 we report the share of positive and negative coefficients for the capped rainfall variable (as used in column 2 of Table A3) which are significant at 10%.

Table A7: The Impact of Mafia on Medium- and Long-Term Outcomes. AR Weak Instrument Robust CIs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Panel A: Medium Term Outcomes | | | | | | | |
| Dependent variable: | Literacy in 1911 | Literacy in 1921 | Literacy in 1931 | Infant Mortality in 1909 | Aqueduct in 1909 | Development Expenditure in 1912 | HHI in 1909 |
| Mafia 1900 | -0.09 | -0.10 | -0.08 | 0.06 | -0.12 | -1.44 | 0.30 |
| | [-0.29, -0.03] | [-0.25, -0.02] | [0.26, -0.03] | [0.02, 0.19] | [-0.30, 0.04] | [-4.30, -0.38] | [0.13, 1.05] |
| Panel B: Long Term Outcome | | | | | | | |
| Dependent variable: | High School | Literacy | | Infant Mortality | Aqueduct Availability | Development Expenditure | HHI |
| a) 1961: Mafia 1900 | -0.01 | -0.04 | | | -0.18 | -0.05 | 0.09 |
| | [-0.04, -0.002] | [-0.12, -0.01] | | | [-0.51, -0.06] | [-0.30, 0.48] | [0.05, 0.25] |
| b) 1971: Mafia 1900 | -0.02 | -0.03 | | 0.00 | -0.07 | | 0.06 |
| | [-0.07, -0.004] | [-0.08, -0.01] | | [-0.02, 0.02] | [-0.19, -0.03] | | [0.02, 0.17] |
| c) 1981: Mafia 1900 | -0.02 | -0.01 | | 0.00 | -0.09 | | 0.05 |
| | [-0.08, 0.003] | [-0.04, 0.001] | | [-0.02, 0.01] | [-0.28, 0.003] | | [0.02, 0.13] |
| IV | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

*Notes*: Estimates of the impact of the Mafia on medium- and long-term economic outcomes, state capacity, and politics. Panel A reports the estimates of the effect of Mafia 1900 on the different medium term dependent variables, where Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. Panel B reports the estimates of the effect of Mafia 1900 on the different long term dependent variables for 1961 (a), 1971 (b), and 1981 (c), respectively. All the specifications in the present table include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. Anderson-Rubin weak-instrument robust 95% confidence intervals reported in the squared brackets.

Table A8: The Impact of Mafia on Medium- and Long-Term Outcomes. Maximum Likelihood Estimates

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Panel A: Medium Term Outcomes | | | | | | | |
| Dependent variable: | Literacy in 1911 | Literacy in 1921 | Literacy in 1931 | Infant Mortality in 1909 | Aqueduct in 1909 | Development Expenditure in 1912 | HHI in 1909 |
| Mafia 1900 | -0.09 | -0.10 | -0.08 | 0.06 | -0.12 | -1.44 | 0.38 |
| | (0.04) | (0.03) | (0.03) | (0.02) | (0.06) | (0.64) | (0.13) |
| Panel B: Long Term Outcome | | | | | | | |
| Dependent variable: | High School | Literacy | | Infant Mortality | Aqueduct Availability | Development Expenditure | HHI |
| a) 1961: Mafia 1900 | -0.01 | -0.04 | | | -0.18 | -0.05 | 0.09 |
| | (0.01) | (0.01) | | | (0.07) | (0.20) | (0.04) |
| b) 1971: Mafia 1900 | -0.02 | -0.03 | | 0.00 | -0.07 | | 0.06 |
| | (0.01) | (0.01) | | (0.01) | (0.03) | | (0.03) |
| c) 1981: Mafia 1900 | -0.02 | -0.01 | | 0.00 | -0.09 | | 0.05 |
| | (0.01) | (0.01) | | (0.01) | (0.06) | | (0.03) |
| IV | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

*Notes*: Maximum likelihood estimates of the impact of the Mafia on medium- and long-term economic outcomes, state capacity, and politics. Panel A reports the estimates of the effect of Mafia 1900 on the different medium term dependent variables, where Mafia 1900 is instrumented by relative rainfall in 1893. Relative rainfall is measured as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The first stage is therefore reported in Table 5. Panel B reports the estimates of the effect of Mafia 1900 on the different long term dependent variables for 1961 (a), 1971 (b), and 1981 (c), respectively. All the specifications in the present table include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table A9: Testing the selection effect in OLS and IV.

| Dependent variables: | OLS | IV | $\hat{\rho}_{uz}$ | $\hat{\beta}$ |
|---|---|---|---|---|
| Literacy 1911 | 0.00 | -0.09 | 0.02 | -0.07 |
| | (0.01) | (0.04) | [-0.16, 0.19] | [-0.19, 0.00] |
| Literacy 1921 | 0.00 | -0.10 | 0.06 | -0.06 |
| | (0.01) | (0.04) | [-0.14, 0.24] | [-0.17, 0.00] |
| Literacy 1931 | 0.00 | -0.08 | 0.04 | -0.06 |
| | (0.01) | (0.03) | [-0.16, 0.21] | [-0.15,-0.01] |
| Development Expenditure 1912 | 0.02 | -1.44 | -0.01 | -1.59 |
| | (0.15) | (0.76) | [-0.18, 0.15] | [-4.13,-0.05] |
| Infant mortality 1909 | 0.00 | 0.05 | 0.08 | 0.03 |
| | (0.00) | (0.02) | [-0.04, 0.19] | [0.01, 0.07] |
| Aqueduct 1909 | 0.01 | -0.12 | -0.03 | -0.17 |
| | (0.02) | (0.12) | [-0.21, 0.13] | [-0.45, 0.00] |
| HHI 1909 | 0.03 | 0.30 | 0.07 | 0.22 |
| | (0.01) | (0.11) | [-0.09, 0.24] | [0.06, 0.47] |
| Literacy 1961 | 0.00 | -0.04 | 0.05 | -0.03 |
| | (0.00) | (0.02) | [-0.15, 0.22] | [-0.07, 0.00] |
| Literacy 1971 | 0.00 | -0.03 | 0.02 | -0.02 |
| | (0.00) | (0.01) | [-0.16, 0.19] | [-0.07, 0.00] |
| Literacy 1981 | 0.00 | -0.01 | -0.01 | -0.01 |
| | (0.00) | (0.01) | [-0.19, 0.15] | [-0.04, 0.00] |
| High school 1961 | 0.00 | -0.01 | 0.02 | -0.01 |
| | (0.00) | (0.00) | [-0.17, 0.19] | [-0.02, 0.00] |
| High school 1971 | 0.00 | -0.02 | 0.05 | -0.01 |
| | (0.00) | (0.01) | [-0.14, 0.23] | [-0.03, 0.00] |
| High school 1981 | 0.00 | -0.02 | -0.03 | -0.02 |
| | (0.00) | (0.01) | [-0.20, 0.14] | [-0.05, 0.00] |
| Aqueduct coverage 1961 | 0.00 | -0.18 | 0.01 | -0.15 |
| | (0.02) | (0.07) | [-0.17, 0.18] | [-0.40, 0.00] |
| Aqueduct coverage 1971 | 0.01 | -0.07 | -0.04 | -0.09 |
| | (0.01) | (0.04) | [-0.21, 0.12] | [-0.23, 0.00] |
| Aqueduct coverage 1981 | 0.01 | -0.09 | 0.00 | -0.09 |
| | (0.01) | (0.05) | [-0.18, 0.17] | [-0.24, 0.01] |
| Infant mortality 1969-70 | 0.00 | 0.00 | 0.11 | 0.01 |
| | (0.00) | (0.01) | [-0.04, 0.26] | [0.00, 0.04] |
| Infant mortality 1982 | 0.00 | 0.00 | 0.16 | 0.01 |
| | (0.00) | (0.01) | [0.03, 0.30] | [0.00, 0.04] |
| Development Expenditure 1957 | 0.04 | -0.05 | -0.11 | -0.70 |
| | (0.08) | (0.30) | [-0.26, 0.03] | [-1.88, 0.02] |
| HHI 1963 | 0.01 | 0.09 | -0.07 | 0.06 |
| | (0.00) | (0.04) | [-0.25, 0.13] | [0.01, 0.14] |
| HHI 1972 | 0.00 | 0.06 | -0.01 | 0.06 |
| | (0.00) | (0.03) | [-0.18, 0.18] | [0.01, 0.14] |
| HHI 1983 | 0.01 | 0.05 | 0.01 | 0.06 |
| | (0.00) | (0.02) | [-0.15, 0.19] | [0.01, 0.13] |

*Notes*: This table reports the fully Bayesian estimates from DiTraglia and García-Jimeno (2016). The first two columns report our OLS and IV estimates from the specification including all of our controls. For all specifications, we assume that the signal-to-noise ratio in the regressor is in the range $\kappa \in (0.5, 1]$, while the correlation coefficient between the error term in the second-stage equation in the regressor, $\rho_{T^*u}$ is in the interval $[0.1, 0.9]$ or $[-0.1, -0.9]$ depending on whether the outcome in question is negatively or positively correlated with economic development. The third column reports the estimate of the correlation between the error term in the second-stage equation and the endogenous regressor, $\hat{\rho}_{ux}$, while the fourth column gives the Bayesian estimate for our coefficient of interest, $\hat{\beta}$. See text and DiTraglia and García-Jimeno (2016)) for details.

Table A10: Reduced Form with Relative Rainfall 1893

| Coefficient of Relative Rainfall 1893 | (1) | (2) | (3) |
|---|---|---|---|
| Dependent variables: | | | |
| Literacy 1911 | 0.05 | 0.05 | 0.10 |
| | (0.04) | (0.04) | (0.05) |
| Literacy 1921 | 0.08 | 0.08 | 0.11 |
| | (0.04) | (0.05) | (0.06) |
| Literacy 1931 | 0.06 | 0.06 | 0.09 |
| | (0.03) | (0.03) | (0.03) |
| Literacy 1961 | 0.03 | 0.03 | 0.04 |
| | (0.02) | (0.02) | (0.03) |
| Literacy 1971 | 0.02 | 0.02 | 0.03 |
| | (0.01) | (0.01) | (0.02) |
| Literacy 1981 | 0.01 | 0.01 | 0.01 |
| | (0.01) | (0.01) | (0.01) |
| High school 1961 | 0.01 | 0.02 | 0.01 |
| | (0.01) | (0.01) | (0.01) |
| High school 1971 | 0.02 | 0.03 | 0.02 |
| | (0.01) | (0.01) | (0.01) |
| High school 1981 | 0.03 | 0.03 | 0.02 |
| | (0.02) | (0.02) | (0.02) |
| Development Expenditure 1912 | 2.00 | 2.05 | 1.64 |
| | (0.97) | (0.92) | (0.98) |
| Development Expenditure 1957 | 0.48 | 0.52 | 0.05 |
| | (0.32) | (0.32) | (0.37) |
| Infant mortality 1909 | -0.04 | -0.04 | -0.06 |
| | (0.02) | (0.02) | (0.03) |
| Infant mortality 1969-70 | 0.00 | 0.00 | 0.00 |
| | (0.01) | (0.01) | (0.01) |
| Infant mortality 1982 | 0.00 | 0.00 | 0.00 |
| | (0.01) | (0.01) | (0.01) |
| Aqueduct 1909 | 0.05 | 0.05 | 0.14 |
| | (0.07) | (0.04) | (0.14) |
| Aqueduct coverage 1961 | 0.11 | 0.13 | 0.20 |
| | (0.08) | (0.08) | (0.11) |
| Aqueduct coverage 1971 | 0.11 | 0.10 | 0.08 |
| | (0.06) | (0.06) | (0.05) |
| Aqueduct coverage 1981 | 0.12 | 0.12 | 0.10 |
| | (0.07) | (0.07) | (0.08) |
| HHI 1909 | -0.34 | -0.33 | -0.33 |
| | (0.15) | (0.14) | (0.13) |
| HHI 1963 | -0.08 | -0.08 | -0.10 |
| | (0.03) | (0.03) | (0.02) |
| HHI 1972 | -0.07 | -0.07 | -0.07 |
| | (0.03) | (0.03) | (0.03) |
| HHI 1983 | -0.07 | -0.07 | -0.06 |
| | (0.03) | (0.03) | (0.03) |
| Province FE | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ |
| Geographic controls | | | ✓ |

*Notes*: OLS estimates of the impact of relative rainfall in 1893 on medium- and long-term economic outcomes, state capacity, and politics. The dependent variables are listed on the left of the Table. We report only the coefficients of relative spring rainfall in 1893. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The specifications in column 1 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 2 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 3 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table A11: Falsification Exercise: Reduced Form with Relative Rainfall 1906

| Coefficient of Relative Rainfall 1906 | (1) | (2) | (3) |
|---|---|---|---|
| Dependent variables: | | | |
| Literacy 1911 | -0.11 | -0.10 | -0.10 |
| | (0.09) | (0.10) | (0.13) |
| Literacy 1921 | -0.06 | -0.05 | -0.10 |
| | (0.10) | (0.09) | (0.11) |
| Literacy 1931 | -0.09 | -0.08 | -0.08 |
| | (0.09) | (0.09) | (0.08) |
| Literacy 1961 | -0.01 | 0.00 | 0.00 |
| | (0.06) | (0.05) | (0.05) |
| Literacy 1971 | 0.01 | 0.01 | 0.02 |
| | (0.04) | (0.03) | (0.04) |
| Literacy 1981 | 0.02 | 0.02 | 0.03 |
| | (0.03) | (0.03) | (0.03) |
| High school 1961 | 0.00 | 0.00 | 0.00 |
| | (0.02) | (0.01) | (0.02) |
| High school 1971 | -0.01 | -0.01 | -0.01 |
| | (0.03) | (0.02) | (0.03) |
| High school 1981 | 0.01 | 0.01 | 0.01 |
| | (0.04) | (0.03) | (0.04) |
| Development Expenditure 1912 | 1.66 | 1.16 | -2.13 |
| | (1.51) | (1.44) | (1.54) |
| Development Expenditure 1957 | 0.19 | 0.29 | 0.73 |
| | (0.79) | (0.84) | (1.00) |
| Infant mortality 1909 | 0.02 | 0.03 | 0.06 |
| | (0.03) | (0.04) | (0.06) |
| Infant mortality 1969-70 | -0.01 | -0.01 | 0.00 |
| | (0.01) | (0.01) | (0.02) |
| Infant mortality 1982 | 0.00 | 0.00 | 0.01 |
| | (0.01) | (0.02) | (0.03) |
| Aqueduct 1909 | -0.29 | -0.28 | 0.09 |
| | (0.30) | (0.29) | (0.22) |
| Aqueduct coverage 1961 | -0.10 | -0.14 | -0.15 |
| | (0.17) | (0.17) | (0.25) |
| Aqueduct coverage 1971 | 0.02 | 0.03 | -0.07 |
| | (0.10) | (0.09) | (0.13) |
| Aqueduct coverage 1981 | -0.12 | -0.12 | -0.22 |
| | (0.09) | (0.08) | (0.17) |
| HHI 1909 | 0.25 | 0.27 | 0.34 |
| | (0.22) | (0.21) | (0.21) |
| HHI 1963 | 0.14 | 0.15 | 0.21 |
| | (0.05) | (0.05) | (0.07) |
| HHI 1972 | 0.09 | 0.09 | 0.15 |
| | (0.06) | (0.06) | (0.09) |
| HHI 1983 | 0.00 | -0.01 | 0.01 |
| | (0.04) | (0.04) | (0.06) |
| Province FE | ✓ | ✓ | ✓ |
| Determinants of Fasci | ✓ | ✓ | ✓ |
| Determinants of Mafia | | ✓ | ✓ |
| Geographic controls | | | ✓ |

*Notes*: OLS estimates of the relationship between relative rainfall in 1906 and medium- and long-term economic outcomes, state capacity, and politics. The dependent variables are listed on the left of the Table. We report only the coefficient of relative spring rainfall in 1906. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. The specifications in column 1 include province dummies and other determinants of the presence of the Peasant Fasci (a dummy for the municipality being an agro-town, the levels of rural rents and urban rents in 1853, the share of total cultivated land, and the share of land devoted to grains). The specifications in column 2 also include various determinants of the presence of the Mafia (sulfur production in 1868-70, the share of land devoted to citrus groves, vineyards and olive trees, and a measure of the presence of the Mafia in 1885). Finally, in column 3 we include a range of geographic controls (log population in 1861, log area of the municipality, elevation of the town center, maximum altitude, average altitude, distance to Palermo, distance to the closest port, the access to a postal road, average temperature, average rainfall and variance of relative rainfall). We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.

Table A12: Falsification Exercise: Relative Rainfall 1882-1891 and Long-Term Outcomes

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Literacy 1961 | -0.02 | -0.02 | -0.02 | 0.04 | 0.03 | 0.02 | -0.04 | -0.02 | -0.04 | -0.01 |
| | (0.03) | (0.05) | (0.05) | (0.04) | (0.03) | (0.03) | (0.05) | (0.03) | (0.03) | (0.03) |
| Literacy 1971 | -0.01 | -0.01 | -0.01 | 0.04 | 0.03 | 0.01 | -0.03 | -0.03 | -0.02 | -0.01 |
| | (0.02) | (0.04) | (0.03) | (0.03) | (0.02) | (0.02) | (0.04) | (0.02) | (0.01) | (0.02) |
| Literacy 1981 | -0.02 | 0.00 | -0.02 | 0.02 | 0.01 | 0.00 | 0.04 | -0.01 | -0.01 | -0.01 |
| | (0.02) | (0.03) | (0.02) | (0.02) | (0.02) | (0.01) | (0.03) | (0.02) | (0.02) | (0.01) |
| High school 1961 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.00 | -0.01 | 0.00 | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| High school 1971 | -0.01 | 0.00 | 0.00 | 0.02 | 0.03 | 0.02 | 0.00 | -0.02 | 0.01 | 0.00 |
| | (0.01) | (0.02) | (0.02) | (0.02) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) |
| High school 1981 | -0.01 | 0.00 | 0.00 | 0.02 | 0.05 | 0.02 | -0.02 | -0.02 | -0.01 | -0.01 |
| | (0.02) | (0.03) | (0.03) | (0.03) | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) |
| Infant mortality 1969-70 | 0.00 | -0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.02) |
| Infant mortality 1982 | -0.02 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | -0.01 | -0.01 | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Aqueduct coverage 1961 | 0.10 | -0.12 | 0.05 | -0.01 | -0.09 | 0.07 | 0.23 | 0.03 | -0.05 | -0.01 |
| | (0.16) | (0.21) | (0.15) | (0.16) | (0.17) | (0.07) | (0.13) | (0.09) | (0.11) | (0.17) |
| Aqueduct coverage 1971 | -0.02 | 0.03 | 0.01 | 0.06 | -0.02 | 0.01 | 0.08 | -0.03 | -0.07 | -0.07 |
| | (0.06) | (0.07) | (0.08) | (0.08) | (0.06) | (0.06) | (0.07) | (0.06) | (0.05) | (0.08) |
| Aqueduct coverage 1981 | -0.07 | -0.01 | -0.04 | 0.01 | -0.04 | -0.01 | 0.06 | 0.013 | -0.12 | -0.10 |
| | (0.10) | (0.10) | (0.10) | (0.14) | (0.09) | (0.09) | (0.15) | (0.08) | (0.06) | (0.09) |
| Development Expenditure 1957 | -0.15 | -0.34 | 0.20 | 0.34 | -0.19 | -0.45 | -0.77 | 0.28 | -0.37 | -0.26 |
| | (0.56) | (0.61) | (0.65) | (0.67) | (0.43) | (0.36) | (0.64) | (0.47) | (0.41) | (0.66) |
| HHI 1963 | 0.04 | -0.01 | -0.01 | 0.02 | 0.01 | -0.02 | -0.07 | 0.02 | 0.02 | 0.00 |
| | (0.04) | (0.06) | (0.05) | (0.05) | (0.04) | (0.02) | (0.05) | (0.03) | (0.03) | (0.06) |
| HHI 1972 | 0.03 | -0.02 | 0.01 | 0.00 | -0.02 | 0.00 | -0.07 | -0.01 | 0.04 | -0.01 |
| | (0.04) | (0.06) | (0.05) | (0.05) | (0.04) | (0.03) | (0.05) | (0.03) | (0.03) | (0.05) |
| HHI 1983 | 0.00 | 0.02 | 0.0144 | 0.00 | -0.01 | -0.01 | -0.02 | 0.01 | 0.01 | -0.05 |
| | (0.02) | (0.06) | (0.03) | (0.05) | (0.04) | (0.03) | (0.05) | (0.0349) | (0.03) | (0.05) |
| Year | 1882 | 1883 | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 |
| Full set of controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

*Notes*: OLS estimates of the relationship between relative rainfall in the years between 1882 and 1891 and long-term economic outcomes, state capacity measures, and political competition. Relative rainfall is computed as the relative spring rainfall measured at weather station level and interpolated at municipality level using the inverse of the distances as weights with a cutoff of 30km. All the specifications in the present table include the full set of controls (Determinants of Fasci, Determinants of Mafia, and Geographic controls) and province fixed effects. We report bootstrapped standard errors allowing for two-way clustering conditional on the district in which the municipality is located and the closest weather station to the municipality.