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Organized crime and business subsidies: Where does the money go?

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ABSTRACT

Business support policies are widespread in advanced countries, to foster employment and productivity. This paper analyses the role of organized crime in the allocation of public subsidies to businesses. We assemble an innovative data set on the Italian mafia at municipality level and test whether mafia-ridden municipalities receive a disproportionally higher amount of funds. We exploit exogenous variation at municipality level to instrument mafia activity and show that the presence of organized crime positively affects the probability of obtaining funding and the amount of public funds. Organized crime is also found to lead to episodes of corruption in the public administration sector. A series of robustness checks confirms the above findings.

1. Introduction

Business support policies are widespread in advanced countries, reflecting a general consensus about their ability to stimulate employment and productivity, especially in lagging areas. In 2012, the 27 EU countries spent €67bn on state aids (excluding those related to the financial crisis).[1] US state and local governments spend about $30–$40bn yearly on local development policies (Moretti, 2011). In recent years, such a huge amount of public funds has naturally been calling for rigorous counterfactual evaluations of these policies.

This paper proposes a complementary perspective: we study whether organized crime diverts public transfers to firms. This issue is particularly relevant because public subsidies to businesses are often framed within broader, place-based policies aimed at boosting economic activity in lagging areas and, at the same time, organized crime is more pervasive in underdeveloped regions. Additionally, by shedding light on the role of the quality of local governance in shaping the allocation of public aids, the issue we analyze is also high on the current policy agenda (Barca, 2009). Not surprisingly, the management of the EU cohesion policy 2014–2020 stresses the role of institutions and the quality of government in assigning funds.

We assemble an innovative dataset on crime at the municipality level in the Italian context. The Italian case is a relevant environment for this study for two reasons. First, the Italian mafia is an exemplar case and serves as a window into other types of criminal organizations that are embedded in the political and socio-economic spheres. Second, among developed countries, Italy is one of the countries most strongly affected by organized crime, as the mafia is diffusely present in at least 4 of the 20 Italian regions.

Mafia presence is measured using a unique and original data set made available by the Italian Ministry of the Interior, which provides detailed information on crime at municipality level during the period 2004–2009. In particular, we exploit the information provided by Article *416-bis* of the Italian Penal Code that regulates mafia-related crimes. We test the impact of the mafia in affecting the allocation of public subsidies to businesses, which are measured with the municipality-level funds granted through Law 488/92. This law has, for many years, been the main policy instrument used to reduce territorial disparities in Italy, by offering a subsidy to businesses willing to invest in poorer regions.

The law governing funding allocation had very detailed and specific criteria to assign funds, in order to reduce the risk of fraud

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[1] *Source:* European commission (http://ec.europa.eu/competition/state_aid/scoreboard/non_crisis_en.html).

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(Bronzini and de Blasio, 2006). Nonetheless, according to investigative reports (Direzione Investigativa Antimafia, various years; Guardia di Finanza; Financial Times, 2010), organized crime found its way to circumvent these provisions. Public transfers might have been diverted through a number of accounting and financial mechanisms, including the creation of fictitious firms, which existed only on paper and whose sole purpose was to apply for public funding. Moreover, organized crime was also involved in the corruption of, or threatening, public officials who had different responsibilities in the allocation of funds.

In order to give a causal interpretation of the relationship between organized crime and public funding, endogeneity must be taken into account. It may arise due to omitted variables, measurement error and reverse causality. In order to deal with it, we focus our analysis on Sicily and explore the origins of the Sicilian mafia. Gambetta (1993) defines the mafia as "*[...] an industry that produces, promotes and sells private protection*" (Gambetta, 1993: page 1). Historically, the need for private protection emerged in Sicily for two interconnected reasons. First, starting from 1812, a number of anti-feudal laws promoted the opening up of the market for land, thus leading to an increase in the number of landowners. Second, in the wake of the new Italian State, a lack of property rights protection together with a vacuum of power, increased landowners' need for protection against unlawful expropriation. As a consequence, the Sicilian mafia emerged as a land protection industry. Assuming that the supply of protection is elastic, we expect that, in equilibrium, mafia presence was more likely to emerge in areas where the value of land was higher. Therefore, we instrument current mafia activity with exogenous historical and geographical measures of land productivity. In particular, we use rainfall shocks in the 19th century and geographical features at the municipality level as a proxy for land value.

We provide evidence that the presence of the mafia positively affects the probability of receiving funding (extensive margin) and the amount of public transfers (intensive margin): according to our estimates, mafia presence increases the likelihood of obtaining funding by 64 percentage points and raises by more than one standard deviation the amount of subsidies to businesses. These findings are robust to alternative econometric specifications, different measures of the mafia, and various estimation methods. We also provide evidence in support of the external validity of our findings by investigating the impact of the mafia on the allocation of other forms of funding to businesses.

Having established our core results, we turn to the interpretation. First, we test whether the positive relationship between mafia presence and public transfers is due to a more generous attitude of the State towards mafia-ridden areas. We show that, if anything, these areas are underfunded in terms of expenditure on culture and education, relative to those where the mafia is absent. Second, we explore the mechanism through which the mafia can divert public resources. We present evidence of the link between the mafia and local entrepreneurship and show that organized crime increases the number of episodes of corruption in the public administration sector. Finally, we disentangle the effect of organized crime from a more general criminal environment. To the best of our knowledge, this is the first study to analyze the causal impact of the mafia on the allocation of public transfers. By grabbing public funds assigned to poorer areas, organized crime effectively undermines growth, investment and development. From this perspective, our findings are relevant for the long-standing debate on the desirability and the design of public aids to firms.

Our study is related to four strands of literature. First, it broadly relates to the growing literature on the impact evaluation of public transfers to firms, whose overall picture indicates mixed evidence regarding the effectiveness of these public aids (Busso et al., 2013; Bondonio and Greenbaum, 2006; Criscuolo et al., 2012; Bronzini and de Blasio, 2006; Bernini and Pellegrini, 2011).[2] Differently from these studies, we do not focus on the counterfactual evaluation of a particular policy intervention, but stress the role of organized crime as a key determinant of the spatial allocation of funds. In this respect, our paper complements the existing studies with an emphasis on the role of institutional quality and, hence, it is also near to those works that examined the mediating role of institutions for the effectiveness of cohesion expenditure in the EU (e.g. Rodriguez-Pose and Garcilazo, 2013).

Second, our paper contributes to the emerging literature analyzing the economic consequences of organized crime. A study by Pinotti (forthcoming) estimates that organized crime is responsible for a 16% loss in GDP per capita over a 30 year period. Our paper sheds light on one mechanism through which mafia negatively affects the economy.

Third, this paper is linked to the recent literature analyzing the effect of an increase in the availability of public funds on governance and the spread of organized crime. Brollo et al. (2013) study the impact of an increase in federal transfers in Brazil on political corruption and on the quality of candidates. They provide empirical evidence that larger transfers induce an increase in corruption, while also reducing the quality of political candidates. Gennaioli and Onorato (2010) evaluate the spread of organized crime caused by an increase in public funding that followed an earthquake affecting two regions in Central Italy in 1997. Both studies look at the impact of public transfers on the spread of (organized) crime. We view our analysis as complementary to these studies. The purpose of the present work is to analyze how established organized crime, such as the Italian mafia, can affect the allocation of public transfers.

Finally, as far as the instrumental variable strategy is concerned, this work is related to papers that study the historical origins of the Sicilian mafia. These papers follow the original view of Gambetta (1993), according to which the mafia emerged in the last part of the 19th century as an industry for private protection. Skaperdas (2001) formalizes this idea, while Bandiera (2003) empirically supports it by showing that the mafia was more likely to be active in towns where land was more divided; Buonanno et al. (forthcoming) document that areas characterized by sulfur availability were also more affected by the mafia, while Dimico et al. (2012) show that mafia presence is related to citrus production.

This paper is structured as follows. Section 2 describes the empirical model. Section 3 presents a brief history of the mafia and identifies its exogenous determinants, which will be used in the instrumental variable analysis. Section 4 describes the data, while Section 5 presents the results. Robustness of the results is explored in Section 6. Section 7 presents further interpretation of the results. Finally, Section 8 concludes.

2. The empirical model

In this section, we outline the empirical framework and discuss the identification strategy that we adopt. First, we estimate two simple models (Probit and OLS) of the relationship between public funds (extensive and intensive margin) and mafia presence. The two econometric specifications read as follows:

$$Pr(Public\ funds\ dummy_i = 1) = \Phi(\alpha_1 + \alpha_2 mafia_i + \boldsymbol{X_i'\beta}) \quad (1)$$

$$Amount\ Public\ funds_i = \gamma_1 + \gamma_2 mafia_i + \boldsymbol{X_i'\beta} + v_i \quad (2)$$

[2] In particular, Bronzini and de Blasio (2006) and Bernini and Pellegrini (2011) evaluate the same policy intervention we study in this paper.

where the variable *Public funds dummy*$_i$ takes the value 1 if at least one firm received public funds in municipality i during the period 2004–2009. The variable *Amount Public funds*$_i$ measures the total amount of public funds per employee assigned to firms located in municipality i over the same period. The indicator variable *mafia*$_i$ takes the value 1 if municipality i experienced at least one mafia-related crime in the same period and 0 otherwise. $\boldsymbol{X_i}$ is the vector of controls that accounts for heterogeneity across municipalities. Specifically, we control for the degree of economic development, measured by employment rate at municipality level; sector composition, evaluated by the industry share; entrepreneurship, calculated as the share of self-employment over total employment; population density; human capital, measured by the ratio of high school and college graduates to the total population aged above 6 years; and social capital, measured by the share of employees in the non-profit sector.

The relation between organized crime and public funding may be endogenous on three grounds. First, the identification of the impact of the mafia on public transfers may suffer from reverse causality: public funds may feed into the expansion of organized crime (Gennaioli and Onorato, 2010). This should lead to an upward bias. Second, our measure of mafia presence may suffer from measurement error. The dummy variable *mafia* is constructed using reports of mafia activity to the Police. As pointed out by Pinotti (forthcoming), underreporting is likely to be greater in municipalities with mafia presence, due to *omertà* or fear of the mafia's retaliation. Third, the econometric specification may suffer from omitted variables: this is potentially very relevant with cross-sectional data, as in our case. Overall, the direction of the bias related to the latter two sources of endogeneity is undetermined. In order to overcome these three issues, we adopt an instrumental variable approach and, in search of valid instruments, we revert to the origins of the mafia.

3. In search of valid instruments: a brief history of the Sicilian mafia

According to a rather consolidated view, the Sicilian mafia emerged in the second half of the 19th century during the transition from the Borbone dynasty to unified Italy (1861). In his 1993 book, Gambetta defines the mafia as "*[...] an industry that produces, promotes and sells private protection*" (Gambetta, 1993: page 1). Following Gambetta's view, we suggest that the demand for private protection arose from a critical historical juncture that was characterized by three main features. First, the end of feudalism contributed to the increase in the demand for private protection. Starting from 1812, the market for land was opened up, and a number of anti-feudal laws promoted the increase in the number of landowners. Between 1812 and 1861 (the year of Italian unification), the number of landowners increased from 2000 to 20,000 (Gambetta, 1993). This number probably increased even more rapidly in subsequent years because of the sale of parts of land and tenements belonging to the Vatican State (*Liquidazione dell'Asse Ecclesiastico*). Given the absence of settlements in the countryside and the lack of property rights legislation, protection was needed to defend the newly acquired plots. Second, in the wake of the new Italian State, a vacuum of power allowed for the emergence of the mafia as a land protection industry. Therefore, armed guards who had provided protection to large landowners (*latifondisti*) could expand their activities, by also providing their services to small landowners. As early as 1875, the issue of mafia presence was acknowledged by the newborn Italian Parliament, which mandated the Damiani-Jacini Inquiry. According to the latter, "*[...] where wages are low and peasant life is less comfortable, [...], there are no symptoms of mafia [...]. By contrast, [...] where property is divided, where there is plenty of work for everyone, and the orange trees enrich landowners and growers alike – these are the typical sites of mafia influence*" (Gambetta, 1993: page 86). Finally, both factors were boosted by an endemic distrust. This lack of trust can be considered as a legacy of the Spanish domination, characterized by a *divide et impera* (divide and rule) strategy. Under the Spanish dominion, commerce and the accumulation of wealth were dampened, superstition was encouraged, and a society based on a strict hierarchy was promoted, while public trust was replaced by private trust (Gambetta, 2000). Already in 1814, Alexis de Tocqueville, during his journey to Sicily, remarks on the lack of trust among the Sicilian community (Gambetta, 2000).[3]

In this context, the value of land appears to be one of the main determinants of the demand for protection. Assuming that the supply of protection is elastic, we expect that, in equilibrium, the mafia emerged in areas where the value of land was higher. Therefore, our set of instruments for current mafia activity includes geographical shifters of land productivity, namely slope, altitude, and rainfall shocks in 19th century, measured as the ratio of average annual rainfall in 1851–1860 (i.e. before the Italian Unification) to the long-run average annual precipitation over the period 1800–1850.[4] All of these variables are relevant determinants of land value, especially before agricultural mechanization. We expect rainfall shocks to have a positive impact on mafia presence. On the other hand, we anticipate that altitude and slope should exert a negative effect on the value of land and therefore a negative impact on mafia presence today.

Besides offering statistical evidence about the exogeneity of our instruments in our overidentified model, we also argue that the value of land in the second half of the 19th century is unlikely to affect local current economic conditions because (*i*) even if the spatial distribution of rainfall is time-persistent, modern, mechanized agriculture is much less dependent on rainfall, and (*ii*) the current role of agriculture in the economy is very small: according to the Italian National Statistics Institute, the share of employment in agriculture was about 70% in 1861, while it equaled 3.8% in 2009 (Istat, 2011).

Moreover, the exogeneity of our instruments may not hold if instrumental variables shape public transfers through channels other than mafia activity that are not controlled for. This would invalidate the exclusion restriction assumption. We argue that by including the set of controls, $\boldsymbol{X_i}$, we take into account other possible transmission channels. For instance, Durante (2010) shows that variability in precipitation stimulates higher level of trust. Trust is not available at the municipality level, but we control for another well-respected measure of social capital, *i.e.* the share of employees in the non-profit sector. Dell (2012) shows that rainfall negatively affected insurgent activity in Mexican municipalities during the Mexican Revolution. These activities, in turn, generated a market-unfriendly land reform and undermined long-run economic development. In our context, these channels are accounted for as: (*i*) there has not been any difference in land reform intensity across Sicilian municipalities since the Italian unification (1861); (*ii*) we control for the degree of economic development by including employment rate, industry share and population density as additional covariates. Finally, rainfalls might also have long lasting effects on entrepreneurship, which, in turn, might affect the allocation of public funds. In order to control for this transmission channel, we control for a measure of entrepreneurship, evaluated

[3] In their seminal work on social capital, Putnam et al. (1993) support the view that different levels of social capital between Northern and Southern Italy are rooted in the historical heritage of the two areas. Guiso et al. (2008) provide extensive empirical evidence of the long lasting effect of social capital in Central and Northern Italy.

[4] Slope is computed as (maximum altitude − minimum altitude)/surface.

Table 1
Summary statistics.

Variable	Description and unit of measurement	Obs.	Mean	Median	S.D.	Min	Max
Amount Public Funds	('000s) Euros/# of employees	390	0.584	0.012	1.256	0	8.585
Public Funds – Dummy	Dummy variable	390	0.502	1	0.5	0	1
Mafia	Dummy variable	390	0.162	0	0.368	0	1
Number of mafia episodes	(# Mafia-related episodes/population >15 years old) $*$ 1,000,000	390	3.388	0	11.357	0	125.929
Density_2001	('000s) persons/km^2 in 2001	390	0.327	0.096	0.618	0.004	5.526
Employment Rate	# employed/labor force in 2001	390	0.306	0.305	0.047	0.166	0.434
Industry share	# employees in industry/total # employees in 2001	390	0.128	0.105	0.09	0	0.654
Social capital	# of employees in the non-profit sector/total # employees in 2001	389	0.024	0.016	0.03	0	0.291
Entrepreneurship	# of self-employed/total employment in 2001	390	0.235	0.233	0.048	0.088	0.377
Human Capital	# high school and college graduates/total population >6 years-old in 2001	390	0.251	0.242	0.064	0.109	0.547
Rainfall	(Mean Rainfall mm 1851–1860)/(Mean Rainfall mm 1800–1850)	390	0.992	0.99	0.0145	0.973	1.037
Slope	('000s) meters/km^2	390	28.791	18.716	32.926	0.776	371.053
Altitude	('000s) meters	390	0.391	0.395	0.277	0.001	1.275

as the share of self-employment over total employment at municipality level.[5]

4. Data

4.1. Measuring the mafia

The first source of data is an innovative and confidential data set made available by the Italian Ministry of the Interior (*Ministero degli Interni*), which provides detailed data on crimes and relevant investigative information at municipality level, by article of the Italian Penal Code (*Codice penale*). The dummy variable *mafia* takes the value 1 if a mafia-related crime, defined by the article *416-bis* of the Penal Code, was reported over the period 2004–2009.[6] Article *416-bis* defines an association as being of a mafia-type nature "*when participants use the power of intimidation of their association and of the resulting conditions of submission and silence to commit criminal offences, or to manage or control, directly or indirectly, economic activities and concessions*".[7] We augment this information with official data from the Ministry of the Interior on whether the municipality council was dissolved due to mafia infiltration. About 16% of the municipalities in Sicily experienced at least one episode of association with the mafia between 2004 and 2009.

This measure of mafia-related crimes provides more flexibility than other, more specific measures of mafia-crime and encompasses violent crimes, such as extortion, drug-dealing and murder, together with a much wider mafia association. According to the Financial Times (2010), "*a new mafia-related bourgeoisie, made of lawyers, notaries, accountants and entrepreneurs, is the connection between criminal organizations and the economic and political reality*". Article *416-bis* allows us to capture exactly this intersection between the mafia and the socio-economic life of Sicilian municipalities.

4.2. Public transfers

As a measure of public transfers to businesses, we employ the Law 488/92 data set, confidentially made available by the Italian Ministry of Industry, which regulates the issuance of project-related capital grants. The funds granted through Law 488/92 have been used as one of the main policy instruments for reducing territorial disparities in Italy, by offering a subsidy to firms willing to invest in poorer areas. Law 488/92 granted more than €1.8 billion over the period 2000–2007, about 24% of total national public transfers (Ministero dello Sviluppo Economico, 2008). Funds are assigned on the basis of five criteria: the percentage of own funds; the number of jobs that the investment project generates (in proportion to the total investment); the proportion of the value of the aid to the maximum applicable grant; a score related to the local (regional level) priorities with respect to location, project type and sector; and an environmental impact score (Bronzini and de Blasio, 2006).

The data set contains micro data on each funding application. We aggregate the amount of funds assigned to businesses located in each municipality during the period 2004–2009 according to Law 488/92. In order to take into account the size of the local economy, we normalize the total amount of funds by the total number of employees in each municipality. Table 1 reports the summary statistics. The mean amount of public funds across the 390 municipalities is €584 per employee, and about 50% of municipalities did not receive any funding over the period considered.

4.3. Covariates and Instrumental variables

The upper panel of Table 1 also reports basic features at municipality level, such as the employment rate, population density, a measure of social capital and the industry share. The employment rate and population density are measured according to the 2001 Italian Census by Istat, while the industry share, the measure of social capital and the employment rate at municipality level are taken from the 2001 Census of Italian firms conducted by Istat.

The mean employment rate across the 390 municipalities is around 30%. We measure social capital as the percentage of employees in the non-profit sector over the total number of employees in 2001. Entrepreneurship is evaluated as the share of self-employment over total employment in 2001, while human capital is measured by the ratio of high school and college graduates to the total population aged above 6 years according to the 2001 Census.

Data on rainfall in the 19th century are taken from the European Seasonal Temperature and Precipitation Reconstruction database. Rainfall data are reconstructed on the basis of paleoclimate proxies, such as tree ring chronologies, ice cores, corals, a speleothem and documental evidence (Pauling et al., 2006). Data on seasonal precipitation are available for Europe for the period 1500–1900 at a $0.5^\circ \times 0.5^\circ$ grid resolution. Each Sicilian municipality is mapped into a cell by minimizing the distance between the capital city of the municipality and the center of the cell. We map the 390 Sicilian municipalities into 25 different cells. The

[5] The economic literature following Miguel et al. (2004) has shown the relationship between rainfall and a number of persistent country level characteristics in a cross-country setting. Given the set of controls and our very fine geographical breakdown, we claim that any persistent effect of rainfall, other than the mafia, is controlled for.

[6] We also conduct the analysis using the actual number of mafia-related episodes per capita according to Article 416-bis.

[7] *Source:* http://www.europarl.europa.eu/document/activities/cont/201210/20121015ATT53636/20121015ATT53636EN.pdf.

Table 2
Balancing properties.

	Mafia = 1 (1)	*Mafia* = 0 (2)	Difference (1) − (2)
Employment rate	0.297	0.307	−0.010
Industry share	0.132	0.127	0.005
Pop. Density	0.465	0.300	0.165*
Pop. Density (excluding Palermo)	0.401	0.300	0.104
Social capital	0.026	0.023	0.003
Human capital	0.259	0.250	0.009
Entrepreneurship	0.242	0.234	0.008

* Significant at 10%.

lower panel of Table 1 presents the summary statistics for the rainfall variable, the slope, and the altitude of the municipalities' capitals according to Istat.

4.4. Balance test

Are municipalities with mafia presence different from municipalities where organized crime is absent? If so, it might be difficult to disentangle the effect of the mafia dummy from the effect of other local characteristics, even in an instrumental variable setting. Table 2 presents the results of a balance test of the covariates.

We split the municipalities into those that experienced mafia-related crimes over the period 2004–2009 and those that did not. The two groups of municipalities do not appear to be statistically different in terms of employment rate, industry share, social capital and entrepreneurship. Population density is greater in mafia-related municipalities, although the difference becomes statistically insignificant once we exclude Palermo, the Sicilian capital.

5. Empirical results

5.1. Probit and OLS results

First, we investigate the impact of mafia presence on public funds using simple Probit and OLS estimation. The first three columns of Table 3 present the marginal effects of the Probit estimation outlined in Eq. (1). Municipalities with a mafia presence are more likely to obtain funding for businesses than municipalities in which the mafia is absent. The results are also consistent when we include employment rate and industry share (column 2) and we control for social capital, population density and entrepreneurship (column 3). Overall, municipalities with a mafia presence are between 27% and 31% more likely to receive funding for businesses.

Columns 4–6 present the OLS results for the intensive margin (Eq. (2)), i.e. the amount of funds per employee received by each municipality over the period 2004–2009 (Eq. (2)). The indicator variable *mafia* is never statistically significant, and the estimation results are not affected when we control for a number of other variables (columns 5 and 6).

5.2. Exploring the first stage

As discussed in Section 2, the analysis presented in the previous subsection may suffer from endogeneity on three grounds: measurement error, reverse causality and omitted variables. To this end, we instrument the variable *mafia*. The excluded instruments are rainfall deviation from the long run mean in the period preceding Italian Unification (1850–1861), altitude and slope. Before proceeding with the instrumental variable estimation, we explore the relationship between the indicator variable *mafia* and the excluded instruments. Column 1 of Table 4 presents the relationship between the mafia and the rainfall shock variable by itself.[8] Consistent with our prior, deviations from the long run rainfall level have a positive and statistically significant impact on mafia presence today.

Column 2 explores the role of the two geographical variables, slope and altitude, in explaining the *mafia* variable.[9] As expected, both variables have a negative impact on the mafia. The next column shows the joint impact of the three excluded instruments on the presence of the mafia today. The three variables are statistically significant, even when jointly introduced. Column 4 presents the impact of the three excluded variables on a different measure of the mafia, i.e. mafia presence in the 19th century on the basis of the data of the Damiani-Jacini enquiry, a Parliamentary enquiry, which was concluded in 1882. Although the sample size drops quite considerably, the three regressors roughly maintain their explicative power in explaining mafia presence in the 19th century. Deviation from the long run rainfall average has a positive and statistically significant impact on the mafia in the 19th century, slope and altitude keep the same negative sign, but are not statistically significant.

The next column replicates the same exercise, with current mafia presence as the dependent variable, but restricting the sample to the one presented in column 4. The results are consistent with those presented in column 3. Finally, column 6 presents a falsification test on the rainfall variable as an instrument. We replace rainfall deviation in the 19th century with rainfall deviation in the 20th century (*Rainfall 1951–1960*).[10] According to our prior, the mafia emerged in the 19th century where the value of land was greater. Therefore, we expect rainfall shocks in the 19th century to be a good predictor of (current) mafia presence. On the other hand, we would not expect rainfall shocks in the 20th century to influence current mafia presence. This prior is indeed confirmed by the estimation results reported in column 6: the rainfall shock in 1951–1960 does not have a statistically significant impact on current mafia presence.

5.3. Instrumental variable analysis

Having explored the link between the indicator variable *mafia* and the exogenous instruments, we now turn to the instrumental variable analysis. Table 5 presents the estimation results for the instrumental variable analysis. Standard errors are clustered at rainfall cell level.[11] Columns 1–3 of Table 5 report the marginal effects of the probit specification for the probability of obtaining funding. The lower panel of Table 5 presents the first stage: the excluded instruments are statistically significant and the test of overidentifying restrictions does not cast doubt on the validity of the instruments. The estimated impact of the excluded instruments on *mafia* is consistent with our prior. The mafia has a positive and statistically significant impact on the probability of obtaining public transfers. These results also hold when we control for additional regressors, such as employment rate and industry share (columns 2 and 3), population density, social capital (measured by the percentage of employees in the non-profit sector), human capital, and entrepreneurship at municipality level (column 3). Hence, IV estimates indicate a large, upward revision of about 30 percentage points. The magnitude of the effect is also economically very relevant: municipalities with mafia presence are between 62 and 64 percentage points more likely to obtain public transfers (equal to the

[8] The Online Appendix presents further evidence regarding the role of rainfall shocks in the 19th century on current mafia presence.

[9] We present further evidence on the validity of altitude as an instrument in the Online Appendix.

[10] The variable *Rainfall 1951–1960* is measured as the ratio of average annual rainfall in 1951–1960 to the long-run average annual precipitation over the period 1900–1950.

[11] Clustering standard errors at province level does not affect the results. The details are available upon request.

Table 3
Public funds and mafia.

	(1)	(2)	(3)	(4)	(5)	(6)
	Public Funds – Dummy			*Amount Public Funds per employee*		
Mafia	0.271***	0.314***	0.278***	−0.034	−0.0128	−0.00843
	(0.0624)	(0.0583)	(0.0617)	(0.150)	(0.150)	(0.152)
Employment		3.418***	2.227***		3.501***	3.000**
Rate		(0.621)	(0.722)		(1.269)	(1.483)
Industry share		1.363***	1.478***		2.711***	2.764***
		(0.356)	(0.356)		(0.884)	(0.893)
Population			0.128**			−0.191***
Density			(0.0643)			(0.0675)
Social Capital			1.612*			−1.700
			(0.879)			(1.621)
Entrepreneurship			0.945*			1.309
			(0.557)			(1.103)
Human Capital			1.707***			1.851**
			(0.558)			(0.811)
Estimation method	Probit	Probit	Probit	OLS	OLS	OLS
Observations	390	390	389	390	390	389
Log *p*. likel.	−262.279	−233.674	−219.596			
R^2				0.0001	0.0599	0.0732

Robust standard errors in parentheses.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 4
Exploring the first stage.

Variables	(1) *Mafia*	(2) *Mafia*	(3) *Mafia*	(4) *Mafia 19th century*	(5) *Mafia (reduced sample)*	(6) *Mafia*
Rainfall	6.001***		4.436***	6.977**	6.876***	
	(1.359)		(1.406)	(2.827)	(2.318)	
Slope		−0.00256***	−0.00225**	−0.00213	−0.00550***	−0.00252***
		(0.000712)	(0.000815)	(0.00132)	(0.00193)	(0.000688)
Altitude		−0.349***	−0.315***	−0.0578	−0.410***	−0.357***
		(0.0619)	(0.0512)	(0.0960)	(0.102)	(0.0677)
Rainfall 1951–1960						0.145
						(0.786)
Observations	390	390	390	153	153	390
R-squared	0.055	0.111	0.140	0.089	0.211	0.112

Standard errors are clustered at rainfall cell level.
*Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

half of the standard deviation of the dependent variable). For comparison, increasing by one standard deviation the employment rate (as a proxy for the degree of economic development) implies a rise of 11 percentage points in the outcome variable; the effect is smaller for the industry share variable (7 percentage points).

The next three columns present the impact of the mafia on the amount of public funds obtained. The excluded instruments are jointly statistically significant, the *F*-test of the exclusion restriction is equal to 20.75 and the test of overidentifying restrictions does not reject the null hypothesis that the excluded instruments are valid. The mafia has a positive and statistically significant impact on the intensive margin as well and the results also hold when we control for the other covariates. Again, there is a large upward revision on the OLS estimates. The effect is economically relevant: it amounts to more than one standard deviation of the dependent variable. For comparison, a one standard deviation increase in the employment rate or in the industry share entails a 0.23 rise in the amount of funds per employee, lower than the coefficient of the mafia variable. We have undertaken some preliminary robustness checks by normalizing the amount of funds by the number of firms, with and without controlling for average firm size. The overall explicative power of these alternative specifications does not outperform the more parsimonious representation shown in Table 5. Moreover, using different time periods for the construction of the rainfall variable yields similar.[12]

Results in Tables 3 and 5 indicate a downward bias in the Probit/OLS estimates. It suggests that the main source of bias is the classical measurement error and/or the existence of an omitted variable, which is positively correlated with mafia and negatively correlated with the outcome variables such as the quality of institutions in so far as our measure of social capital (share of employees in the non-profit sector) does not fully capture it.

The same channel that makes rainfall shocks a relevant instrument, *i.e.* mafia persistence, also challenges the exclusion restriction. Indeed, the historical presence of the mafia may have discouraged firm creation. Thus, historical rainfall shocks, by affecting historical mafia presence, can be directly related to firm subsidies through channels other than today's mafia presence. We believe that these alternative channels are implausible, but

[12] Results are reported in the Online Appendix.

Table 5
Public funds and mafia – Instrumental variable analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
	Second stage					
Variables	*Public funds – Dummy*			*Amount Public funds per employee*		
Mafia	0.624***	0.642***	0.641***	1.510***	1.503***	1.665***
	(0.027)	(0.027)	(0.031)	(0.564)	(0.552)	(0.582)
Employment		2.706***	2.288***		4.482***	4.927***
Rate		(0.599)	(0.704)		(1.537)	(1.807)
Industry		0.847***	0.862***		2.535***	2.505***
Share		(0.292)	(0.279)		(0.881)	(0.915)
Population			0.009			−0.291***
Density			(0.021)			(0.0801)
Social			0.849			−2.117
Capital			(0.752)			(1.665)
Entrepreneurship			0.344			0.794
			(0.541)			(1.439)
Human			0.741			1.044
Capital			(0.463)			(0.831)
	First stage *Mafia*					
Rainfalls	3.573***	4.296***	4.798***	4.436***	4.325***	4.583***
	(1.348)	(1.132)	(0.995)	(1.406)	(1.480)	(1.482)
Slope	−0.002***	−0.003***	−0.003***	−0.002**	−0.002**	−0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Altitude	−0.347***	−0.291***	−0.219***	−0.315***	−0.325***	−0.283***
	(0.053)	(0.049)	(0.051)	(0.051)	(0.052)	(0.062)
Test overid. *p*-value	0.4409	0.4579	0.2401	0.3256	0.7306	0.5374
First stage *F*	–	–	–	20.75	21.34	24.34
Obs	390	390	389	390	390	389

Standard errors are clustered at rainfall cell level.
*Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

nonetheless we tackle this potential problem by adopting a 3SLS approach, in which current mafia presence is instrumented with mafia presence in the 19th century, as measured according to Damiani-Jacini data, and the latter is instrumented with rainfall shocks, slope and altitude. The econometric specification is the following:

$$Amount\ Public\ funds_i = \gamma_1 + \gamma_2 mafia_i + \mathbf{X}_i'\boldsymbol{\beta} + v_i$$

$$mafia_i = \beta_1 + \beta_2 mafia19_i^{th} + \mu_i$$

$$mafia19_i^{th} = \delta_1 + \delta_2 raifalls_i + \delta_3 slope_i + \delta_4 altitude_i + \varepsilon_i$$

The results of the 3SLS analysis are presented in columns 1–3 of Table 6 and confirm our main findings. Rainfall shocks have a positive and statistically significant impact on mafia presence in the 19th century. The estimated coefficients of altitude and slope are both negative and statistically significant. Turning to the second stage, mafia in the 19th century has a positive and statically significant impact on mafia presence today. Finally, *mafia* has a positive and statistically significant impact on public fund allocation, thus confirming our main results. The number of observations in this exercise drops to 153 municipalities, due to data availability on the mafia in the 19th century. In order to make the 3SLS analysis comparable to the 2SLS analysis (Table 5), we replicate the estimation of Eq. (2) to the available sample. The results are reported in column 4 and are fully consistent with our benchmark estimates.

6. Robustness checks

In this Section, we present a series of robustness checks. We depart from our baseline estimates (Table 5, columns 3 and 6) in a number of ways. We start by considering alternative econometric specifications. Then we use alternative measures of mafia. Next, we provide evidence that the results also hold when we take into account the potential issue of weak instruments.

6.1. Alternative econometric specifications and measures of mafia

Table 7 presents the robustness checks for the extensive margin, i.e. the probability of obtaining funding. Columns 1 and 2 report the estimated coefficients of a specification in which only rainfall or only the geographical variables (slope and altitude) are used as excluded instruments respectively. Our previous results are consistent with the inclusion of only a subset of instruments. Next, we report the estimated coefficients of an econometric specification which adds province fixed effects (9 provinces) to the specification presented in column 3 of Table 5. The impact of the mafia on the probability of obtaining public transfers is still statistically significant at the 1% level.

Column 4 presents the results of a specification in which we address the possibility that our findings are biased because of spatial correlation. If *mafia* is spatially correlated, we would expect crime spillovers across municipalities. Neglecting these spillovers would entail an omitted variable bias. In order to cope with this bias, we include the variable *mafia-neighbor*$_i$ that takes the value 1 if a mafia-related episode has been registered in any neighboring municipality.[13] The estimated coefficient of the mafia variable is positive and statistically significant at the 1% level, while the measure of spatial correlation does not appear to be statistically significant.

Columns 5 and 6 present two alternative measures of the mafia. First, we introduce a narrow definition of the *mafia* dummy

[13] Neighboring municipalities are defined on the basis of local labor markets. Local labor markets are defined on the basis of commuting distances according to the 2001 Istat Census. There are 77 local labor markets in Sicily.

Table 6
3SLS.

	(1)	(2)	(3)	(4)
	3SLS			2SLS
	Third Stage			
	Public funds – Amount			*Public funds – Amount*
Mafia	2.378***			1.854**
	(0.658)			(0.764)
Employment Rate	7.011**			4.925*
	(3.399)			(2.791)
Industry Share	0.805			0.893
	(1.605)			(1.686)
Pop. Density	−0.452*			−0.547***
	(0.273)			(0.211)
Social Capital	−3.003			−2.543
	(3.316)			(2.725)
Entrepreneurship	1.913			0.897
	(2.548)			(3.003)
Human Capital	0.486			0.0530
	(2.428)			(1.521)
		Second stage *Mafia*		
Mafia 19th century		1.280***		
		(0.228)		
			First stage *Mafia 19th century*	
Rainfalls			5.958***	
			(1.757)	
Slope			−0.003**	
			(0.001)	
Altitude			−0.244***	
			(0.076)	
Observations	153	153	153	153

Standard errors are clustered at rainfall cell level.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

variable. The new dummy variable, *mafia_narrow*, takes the value 1 if a municipality experienced a mafia-type crime, as defined by the Article *416-bis* of the Penal Code, over the period 2004–2009; and zero otherwise.[14] Second, we replace the mafia indicator variable with the actual number of mafia-related episodes per capita according to Article *416-bis*.[15]

Consistent with the previous results, the estimated coefficient on *mafia-narrow* in column 5 of Table 7 is statistically significant at the 1% level. Not just the presence of the mafia, but also the number of mafia episodes, significantly affects the probability of obtaining public funds.

Table 8 presents the same robustness checks for the intensive margin, i.e. the amount of public transfers. The estimated coefficient on *mafia* is not statistically significant when only rainfall shocks are used as an excluded instrument (column 1), while it becomes positive and statistically significant when slope and altitude are introduced as excluded instruments (column 2). Column 3 of Table 8 presents the results for an econometric specification in which we control for province fixed effects. The estimated coefficient of the mafia indicator is positive and statistically significant at the 1% level. Although the instruments are slightly weaker in this specification, they are still valid, as reported by the *p*-value of the test of overidentifying restrictions. We will address the potential issue of weak instruments in the next section.

The results are also consistent when we introduce the spillover effects from neighboring municipalities (column 4) and the two alternative measures of the mafia (columns 5 and 6). The results of the robustness checks confirm the effect of the mafia, not just on the probability of obtaining funding, but also on the amount that is allocated.

6.2. Coping with weak instruments

In this Section we deal with the issue of weak instruments in the intensive margin results. Although the *F*-test of the exclusion restriction is always large in the main specification (Table 5), in the robustness checks reported in Table 8, Columns 3 and 6, the first stage *F*-statistic signals a potential weak instrument issue. Hence, we present further analysis to prove the robustness of our results. When instruments are weak, two major problems arise. First, 2SLS estimated standard errors are small and the width of confidence intervals is narrow. As a result, hypothesis testing based on 2SLS estimates is misleading. Second, the 2SLS estimator is consistent, but biased in finite samples (Murray, 2006).

The first column of Table 9 deals with the issue of narrow confidence intervals and follows the conditional likelihood ratio approach developed by Moreira (2003). Moreira's conditional likelihood ratio test adjusts the critical values for hypothesis testing on the basis of the sample employed and constructs the confidence intervals. The bounds of our confidence intervals (CLRT and Anderson Rubin) presented in column 1 are both positive, thus supporting our previous results.

The second exercise required to deal with weak instruments entails taking care of the biased estimates. The limited information maximum likelihood estimator is a k-class estimator, which provides an unbiased median. Column 2 presents the results of the limited information maximum likelihood estimation for a Fuller value equal to 2.[16] The results confirm the positive impact of the mafia on public funds.

Against these benchmark estimates, we now consider the specification that includes province fixed effects. The new confidence intervals corrected according to Moreira (2003) have a positive lower bound (column 3) and an LIML estimate which is positive and statistically significant at the 5% (column 4).

Finally, we replicate the exercise to include the two alternative measures of the mafia, i.e. the narrow definition and the number of mafia episodes per capita. Columns 5–6 confirm the previous findings: *mafia* has a positive and statistically significant impact on the amount of public transfers to businesses, even when we correct for weak instruments.

6.3. Concurrent sources of public funds

Law 488/92 was one of the main programs to stimulate investment in disadvantaged areas in Italy. There were other location-based policies at the time, such as the Planning Contracts (Contratti di Programma), the Territorial Pacts (Patti Territoriali), the Area Contracts (Contratti d'Area) and investment incentives according to Law 388/2000. These policies differ in the way funding was distributed, as they might require agreements between firms and the central government (Planning Contracts); they might be mainly designed for private and public investments (Territorial Pacts); they might involve multiple partners, such as central and local authorities, trade unions, and entrepreneurial associations (Area Contracts); or they could come in the form of a tax credit (Law

[14] About 13.9% of municipalities experienced a mafia-type episode, as defined by the variable *mafia_narrow*, in the period 2004–2009.
[15] On average, the yearly number of mafia-related episodes per capita is 0.003 per municipality over the 2004–2009 period.
[16] Results hold for different values of the Fuller parameter.

Table 7
Robustness checks – Extensive margin.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
			Public funds – dummy			
Mafia	0.639***	0.637***	0.655***	0.643***		
	(0.038)	(0.034)	(0.036)	(0.028)		
Mafia – Neighbor				−0.042		
				(0.051)		
Mafia – Narrow					0.641***	
					(0.024)	
Number of mafia episodes						0.035***
						(0.006)
Excluded Instruments	Rainfall	Altitude Slope	All	All	All	All
Test overid *p*-value	–	0.1104	0.0045	0.2434	0.3984	0.2080
Province FE	No	No	Yes	No	No	No
Obs	389	389	389	389	389	389

All regressions include population density, employment rate, social capital, entrepreneurship, human capital and industry share. Instrumented variable, columns 1–4: mafia. Instrumented variable, column 5: mafia narrow. Instrumented variable, column 6: number of mafia episodes per capita. Standard errors are clustered at rainfall cell level.
*Significant at 10%.
**Significant at 5%.
*** Significant at 1%.

Table 8
Robustness checks – Intensive margin.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
			Public funds – Amount			
Mafia	2.139	1.487***	1.372***	1.645***		
	(1.408)	(0.395)	(0.510)	(0.572)		
Mafia – Neighbor				0.019		
				(0.149)		
Mafia – Narrow					2.054***	
					(0.672)	
Number of mafia episodes						0.114***
						(0.040)
Excluded Instruments	Rainfall	Altitude Slope	All	All	All	All
Overid *p*	–	0.2675	0.3932	0.5369	0.4849	0.7853
F	24.439	21.188	8.096	28.917	29.765	9.423
Province FE	No	No	Yes	No	No	No
Obs	389	389	389	389	389	389

All regressions include population density, employment rate, social capital, human capital, entrepreneurship and industry share. Instrumented variable, columns 1–4: mafia. Instrumented variable, column 5: mafia narrow. Instrumented variable, column 6: number of mafia episodes per capita.
Standard errors are clustered at rainfall cell level.
*Significant at 10%.
**Significant at 5%.
*** Significant at 1%.

Table 9
Coping with weak instruments – Intensive margin.

	(1) CLRT	(2) Fuller	(3) CLRT	(4) Fuller	(5) CLRT	(6) Fuller
			Public Funds – Amount			
Mafia	1.665***	1.677***	1.372*	1.655***		
	(0.543)	(0.586)	(0.700)	(0.630)		
Number of mafia episodes					0.114**	0.102***
					(0.047)	(0.036)
Confidence set:						
Conditional LR	[0.744, 3.094]		[0.342, 4.094]		[0.048, 0.350]	
Anderson–Rubin	[0.578, 3.408]		[1.000, 2.817]		[0.032, 0.653]	
Province FE	No	No	Yes	Yes	No	No
Observations	389	389	389	389	389	389

All regressions include population density, employment rate, social capital, human capital, entrepreneurship and industry share. Instrumented variable, columns 1–4: mafia. Instrumented variable, columns 5–6: mafia narrow. Instrumented variable, columns 7–8: number of mafia episodes. Excluded instruments: Rainfall, slope and altitude.
Standard errors clustered at rainfall cell level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 10
Concurrent programs.

	Law 488/92	Territorial Pacts	Law 388	Area Contracts
Law 488/92	1.0000			
Territorial Pacts	0.0014	1.0000		
Law 388	0.0512	0.0216	1.0000	
Area Contracts	0.1088	0.1561	0.0849	1.0000

Table 11
Controlling for concurrent programs.

Variables	(1) *Public funds – dummy*	(2) *Public funds – Amount*
Mafia	0.641***	1.747***
	(0.031)	(0.594)
State aids – dummy	0.001	−0.226
	(0.010)	(0.228)
Test overid	0.2400	0.5717
Observations	389	389

All regressions include population density, employment rate, social capital, entrepreneurship, human capital and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall, slope and altitude.

388/2000).[17] Given the presence of concurrent programs, our dependent variable might capture only a part of the amount of subsidies received by a municipality. Not including these concurrent state aids might affect parameter estimates, especially if concurrent programs are negatively correlated with Law 488/92. Table 10 presents a correlation matrix among the indicator variables for each of the state aids, net of the effects of the exogenous regressors, capturing the different sources of funds available at municipality level.[18] The correlation coefficient between Law 488/92 and each of the other sources of funds is very close to zero and positive, but never negative. Indeed, according to Andini and de Blasio (2013), there is often an overlap of these programs, as municipalities are often exposed to more than one source of funding.

In order to control for this potential source of bias, we construct a dummy variable, *state aids*, which takes the value 1 if municipality *i* received at least one of these state aids over the period considered. We augment our baseline 2SLS specification by including this dummy variable. The results are reported in Table 11. They confirm our main findings, i.e. the variable *mafia* has a positive and statistically significant impact on the allocation of Law 488/92 funds, even when controlling for these other sources of funding.

The exercise conducted in Table 11 should be reassuring in showing that our main results hold, even when controlling for other sources of funding, and that measuring the intensity of public support received by each municipality through Law 488/92 data would not be misleading.

How generalizable are our results? Does mafia activity affect the allocation of state aids in general, or are our findings specific to Law 488/92? In order to address these questions, we re-run the analysis using the information on the total public support received by firms in each Sicilian municipality. Due to data availability, we can only analyze the extensive margin, *i.e.* we can only investigate the effect of mafia presence on the probability of receiving at least one of these public funds (Law 488/92. Territorial Pacts, Law 388, Area Contracts).[19] Table 12 presents the results for this exercise. We construct an indicator variable, *all public funds*, which takes the value 1 if municipality *i* receives at least one of these state aids. In the first column we present the results of the linear probability model, while in the second column we report the 2SLS estimates.[20] The mafia has a positive and statistically significant impact on the probability of receiving at least one of these public funds. This result qualitatively holds also when we use the variable state aids as the dependent variable, i.e. when we analyze the impact of the mafia on the probability of receiving at least one of the concurrent programs (columns 3–4). We may conclude that the mafia affects the allocation of public funds to firms, beyond the evidence related to Law 488/92. The findings in Table 12 complement the results presented in the previous table, thus providing reassurance that the spatial distribution of Law 488/92 is representative of the spatial distribution of public funds devoted to local economies.

Table 12
All public funds and mafia.

Variables	(1) *All public funds*	(2) *All public funds*	(3) *State aids*	(4) *State aids*
Mafia	0.079**	0.370***	0.050	0.354**
	(0.029)	(0.117)	(0.035)	(0.175)
Estimation method	LPM	2SLS	LPM	2SLS
Test overid		0.6562		0.4906
Observations	389	389	389	389

All regressions include population density, employment rate, social capital, entrepreneurship, human capital and industry share. Instrumented variable (columns 2 and 4): mafia. Excluded instruments (columns 2 and 4): Rainfall, slope and altitude.

7. Interpreting the results

This Section presents further insights on the interpretation of the results. First, we test whether the positive relationship between the mafia and public transfer allocation is due to a more generous attitude of the State towards mafia-ridden municipalities. Second, we identify the possible mechanism through which the mafia can divert public subsidies. Finally, we test whether a criminal environment, rather than mafia-related crimes, has an effect on the allocation of funds.

7.1. Two competing scenarios

So far, we have shown that mafia activity has a positive and robust causal impact on the allocation of public funds. However, this finding can be explained according to two different stories. In the first scenario, the State indirectly opposes the mafia by boosting employment opportunities through the allocation of funding to firms located in mafia-ridden areas. According to the second scenario, the State offers investment subsidies for general economic development purposes; however, mafia-connected firms intercept part of these transfers and pocket the public subsidies. In the rest of this subsection, we disentangle these two interpretations and provide strong evidence in favor of the second explanation.

If the first scenario is valid, then it is reasonable to assume that the State tends to combat organized crime with alternative forms of public spending. We consider public expenditure at municipality level on a set of other items, such as expenditure on culture and

[17] Andini and de Blasio (2013) find little effectiveness of Planning Contracts. Accetturo and de Blasio (2012) investigate the impact of Territorial Pacts and find no effect on growth.

[18] Unfortunately it is not possible to obtain information regarding the amount each municipality received according to these programs. 85% of the Sicilian municipalities received at least one of these concurrent programs over the period considered.

[19] 91% of the Sicilian municipalities received at least one of these public funds.

[20] The coefficient of the *mafia* variable cannot be estimated using Probit estimation method, as the mafia dummy variable predicts the dependent variable perfectly. The estimates presented in Table 12 are based on a Linear Probability Model instead.

Table 13
Falsification tests.

	(1) *Expenditure on Culture*	(2) *Expenditure on Schooling*	(3) *Ln (Seized Real Estates)*	(4) *Corruption per capita*	(5) *Public funds – dummy*	(6) *Public Funds – Amount*
Mafia	−17.73***	−126.6**	3.895***	0.0785*	0.640***	1.667***
	(6.101)	(62.17)	(0.715)	(0.0440)	(0.320)	(0.586)
Other crime					0.074	0.196
					(0.419)	(1.005)
Overid *p*-value	0.4027	0.6217	0.3202	0.3899	0.2493	0.5240
F-value	24.342	24.342	24.342	24.342	–	24.183
Obs.	389	389	389	389	389	389

All regressions include population density, employment rate, social capital, human capital, entrepreneurship and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall, slope and altitude. Standard errors are clustered at rainfall cell level.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

schooling (up to lower-secondary school), divided by the corresponding population.[21] We conduct an instrumental variable analysis, as in Table 5, where the dependent variable is one of the two expenditure items listed above. Table 13 reports the estimation results of this falsification test. The estimated impact of mafia presence on expenditure on culture and education is negative and statistically significant at the 1% and 5% level, respectively. These results contradict the view that the State is more likely to be generous towards municipalities where the mafia is present. If anything, these municipalities seem to be underfunded, relative to municipalities where the mafia is absent. These results are not driven by a crowding-out effect, as funds to firms and cultural and educational expenditures do not depend on the same budget constraint.

7.2. Into the Black Box

So far we have presented the reduced form of the causal relationship between the mafia and public funding. The scope of this section is to shed light on the possible mechanism through which organized crime may grab public subsidies. Given that Law 488/92 assigns public transfers directly to firms, we suggest that the mafia may resort to the creation of fictitious businesses with the sole scope of applying for these subsidies. Law 488/92 funds are allocated in three equal installments. The first installment is paid out to the winning firms as soon as the competition results are published. The second installment is disbursed the following year, subject to some investment being conducted during the first year of funding. According to anecdotal evidence (Rai, 2008), newly built, although empty, warehouses have often been used as proof of investment to obtain the second installment. The third and final installment is paid out subject to proof of employment creation. The Financial Times (2010) reports the "curious case" of a firm producing DVDs on paper, i.e. a firm which was created with the sole scope of obtaining EU funding. In that case, the plant, which never started production, was missing a roof, though it was deemed eligible to receive the subsequent installment. We proxy the number of fictitious firms created by the mafia with the number of real estate seizures by Italian police due to links to organized crime. We assemble the dataset at municipality level, using information from the Italian agency that administers the goods and properties seized from organized crime.[22] Column 3 of Table 13 provides evidence of the link between organized crime and the proxy for fictitious firms. We create a variable *Seized Real Estate*$_i$ which measures the number of real estate seizures from the mafia in 2009. Using the same set of exogenous instruments, we show that the mafia has a positive, large and statistically significant impact on the (log) number of real estate seizures.

Creating a fictitious firm is just the first stage of a more complex system in which the mafia pulls the strings of its connections. According to Rossi (2006), government spending in Southern Italy has been widely associated with corruption.[23] In 2008, the Antimafia Commission of the Italian Parliament openly denounced the nexus between the lack of control in the allocation of funding, both at national and regional level, and the ability of organized crime to influence the allocation procedures and to distract public resources. In Calabria (a southern region with a strong mafia presence), five proceedings were taken against public officials in 2007, due to mismanagement and irregularities in the allocation of funds ex Law 488/92 (Commissione Parlamentare di Inchiesta sul Fenomeno della Criminalità Mafiosa o Similare, 2008).

The next step of our analysis is to show the causal link between the mafia and corruption in public administration. Empirical evidence in support of this hypothesis is presented in column 4 of Table 13. The dependent variable is the number of public administration corruption events per capita, at municipality level, according to the Italian Penal Code.[24] Our findings support the view that the positive effect of the mafia on public transfers is very likely to pass through frauds and an extensive set of connections. Using the 2SLS estimation methodology, we show that the mafia has a positive and statistically significant impact on the measure of corruption among public officials. This result provides direct evidence of the negative impact of mafia presence on the functioning of public administration and of its long arm in the public sector.

Our findings are also consistent with previous studies about the inefficacy of Law 488/92. Bronzini and de Blasio (2006) apply a rigorous counterfactual evaluation framework to show that these subsidies did not generate additional investments. The authors show that financed firms simply brought forward investment projects originally planned for the post-intervention period to take advantage of the incentives. Overall, the authors conclude that their exercise "*cast[s] some doubts on the efficacy of Law 488*" (Bronzini and de Blasio, 2006: page 329). Bernini and Pellegrini (2011) support these findings by demonstrating that firms subsidized by Law 488/92 show a smaller increase in TFP than non-subsidized firms.

7.3. Mafia or crime culture?

In this section we question whether our findings are capturing the impact of mafia activity on the allocation of transfers, or

[21] Cultural expenditure is divided by total population; expenditure for education is divided by the population aged 3–13. Unfortunately, only a small set of expenditure items is available at municipality level. For example, expenditure on education above the lower-secondary level is only available at a more aggregate locality level.

[22] *Source*: Agenzia Nazionale per l'amministrazione e la destinazione dei beni sequestrati e confiscati alla criminalita' organizzata (2009).

[23] A number of journalistic inquiries further support the idea that many episodes of corruption also featured the allocation of funds related to Law 488/92 (Rai, 2008).

[24] Articles 246, 314, 317, 318, 322, 323, 479, 480, 481, 319, 493, 319*ter*, 320, 322*bis*, 316.

whether they are measuring the impact of crime in general, which is suspected to be highly correlated with mafia presence. In other words, is it organized crime or crime culture? Columns 5 and 6 of Table 13 present the results of a simple exercise. We replicate the basic specification of column 6 in Table 5 and add a new measure of crime that we use together with the *mafia* indicator. We proxy crime culture with a number of other types of crime committed at municipality level, namely manslaughter, involuntary manslaughter and infanticide, divided by population.[25] The new crime variable does not have any statistically significant impact on the probability of obtaining funding, or on the amount of public transfers. Therefore, we can rule out that crime culture affects funding allocation.

8. Conclusions

An emerging literature has focused on the economic impact evaluation of many programs aimed at sustaining firms. We contribute to this literature by examining the role of organized crime in shaping the allocation of funds. Using an innovative dataset on crime and a pioneering set of instruments for organized crime, we provide evidence that mafia presence influences the allocation of public funds. Further results suggest that the mafia pockets at least part of the disproportional amount of funds by creating fictitious firms and by corrupting public officials who play a role in the funding allocation.

These findings regard the short run impact of organized crime on economic outcomes. However, we envisage a long run impact as well. The mafia may have long-run disincentive effects by crowding out talent from entrepreneurship, thereby negatively affecting the economy in the long run. By manipulating the assignment of public funds aimed at poorer areas, organized crime effectively undermines growth, investment and development.

This paper addresses a relevant policy question: how can a government prevent public funding from being diverted by organized crime? Our results indicate that the design of geographically-targeted aid policies should be supported by detailed analysis of local crime activities. The European Structural Funds, one of the main policy instruments to stimulate convergence across European countries, provide an interesting example. According to a report by the Commission of the European Communities (2009), the number of irregularities related to European Structural Funds was 4007 in 2008, an increase of 6.7% compared to 2007. The European Parliament warns of the role of organized crime, which "*[...] is increasing its capacity for collusion within institutions, particularly by means of fraud against the Community budget*".[26] According to the European Anti-Fraud Office, the majority of cases of misuse of EU Funds by organized crime have taken place in Italy, Greece, Spain, Bulgaria and Slovakia, while investigations are currently taking place in several other European countries (European Parliament, 2011).

As far as the presence of crime is stronger in poorer, targeted regions, as is likely to be the case, funding policies should take into account the risk that at least part of the money feeds into organized crime. The results of this study suggest that policies based on monetary incentives should, at least, be accompanied by actions aimed at combating organized crime.

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Appendix A. Supplementary material

Supplementary material associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jue.2015.01.002.

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[25] Articles 578, 589, 584 of the Italian Penal Code. Other crime could be potentially endogenous. However, none of these three types of crime is characterized by premeditation, contrary to the type of homicides committed by the mafia.

[26] *Source*: European Parliament (2010).

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