BANCA D'ITALIA

EUROSISTEMA

Temi di Discussione

(Working Papers)

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June 2013

Number 916

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ISSN 1594-7939 (print)
ISSN 2281-3950 (online)

Printed by the Printing and Publishing Division of the Bank of Italy

THE EFFECT OF ORGANIZED CRIME ON PUBLIC TRANSFERS

by Guglielmo Barone* and Gaia Narciso**

Abstract

Organized crime is widely regarded as damaging to the economy, to say nothing of people's lives. Yet little is known about the mechanism at work. This paper helps fill the gap by analyzing the impact of organized crime on the allocation of public subsidies to businesses. We assemble an innovative data set on Italian mafia crimes at municipal level and test whether organized crime diverts public funding. We exploit exogenous variations at the level of municipalities to instrument current mafia-style activity by using exogenous shifters of land productivity in the 19th century. Our results show that the presence of organized crime positively affects both the extensive margin (probability of funding) and the intensive margin (amount of public funding to enterprises). The impact is economically relevant and equal to at least one standard deviation of the dependent variable. Organized crime is also found to cause episodes of corruption in the public administration. A series of robustness checks confirm the findings. Our results suggest that geographically targeted aid policies should be careful to take local crime conditions into account.

JEL Classification: H4, K4, O17.
Keywords: organized crime, public transfers, corruption.

Contents

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1. INTRODUCTION[1]

Organized crime is a worldwide, widespread phenomenon and entails deep economic and social consequences. The purpose of this paper is to enhance our understanding of organized crime activities by studying whether organized crime diverts public transfers. This issue is especially relevant in the case of public subsidies to businesses, given the pervasive presence of organized crime in everyday socio-economic and political life (Allum and Sieber, 2003).

We assemble an innovative dataset on crime at municipality level in the Italian context. Organized crime presence is measured using detailed information on crime at municipality level, by article of the Italian Penal Code, over the period 2004-2009. In particular, we exploit the information regarding Article *416-bis* that regulates mafia-related crimes. Public transfers are measured by aggregating the amount of funds transferred to firms at municipality level according to Law 488/92. These funds have for many years been the main policy instrument for reducing territorial disparities in Italy by offering a subsidy to businesses willing to invest in poorer regions.

The law entailed pre-determined specific criteria to assign funds that were aimed at containing the risk of frauds (Bronzini and de Blasio, 2006). Nonetheless, according to investigative reports, organized crime found its way to circumvent those provisions, often using professional affiliates that specialized in the diversion of the funds. Funds were diverted through a number of accounting and financial mechanisms (including the creation of fictitious firms, existing only on paper and with the sole scope of applying for public funding) as well as collusion, corruption of or threatening to public officials involved with different responsibilities in the allocation of funds (Direzione Investigativa Antimafia, various years; Guardia di Finanza).

The relation between organized crime and public funding may be endogenous on three grounds: omitted variables, measurement error and reverse causality. In order to deal with the endogeneity of this relationship we focus our analysis on a region in the South of Italy where organized crime is widespread and explore the historical origins of mafia. Gambetta (1993) defines organized crime in that region as *"[...] an industry that produces, promotes and sells private protection*" (Gambetta, 1993: page 1). Private protection was historically needed for two

[1] We wish to thank Antonio Accetturo, Gani Aldashev, Chiara Bentivogli, Lucia Corno, Caterina Gennaioli, Giampaolo Iuzzolino, Andrea Linarello, Carol Newman, Kevin O'Rourke, Ben Olken, Massimilano Onorato, Massimo Sbracia, Michael Wycherley and two anonymous referees for their helpful suggestions, as well as seminar participants at Trinity College Dublin, University College Dublin, NUI Maynooth, the Bank of Italy, University of Namur (FUNDP), RES 2012 Annual Conference, Copenhagen Business School, Universitat Pompeu Fabra, University of Sussex, University of Milano-Bicocca, SIEP 2012 Annual Conference, SIE 2012 Annual Conference and SIDE-ISLE 2012 Annual Conference. We also thank Andrew Gray and Julia Anna Matz for excellent research assistance. The views expressed here are our own and do not necessarily reflect those of the Bank of Italy.

main 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 favoured the emergence of mafia 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 shifters of land productivity. In particular, we use rainfall shocks in the XIX century and geographical features at municipality level.

We provide evidence that the presence of mafia significantly 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% 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 mafia, and various estimation methods.

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 areas with mafia presence. We show that, if anything, these areas are underfunded in terms of expenditure on culture and education relative to those where mafia is absent. Second, we explore the mechanism through which mafia can divert public resources. We present evidence of the link between mafia and local entrepreneurship and show that organized crime increases the number of episodes of corruption in the public administration sector. Finally, we disentangle mafia from a more general crime culture. We do not find any evidence that other types of crime influence the allocation of public transfers.

Our study is related to three strands of literature. First, it contributes to the emerging literature analyzing the economic consequences of organized crime. A study by Pinotti (2011) estimates the impact of organized crime on GDP per capita in Italy. Using a methodology introduced by Abadie and Gardeazabal (2003) for the Basque conflict, Pinotti provides evidence that organized crime may have produced significant negative effects on income per capita over the years. Bonaccorsi di Patti (2009) shows that crime adversely affects access to credit. Borrowers in high-crime areas are found to pay higher interest rates, pledge more collateral, and resort less to asset-backed loans and more to revolving credit lines. Our study sheds light on another mechanism through which mafia negatively affects the economy: by grabbing public funds assigned to poorer areas, organized crime effectively undermines growth, investment and development.

Second, 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. (2010) study the impact of an increase in federal transfers in Brazil on political corruption and on the quality of candidates. They consider a career concern model with endogenous candidate selection and provide empirical evidence that larger transfers induce an increase in corruption, while reducing the quality of political candidates. Gennaioli and Onorato (2010) analyze the impact of public transfers on the spread of organized crime. The authors use Italian data for crime convictions and evaluate the spread of organized crime caused by an increase in public funding which followed an earthquake affecting two regions in the centre of 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 Italian mafia, can affect the allocation of public transfers.

Finally, as far as the instrumental variable strategy is concerned, this work is related to two papers that study the historical origins of mafia. Both of them follow Gambetta (1993)'s original view according to which mafia emerged in the last part of the XIX century as an industry for private protection. Bandiera (2003) empirically supports this idea by showing that mafia was more likely to be active in towns where land was more divided; Buonanno et al. (2012) document that areas characterized by sulphur availability were also more affected by mafia.

This paper is structured as follows. Section 2 describes the empirical model. Section 3 illustrates some exogenous determinants of mafia 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:

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

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

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; while $\boldsymbol{X_i}$ is the vector of controls that accounts for heterogeneity across municipalities. Namely, 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 over the total population aged above 6 years; social capital, measured by the share of employees in the non-profit sector.

3. IN SEARCH OF VALID INSTRUMENTS

The relation between organized crime and public funding may be endogenous on three grounds. First, the identification of the impact of mafia on public transfers may suffer from reverse causality: public funds may feed into the expansion of organized crime, as suggested by 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 (2011), underreporting is likely to be greater in municipalities with mafia presence due to *omertà* or fear of 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 for valid instruments, we revert to the origins of mafia. In the Appendix we sketch a brief history of mafia in the region we study. We follow Gambetta (1993)'s view according to which mafia emerged in the second half of the XIX century during the transition from the Borbone dynasty to unified Italy (1861) as a private protection industry.

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, 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 XIX 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.[2] All 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 XIX century is unlikely to affect local current economic conditions because (*i*) even if the spatial distribution of rainfall is time-persistent, modern and 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 equalled 3.8% in 2009 (Istat, 2011).

Moreover, the exogeneity of our instruments may not hold if instrumental variables shape public transfers through other channels than mafia activity that are not controlled for. This would invalidate the exclusion restriction assumption. We argue that by including the set of controls X_i we take into account other possible transmission channels. For instance, Durante (2010) shows that variability in precipitation stimulates higher level of trust: farmers invest on it to facilitate cooperation and risk sharing as an implicit insurance arrangement. 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 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 as the share of self-employment over total employment at municipality level. [3]

[2] Slope is computed as (maximum altitude – minimum altitude) / surface.

[3] The same channel that makes rainfall shocks a relevant instrument, *i.e.* mafia's persistence, also challenges the exclusion restriction. Indeed, the historical presence of mafia may have discouraged firm creation. Thus, historical rainfall shocks, by affecting historical mafia's presence, can be directly related to firm subsidies through other channels than today's mafia presence. In the Appendix we tackle this potential problem by adopting a 3SLS approach, in which current mafia presence is instrumented with mafia presence in the XIX century and the latter is instrumented with rainfall shocks, slope and altitude. The results of the 3SLS analysis confirm our main findings.

4. DATA

Measuring mafia. The first source of data is an innovative and confidential data set made available by the Italian Ministry of 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. Article *416-bis* defines an association as being of mafia-type nature "*when those belonging to the association exploit the potential for intimidation which their membership gives them, and the compliance and* omertà *which membership entails and which lead to the committing of crimes, the direct or indirect assumption of management or control of financial activities, concessions, permissions, enterprises and public services for the purpose of deriving profit or wrongful advantages for themselves or others*". We augment this information with official data from the Ministry of Interior on whether the municipality council was dissolved due to mafia infiltration. About 16% of the municipalities experienced at least one episode of association with 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, murder, together with a much wider mafia association. In the words of Beppe Pisanu, president of the anti-mafia commission of the Italian Parliament, "*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 mafia and the socio-economic life of municipalities.

Public transfers. As a measure of public transfers to businesses, we employ the Law 488/92 data set made confidentially 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 the main policy instrument for reducing territorial disparities in Italy, by offering a subsidy to firms willing to invest in poorer areas. Law 488/92 granted more than € 1,800 million over the period 2000-2007, about 24% of the total national public transfers (Ministero delle 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 between the value of the aid and the maximum applicable grant; a score related to

the local (regional level) priorities with respect to location, project type and sector; 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.

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.

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	0.000	8.585
Public Funds – dummy	Dummy variable	390	0.502	1	0.50	0	1
Mafia	Dummy variable	390	0.162	0.000	0.368	0.000	1.000
Density_2001	(‘000s) persons / km^2 in 2001	390	0.327	0.096	0.618	0.004	5.526
Employment Rate	# employed / labour 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	0.090	0.000	0.654
Social capital	# of employees in the non-profit sector / total # employees in 2001	389	0.024	0.016	0.030	0.000	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	0.990	0.0145	0.973	1.037
Slope	(‘000s) Metres/ km^2	390	28.791	18.716	32.926	0.776	371.053
Altitude	(‘000s) metres	390	0.391	0.395	0.277	0.001	1.275

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 over the total population aged above 6 years according to the 2001 Census.

Data on rainfall in the XIX 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° x 0.5° grid resolution. Each municipality is mapped into a cell by minimizing the distance between the capital city of the municipality and the centre of the cell. We map the 390 municipalities into 25 different cells. The 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.

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.

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*
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%.

We split the municipalities into those that experienced mafia-related crimes over the period 2004-2009 and those which 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 the capital town.

5. EMPIRICAL RESULTS

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 equation (1). Municipalities with mafia presence are more likely to obtain funding to businesses than municipalities in which mafia is absent. The results are consistent also 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 mafia presence are between 27% and 31% more likely to receive funding to businesses.

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			
R2				0.0001	0.0599	0.0732

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

Columns 4-6 present the OLS results for the intensive margin (equation 2), i.e. the amount of funds per employee received by each municipality over the period 2004-2009. 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).

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 mafia indicator variable and the excluded instruments. Column 1 of Table 4 presents the relationship between mafia and the rainfall shock variable by itself.[4] Deviations from long run rainfall level have a positive and statistically significant impact on mafia presence today. This is consistent with our prior: rainfall increases land value that, in turn, increases the demand for protection and then, the market equilibrium in the protection industry.

Table 4: Exploring the First Stage

VARIABLES	(1) *Mafia*	(2) *Mafia*	(3) *Mafia*	(4) *Mafia XIX century*	(5) *Mafia (reduced sample)*	(6) *Mafia*
Rainfall	6.001***		4.436***	6.977**	6.876***	0.145
	(1.359)		(1.406)	(2.827)	(2.318)	(0.786)
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)
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%.

Column 2 explores the role of the two geographical variables, slope and altitude, in explaining the mafia variable.[5] As expected, both variables have a negative impact on mafia. The next column shows the joint impact of the three excluded instruments on the presence of mafia today. The three variables are statistically significant at the 1% level even when jointly introduced. Column 4 presents the impact of the three excluded variables on a different measure of mafia, i.e. mafia presence in the XIX 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 maintain their explicative power in explaining mafia presence in the XIX century. Deviation from the long run rainfall average has a positive and

[4] The Appendix presents further evidence on the role of rainfall shocks in the XIX century on current mafia presence.
[5] We present further evidence on the validity of altitude as instrument in the Appendix.

statistically significant impact on mafia in the XIX century, slope has a negative and statistically significant impact, while altitude keeps the same negative sign, but is not statistically significant.

The next column replicates the same exercise, with current mafia presence as 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 instrument. We replace rainfall deviation in the XIX century with rainfall deviation in the XX century (*Rainfall 1951-1960*).[6] According to our prior, mafia emerged in the XIX century where the value of land was greater. Therefore, we expect rainfall shocks in the XIX century to be a good predictor of (current) mafia presence. On the other hand, we would not expect rainfall shocks in the XX 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 mafia today.

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.[7]

Columns 1-3 of Table 5 report the estimates of the specification for the probability of obtaining funding. The lower panel of Table 5 present 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. Mafia has a positive and statistically significant impact on the probability of obtaining public transfers. These results hold also 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). Municipalities with mafia presence are between 62% and 64% more likely to obtain public transfers. Hence, IV estimates indicate a large upward revision of about 30 percentage points. The effect is also economically relevant as it compares to a 0.5 standard deviation of the dependent variable.

The next three columns present the impact of mafia on the amount of public funds. The excluded instruments are jointly statistically significant, the F-test of the exclusion restriction is

[6] 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.

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

equal to 20.75 and the test of overidentifying restrictions does not reject the null hypothesis that the excluded instruments are valid. Mafia has a positive and statistically significant impact on the intensive margin as well and the results hold also when we control for the other covariates. Again, the effect is economically relevant too: it amounts to about one standard deviation of the dependent variable. We have undertaken some preliminary robustness checks by normalizing the amount of funds by the number of firms, with and without controlling for the average firm size. The overall explicative power of these alternative specifications does not outperform the more parsimonious representation shown in Table 5. Moreover we have also checked that our findings are robust to the 1851-1860 time span we used to construct the rainfall variable.[8]

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.	0.4409	0.4579	0.2401	0.3256	0.7306	0.5374
P-value						
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%

[8] Results are reported in the Appendix.

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 hold also when we take into account the potential issue of weak instruments.

Alternative econometric specifications and measures of mafia. Table 6a reports 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.

Table 6a: Robustness checks – Extensive margin

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*Public funds - dummy*					
Mafia	0.639***	0.637***	0.655***	0.643***		
	(0.038)	(0.034)	(0.036)	(0.028)		
Mafia - Neighbour				-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						

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%.

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 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.[9] 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 mafia. First, we introduce a narrow definition of the mafia dummy 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.[10] Second, we replace the mafia indicator variable with the actual number of mafia-related episodes per capita according to Article *416-bis.*[11] Consistent with the previous results, the estimated coefficient on *mafia-narrow* in column 5 of Table 6a is statistically significant at the 1% level. Not just the presence of mafia, but also the number of mafia episodes significantly affects the probability of obtaining public funds.

Table 6b 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 6b presents the results for an econometric specification in which we control for province fixed effects. The estimated coefficient of mafia is positive and statistically significant at the 5% 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 cope with the potential issue of weak instruments in the next Section.

[9] 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 the region we study.

[10] About 13.9% of municipalities experienced a mafia-type episode as defined by the variable *mafia_narrow* in the period 2004-2009.

[11] On average, the yearly number of mafia-related episodes per capita is 0.003 per municipality over the 2004-2009 period.

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

Table 6b: Robustness checks – Intensive margin

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*Public funds - Amount*					
Mafia	2.139	1.487***	1.372***	1.645***		
	(1.408)	(0.395)	(0.510)	(0.572)		
Mafia - Neighbour				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%.

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 well above the 10 cut-off value in the main specification (Table 5), in the robustness checks reported in Table 6b, 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 7 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.

Table 7: 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%.

The second exercise in order to deal with weak instruments entails taking care of the biased estimates. The limited information maximum likelihood is a k-class estimator, which provides an unbiased median. Column 2 presents the results of the limited information maximum likelihood estimation for Fuller value equal to 2.[12] The results confirm the positive impact of mafia on public funds.

Against these benchmark estimates, we now consider the specification which includes province fixed effects. The new confidence intervals corrected according to Moreira (2003) have

[12] Results hold for different values of the Fuller parameter.

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 mafia, i.e. the narrow definition and the number of mafia episodes per capita. Columns 5-8 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.

7. INTERPRETING THE RESULTS

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

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 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 favour of the second explanation.

If the first scenario is valid, then it is reasonable to assume that the State tends to contrast organized crime also with other forms of public spending. We consider public expenditure at municipality level on a set of other items, such as expenditure on culture and schooling (up to lower secondary school), divided by the corresponding population.[13] We conduct an instrumental variable analysis as in Table 5, where the dependent variable is one of the two expenditure items listed above. Table 8 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 mafia is present. If

[13] Culture 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.

anything, these municipalities seem to be underfunded, relative to municipalities where mafia is absent. These results are not driven by a crowding-out effect, as funds to firms and culture and education expenditures do not depend on the same budget constraint.

Into the black box. So far we have presented the reduced form of the causal relationship between 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 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 instalments. The first instalment is paid out to the winning firms as soon as the competition results are published. The second instalment is disbursed the following year, subject to some investment being conducted during the first year of funding. According to anecdotal evidence, newly built, although empty, warehouses have often been used as proof of investment to obtain the second instalment. The third and final instalment is paid out subject to proof of employment creation. The media report 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, albeit it was deemed eligible to receive the subsequent instalment. We proxy the number of fictitious firms created by mafia with the number of real estates seized 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.[14] Column 3 of Table 8 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 estates seized from mafia in 2009. Using the same set of exogenous instruments, we show that mafia has a positive, large and statistically significant impact on the (log) number of seized real estates.

Creating a fictitious firm is just the first step of a more complex system in which mafia pulls the strings of its connections. According to Rossi (2006), government spending in the Italian South has been widely associated with corruption. In 2008 the Anti-mafia 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 a different southern region with a strong mafia presence, in 2007 five proceedings were taken against public officials due to

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

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 mafia and corruption in public administration. Empirical evidence in support of this hypothesis is presented in Column 4 of Table 8. The dependent variable is the number of public administration corruption events per capita, at municipality level, according to the Italian Penal Code.[15] Our findings support the view of the Court of Auditors that the positive effect of 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 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.

Table 8: 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*** (6.101)	-126.6** (62.17)	3.895*** (0.715)	0.0785* (0.0440)	0.640*** (0.320)	1.667*** (0.586)
Other crime					0.074 (0.419)	0.196 (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%.

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

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

Pellegrini (2011) support these findings by demonstrating that firms subsidized by Law 488/92 show a smaller increase in TFP than non-subsidized firms.

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 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 mafia or crime culture? Columns 5 and 6 of Table 8 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.[16] 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 of organized crime on economic outcomes. We contribute to this literature by uncovering one of the mechanisms through which organized crime affects the economy. We provide evidence that organized crime can affect the allocation of public 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 mafia pockets at least part of the disproportional amount of funds by creating fictitious firms and by corrupting public officials.

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

This paper addresses a relevant policy question: how can a government prevent that public funding is 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 (2008), the number of irregularities related to European Structural

[16] Articles 578, 589, 584 of the Italian Penal Code.

Funds was 4,007 in 2008, an increase of 6.7% compared to 2007. Although there are no official statistics for EU fraud involving mafia activity, the European Parliament warns of the role of organised crime, which *"[...] is increasing its capacity for collusion within institutions, particularly by means of fraud against the Community budget*".[17] More recently, the legislative proposals regarding the EU cohesion policy 2014-2020 stress the role of institutions and the quality of government in assigning funds.

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 be at least accompanied by actions aimed at combating organized crime.

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

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APPENDIX

Historical roots for the instruments

According to a rather consolidated view, in the region we study in this paper mafia emerged in the second half of the XIX century during the transition from the Borbone dynasty to unified Italy (1861). In his 1993 book, Gambetta defines 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 2,000 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", 1867). 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 mafia as a land protection industry. Therefore, armed guards who had provided their protection to *latifondisti* could expand their activities by providing their service also 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* strategy. Under the Spaniard 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 remarks the lack of trust among the community we study (Gambetta, 2000).[18]

[18] In their seminal work on social capital, Putnam et al. (1993) support the view that different levels of social capital between the North and the South of 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 the Centre and North of Italy.

Further empirical evidence

In what follows we provide additional evidence in support of our estimation strategy, as well as some additional results.

1. Rainfall in the XIX century

This section provides further evidence of the role of rainfall shocks in the XIX century in affecting mafia presence today. The variable Rainfall presented in the paper is measured as the rainfall deviation from the long run mean in the period preceding Italian Unification (1850-1861). Table A1 provides evidence that using different time periods yields similar results. Columns 1 and 2 of Table 1 reports the estimation results when the variable Rainfall is measured as the rainfall deviation from the long run mean in the period 1841-1860. Current mafia presence affects both the extensive and intensive margin at the 1% significance level and the magnitude of the effect is similar to the one presented in the paper (Table 5). Changing the time span to the period 1846-1860 (columns 3 and 4) or to the period 1856-1860 (columns 5 and 6) yields consistent results.

Table A1: Rainfall shocks in the XIX century

	(1)	(2)	(3)	(4)	(5)	(6)
	Second Stage					
	Public funds - dummy	*Amount Public funds*	*Public funds - dummy*	*Amount Public funds*	*Public funds - dummy*	*Amount Public funds*
	1841-1860		1846-1860		1856-1860	
Mafia	0.636***	1.554***	0.638***	1.596***	0.641***	1.523***
	(0.034)	(0.543)	(0.033)	(0.545)	(0.032)	(0.409)
Employment Rate	2.325***	4.800***	2.316***	4.848***	2.299***	4.763***
	(0.719)	(1.773)	(0.714)	(1.790)	(0.734)	(1.645)
Industry Share	0.900***	2.522***	0.887***	2.516***	0.862***	2.527***
	(0.286)	(0.901)	(0.285)	(0.907)	(0.300)	(0.891)
Pop. Density	0.015	-0.285***	0.013	-0.287***	0.008	-0.283***
	(0.022)	(0.0771)	(0.022)	(0.0775)	(0.024)	(0.0692)
Social Capital	0.872	-2.089	0.863	-2.099	0.886	-2.081
	(0.759)	(1.637)	(0.755)	(1.646)	(0.766)	(1.607)
Entrepreneurship	0.371	0.828	0.362	0.815	0.273	0.838
	(0.547)	(1.422)	(0.543)	(1.428)	(0.561)	(1.466)
Human capital	0.797*	1.097	0.779*	1.077	0.758*	1.112
	(0.474)	(0.821)	(0.471)	(0.826)	(0.452)	(0.833)
	First stage					
	Mafia					
Rainfalls	2.614***	2.700***	3.299***	3.332***	3.318	0.824
	(0.651)	(0.858)	(0.782)	(1.068)	(2.932)	(3.605)
Slope	-0.003***	-0.002**	-0.003***	-0.002**	-0.002***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Altitude	-0.257***	-0.307***	-0.255***	-0.308***	-0.245***	-0.329***
	(0.052)	(0.056)	(0.052)	(0.056)	(0.069)	(0.048)
Overid P-value	0.2473	0.5065	0.2507	0.5203	0.0965	0.3026
First stage *F*	-	27.22	-	25.71	-	16.25
Time span	1841-1860		1846-1860		1856-1860	
Observations	389	389	389	389	389	389

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

2. Do funding applications depend on altitude?

In this Section we question whether altitude might have a direct role in determining the number of applications submitted in each municipality. We may envisage a scenario in which differences in altitude across municipalies may have shaped firms' profitability over the centuries and therefore might affect the demand for subsidies today. Were this mechanism in place, altitude would not be a valid instrument. In order to test for this scenario, we contruct the indicator

variable *Mountain* which takes the value 1 if the municipality is classified as mountainous by Istat and zero otherwise. Out of the 390 municipalities, 97 are classified as mountainous. Table A2 presents the correlation between the number of applications per firm at municipality level, measured on the basis of the Ministry of Industry database, and altitude. We regress the number of applications per firm on the *Mountain* dummy (column 1) and a set of controls (columns 2 and 3). The coefficient on the Mountain dummy is never statistically significant, thus supporing the validity of altitude as instrument.

Table A2: Do funding applications depend on altitude?

	(1)	(2)	(3)
	Number of applications per firm		
Mountain - dummy	-0.000726	0.000244	-0.00187
	(0.00273)	(0.00275)	(0.00281)
Employment rate		0.0433*	0.0633**
		(0.0252)	(0.0301)
Industry share		0.0415***	0.0372***
		(0.0132)	(0.0132)
Population density			-0.00623***
			(0.00206)
Social capital			-0.0800**
			(0.0386)
Entrepreneurship			0.0364
			(0.0246)
Human Capital			0.0107
			(0.0226)
Observations	390	390	389
R-squared	0.000	0.036	0.073

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

3. Normalising funds to the number of firms

So far we have measured the extensive margin as the amount of funds per employee at municipality level. This section provides evidence that similar results hold when the dependent variable is normalised to the number of firms instead. We collect information on the number of firms and average size at municipality level from Istat . Table A3 presents the results of a specification similar to the one of equation 2, where the dependent variable is the amount of public funding normalised to the number of firms. Again, mafia has a positive and statistically significant impact on the amout of funding (column 1), also when controlling for the average firm size (column 2). We conclude that the results are robust even when controlling for heterogeneity in the entrepreneurial environment across municipalies.

Table A3: Normalising funds to the number of firms

	(1)	(2)
	Second Stage	
	Amount of funds per firm	
Mafia	4.900***	3.831**
	(1.738)	(1.906)
Employment rate	12.98***	12.28**
	(4.642)	(5.231)
Industry share	15.18***	10.68***
	(5.758)	(3.345)
Population density	-0.908***	-0.787***
	(0.229)	(0.226)
Social capital	-6.296	-8.763*
	(5.042)	(5.122)
Entrepreneurship	-3.913	1.708
	(5.963)	(3.841)
Human Capital	5.283**	1.108
	(2.482)	(3.547)
Firm size		1.139*
		(0.634)
	First stage	
	Mafia	
Rainfalls	4.582***	4.526***
	(1.482)	(1.508)
Slope	-0.002**	-0.002**
	(0.001)	(0.001)
Altitude	-0.283***	-0.271***
	(0.062)	(0.058)
Overid P-value	0.5762	0.4610
First stage *F*	24.342	26.400
Observations	389	389

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

4. Three Stages-Least Squares

The same channel that makes rainfall shocks a relevant instrument, *i.e.* mafia's persistence, also challenges the exclusion restriction. Indeed, the historical presence of mafia may have discouraged firm creation. Thus, historical rainfall shocks, by affecting historical mafia's presence, can be directly related to firm subsidies through other channels than today's mafia presence. In this section we tackle this potential problem by adopting a 3SLS approach, in which current mafia presence is instrumented with mafia presence in the XIX century, as measured according to Damiani-Jacini data, and the latter is instrumented with rainfall shocks, slope and altitude. The results of the 3SLS analysis are presented in columns 1-3 of Table A4 and confirm our main findings. Rainfall shocks have a positive and statistically significant impact on mafia's presence in the XIX century. The estimated coefficients of altitude and slope are both negative and statistically significant. Turning to the second stage, mafia in the XIX 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 mafia in the XIX century. In order to make the 3SLS analysis comparable to the 2SLS analysis (Table 5 in the paper), we replicate the estimation of equation 2 to the available sample. The results are reported in column 4 and are fully consistent with our benchmark estimates.

Table A4: 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 XIX century		1.280***		
		(0.228)		
			First stage	
			Mafia XIX cent.	
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<0.01, ** p<0.05, * p<0.1

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