THE EFFECT OF MAFIA ON PUBLIC TRANSFERS*

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Abstract: According to widespread consensus, organized crime harms economic outcomes. Yet little is known about the mechanism at work. This paper contributes to filling this 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 at municipality level and test whether mafia diverts public funding. We exploit exogenous variation at municipality level to instrument current mafia activity with rainfall in the XIX century and geographical shifters of land productivity. Our results show that organized crime increases the amount of public funds to enterprises; the impact is economically relevant and equals one standard deviation of the dependent variable. We shed light on the mechanism through which mafia may divert public subsidies: organized crime, besides attracting disproportional funding, also leads to episodes of corruption in the public administration sector and to misuse of public funds. A series of robustness checks confirms the above findings. Our results suggest that the design of geographically targeted aid policies should take into account local crime conditions.

Keywords: organized crime, public transfers, corruption.

JEL classification: H4, K4, O17.

Total word count: 44,305.

* We wish to thank Gani Aldashev, Lucia Corno, Caterina Gennaioli, Andrea Linarello, Carol Newman, Kevin O'Rourke, Massimilano Onorato, Michael Wycherley and seminar participants at Trinity College Dublin, University College Dublin, NUI Maynooth and the Bank of Italy for helpful suggestions. We 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.

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I. INTRODUCTION

Organized crime is a worldwide, widespread phenomenon and entails deep economic and social consequences. According to The Economist (2009), the Japanese Yakuza *"[...] is estimated to haul in as much as 2 trillion Yen (around 21 billion US dollar) annually"*. The activities of Italian mafia were estimated to amount to 7% of Italian GDP in 2007 and crime business flourishes even during periods of economic crisis. In 2009, while Italy's GDP fell by 5%, organized crime increased in turnover terms by 3.7% (Financial Times, 2010a).

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).[1]

We assemble an innovative dataset on crime at municipality level in the Italian context. The Italian case is a relevant environment for this study for two reasons. First, Italian mafia, like other types of organized crime such as the Japanese Yakuza, is rooted in the political and socio-economic life and its origins can be traced back to the XIX century. Second, among developed countries, Italy is one of the countries most strongly ridden by organized crime, as mafia is diffusely present in at least 5 of the 20 Italian regions.

According to investigative reports, there are four main ways through which mafia may divert public transfers to businesses.[2] First, organized crime may resort to the creation of fictitious firms, existing only on paper and with the sole scope of applying for public funding.[3] Second, mafia may corrupt or threaten public officials who supervise the allocation of funding. Third, organized crime may collude with the local public sector in modifying town plans to allow fictitious firms to use allotments originally assigned to other uses. Finally, mafia may exploit its connections to local banks involved in the disbursement of public funds.

[1] According to anecdotal evidence, organized crime is estimated to control 1 in 5 businesses in Italy (BBC, 2000). Similarly, in 1998, the Russian government suggested that the Russian *mafiya* controlled 40% of private business and 60% of state-owned companies (BBC, 1998).
[2] *Source*: Direzione Investigativa Antimafia.
[3] See for example Financial Times (2010b).

Mafia presence is measured using a unique data set made available by the Italian Ministry of Interior, which provides 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. 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 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 Sicily and explore the origins of Sicilian mafia. Gambetta (1993) defines mafia as *"[...] an industry that produces, promotes and sells private protection*" (Gambetta, 1993: page 1). Private protection was historically needed in Sicily for two 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 variation in the XIX century and geographical features at municipality level.

We provide evidence that the presence of mafia significantly affects the allocation of public transfers: according to our estimates, the impact of mafia presence equals one standard deviation of the dependent variable. This implies that mafia diverted about 35% of the total amount of public transfers. This result is robust to alternative econometric specifications, different measures of mafia, and various estimation methods.

Having established our core result, we turn to its 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, nursery services, 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 crime culture, proxied by the number of manslaughter, involuntary manslaughter and infanticide episodes. We do not find any evidence that other types of crime influence the allocation of public transfers.

To the best of our knowledge, this is the first study to analyze the causal impact of mafia on the allocation of public transfers and to uncover the mechanisms through which organized crime affects the economy.

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 compares Southern Italian regions on the basis of the dynamics and historical roots of different groups involved in organized crime. According to his analysis, organized crime is responsible for a 16% loss in GDP per capita over a 30 year period. 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 et al. (2011) 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 Sicilian 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. (2011) document that areas characterized by the most valuable export goods (sulphur and citrus fruits) were also more affected by mafia.

This paper is structured as follows. Section 2 describes the empirical model. Section 3 presents a brief history of 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.

II. THE EMPIRICAL MODEL

In this section we outline the empirical framework and discuss the identification strategy that we adopt. First, we estimate a simple model of the relationship between public funds and mafia presence. The econometric specification reads as follows:

$$Public\ funds_i = \alpha_1 + \alpha_2 mafia_i + \boldsymbol{X'}_i\boldsymbol{\beta} + \varepsilon_i$$

where the variable $Public\ funds_i$ measures the total amount of public funds per employee assigned to firms located in municipality i in the period 2004-2009. 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 the unemployment rate at municipality level; sector composition, evaluated by the industry share; population density 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 mafia on public transfers may suffer from reverse causality: public funds may feed into the expansion of organized crime. 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. 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.

III. IN SEARCH OF VALID INSTRUMENTS: A BRIEF HISTORY OF MAFIA

According to a rather consolidated view, Sicilian 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 arises from three main motives. 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, the end of feudalism, 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 Bonfadini 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, Alexander de Tocqueville, during his journey to Sicily, remarks the lack of trust among the Sicilian community (Gambetta, 2000).[4]

In this context, the value of land appears to be one of the main determinants of the demand for protection. We hypothesize that if 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 rainfall in the decade before 1861 (the year of Italian unification), together with historical and geographical shifters of land productivity: population density in 1861, slope and altitude at municipality level. All these variables are relevant determinants of land value, especially before agricultural mechanization. We do not have a prior about the expected sign of the rainfall variables on current mafia presence. First, the optimal quantity of water depends on the crop type. Second, agriculture economists agree that the effect of rainfall on farm output is not monotonic

[4] 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.

(e.g. Mendelsohn et al., 1994; Kurukulasuriya and Mendelsohn, 2007). Third, historians claim that mafia controlled water wells (e.g. Santino 2002). As far as water wells are concentrated in areas with less rainfall (where the wells' smoothing role is more important), we could expect a negative association between rainfall and the presence of mafia. Overall, we include in our first stage regression rainfall and its squared value to capture the indeterminateness of the direction of the relationship. On the other hand, we anticipate that the altitude and slope should exert a negative effect on the value of land, while the sign of the effect of the population density in 1861 is expected to be positive: the greater the population density, the greater the competition over land acquisition.

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. This would invalidate the exclusion restriction assumption. We argue that even in the presence of time correlations of the instruments, exogeneity relies on the fact that modern agriculture is less sensitive to weather conditions, whilst economic development is less dependent on agriculture. Also, by including the set of controls $\boldsymbol{X_i}$ we take into account other possible transmission channels.[5]

[5] 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, the share of employees in the non-profit sector.

IV. DATA

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 (*Ministero degli Interni*) 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 mafia between 2004 and 2009 (Table I).

As a measure of public transfers to businesses, we employ the Law 488 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 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.[6] The data set contains micro data on each funding application. We aggregate the amount of funds assigned to plants located in each municipality during the period 2004-2009 according to Law 488, normalized by the total number of employees in the same municipality. Table I reports summary statistics. The mean amount of public funds across the 390 municipalities is € 584 per employee, and about 49% of municipalities did not receive any funding over the period considered.

[6] 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).

[Table I about here]

The upper panel of Table I also reports basic features at municipality level, such as the unemployment rate, population density, a measure of social capital and the industry share. The unemployment 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 unemployment rate at municipality level are taken from the 2001 Census of Italian firms conducted by Istat. The mean unemployment rate across the 390 municipalities is around 25%, with a maximum value of 49% reached in Giuliana, a municipality located in the province of the Sicilian capital, Palermo. We measure social capital as the percentage of employees in the non-profit sector over the total number of employees in 2001.

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 Sicilian 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 Sicilian municipalities into 25 different cells (15.6 municipalities per cell on average). The lower panel of Table I presents the summary statistics for the rainfall variable.

The lower panel of Table I also reports the slope and altitude of the municipalities' capitals according to Istat and the municipality's population density in the year of the Italian unification, as of the first Census in December 1861.

Table II presents the results of a simple exercise. We split the municipalities into those which experienced mafia-related crimes and those which did not. The median amount of funds is greater in municipalities which experienced mafia-related crime in the period considered, than in municipalities which did not witness any mafia-related crime. The difference between the medians is statistically significant at the 5% level. This first result is consistent with the idea of a positive relationship between public funds and mafia presence.

[Table II about here]

V. EMPIRICAL RESULTS

V.A. OLS Results

First, we investigate the impact of mafia presence on public funds using simple OLS estimation. As outlined in Section 2, we always include the unemployment rate and the industry share at municipality level among our control variables. The indicator variable mafia is never statistically significant and the estimation results are not affected when we control for population density (Table III, columns 2 and 4) and social capital (Table III, columns 3 and 4).

[Table III about here]

V.B. Instrumental Variable Analysis

As discussed in Section 2, the OLS 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*. Table IV presents the estimation results for the 2SLS analysis. The excluded instruments are average rainfall in the period preceding Italian Unification (1850-1861), rainfall squared, altitude, slope and population density in 1861.

Column 1 of Table IV reports the estimates of the basic 2SLS specification. The excluded instruments are jointly statistically significant and the F-test of the exclusion restriction is equal to 12.9, while the test of overidentified 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 public transfers. These results hold also when we control for additional regressors, such as population density (columns 2 and 4), and social capital, measured by the percentage of employees in the non-profit sector (columns 3 and 4). The effect is economically relevant: it amounts to about one standard deviation of the dependent variable. Our estimates show that mafia presence increases the total amount of funds by about 35%.

We have undertaken a series of preliminary robustness checks by varying the set of control variables to include human capital (measured by the number of college graduates) at municipality level and employment share by two-digit sector. The overall explicative power of these alternative specifications does not outperform the more parsimonious representation shown in Table IV. [7]

[Table IV about here]

VI. ROBUSTNESS CHECKS

In this section we present a series of robustness checks. We start by considering alternative econometric specifications. Then we use alternative measures of mafia to take into account the number of mafia-related crimes within each municipality. Next, we consider different estimation methods, namely GMM estimation and a treatment effect model that takes into account the binary nature of the endogenous explanatory variable. We provide evidence that the results hold also when we take into account the potential issue of weak instruments.

VI.A. Alternative Econometric Specifications

Table V presents the results of an alternative set of specifications. In columns 1 and 2 we report the estimated coefficients of an econometric specification which adds province fixed effects (9 provinces) to the specification presented in column 4 of Table IV. The impact of mafia on public transfers is still statistically significant at the 5% level. Columns 3 and 4 present the results for an econometric specification in which we control for Local Labor market (LLM) fixed effects. 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, with an average of 5 municipalities per local labor market. The estimated coefficient on the mafia variable is still positive and statistically significant at the 5% level. In both cases the magnitude of the coefficient of interest is very similar to that shown in Table IV.

[7] Results are not reported here but available from the authors upon request. Clustering standard errors at province level or rainfall cell level does not affect the results either. The details of these robustness checks are available from the authors upon request.

[Table V about here]

Finally, columns 5 and 6 present 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. The LLM fixed effect specification partially addresses this issue. In order to fully 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 municipality (other than *i*) belonging to the local labor market of municipality *i*. 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.

VI.B. Alternative Measures of Mafia

In this section we 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.[8] Second, we replace the mafia indicator variable with the actual number of mafia-related episodes per capita according to the Art. 416-*bis* of the Penal Code.[9]

Consistent with the previous results, the estimated coefficient on *mafia-narrow* in column 2 of Table VI is statistically significant at the 5% level. Not just the presence of mafia, but also the number of mafia episodes significantly affects the amount of public funds. Although the instruments are weaker in this specification, they are still valid, as reported by the P-value of the test for overidentification restrictions.

[Table VI about here]

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

[9] On average, the number of mafia-related episodes per capita is 0.02 per municipality, with the municipality Gurgio (Agrigento) experiencing the highest number of mafia-related episodes over the 2004-2009 period.

VI.C. Alternative Estimation Methods

Next, we replicate the econometric analysis by relying on two different estimation methods. Table VII presents the new estimation results. Columns 1 and 2 report the estimates for the GMM analysis. The estimated coefficient on the mafia variable is close to the one presented in Table IV and it is statistically significant at the 1% level.

In the last two columns we take into account that our endogenous variable is binary, therefore estimating a probit first stage. Column 3 reports the results of the probit estimation of the first stage, while column 4 presents the second stage. The mafia variable is statistically significant at the 1% level.

[Table VII about here]

VI.D. Coping with Weak Instruments

In this section we deal with the issue of weak instruments. Although the F-test of the exclusion restriction is always above the 10 cut-off value in the main specification (Table IV), 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.[10]

The first column of Table VIII 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 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. Columns 2 to 4 present the results of the limited information maximum likelihood estimation for different Fuller values. The results confirm the positive impact of mafia on public funds.

[10] For a review of the literature coping with weak instruments, see Murray (2006).

[Table VIII about here]

VII. 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.

VII.A. 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 (distinguishing among nursery services, primary school and lower-secondary school), divided by the corresponding population.[11] We conduct an instrumental variable analysis as in Table IV, where the dependent variable is one of the four expenditure items listed above. Table IX reports the estimation results of this falsification test. The estimated impact of mafia presence on expenditure on culture,

[11] Culture expenditure is divided by total population; expenditure for nursery service, primary school and lower-secondary school are divided by the population aged 3-5, 6-10 and 11-13, respectively. Unfortunately, only a small set of expenditure items are available at municipality level. For example, expenditure on education above the lower-secondary level is only available at a more aggregate locality level.

nursery services and lower secondary school is not statistically significant, while it is negative and statistically significant at the 1% level on primary school expenditure. These results contradict the view that the State is more likely to be generous towards municipalities where mafia is present. If anything, these municipalities seem to be underfunded, as in the case of primary school expenditure, relative to municipalities where mafia is absent.

[Table IX about here]

VII.B. 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 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. We can proxy the number of fictitious firms created by mafia with the number of businesses 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.[12] Column 1 of Table X provides evidence of the link between organized crime and firms. We create an indicator variable $seized\ firms_i$ which takes the value 1 if at least one firm is seized in municipality *i* due to mafia connections in 2009; and zero otherwise. Using the same set of exogenous instruments, we show that mafia has a positive, large and statistically significant impact: the probability of having at least one firm seized increases by 54 percentage points (compared to a standard deviation of 0.406) in a mafia-ridden municipality.

Creating a fictitious firm is just a 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.[13] The next step of our analysis is to demonstrate the causal link between mafia and corruption in public administration. Empirical evidence in support of this hypothesis is presented in Column 2 of Table X. The dependent variable is the number of public

[12] *Source*: Agenzia Nazionale per l'amministrazione e la destinazione dei beni sequestrati e confiscati alla criminalita' organizzata (2009).
[13] A number of journalistic inquiries further support the idea that many episodes of corruption also featured the allocation of funds related to the Law 488 (Rai, 2008).

sector corruption events per capita, at municipality level, according to the Italian Penal Code.[14] 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.

Our findings show that the positive effect of mafia on public transfers is very likely to pass through frauds and an extensive set of connections. 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*" (Financial Times, 2010b).

Our results are also consistent with previous findings about the inefficacy of Law 488. 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 show a smaller increase in TFP than non-subsidized firms.

[Table X about here]

VII.C. 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 1 and 2 of Table XI present the results of a simple exercise. We replicate the basic specification of column 4 in Tables III and IV with a new measure of crime that we use instead of *mafia*. We proxy crime culture with a number of other types of crime committed at municipality level,

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

namely manslaughter, involuntary manslaughter and infanticide, divided by population.[15] The new crime variable does not have any statistically significant impact on public transfers in both the OLS estimation (column 1) or the 2SLS estimation (column 2). Therefore, we can rule out that crime culture affects the amount of funding assigned to municipalities.

[Table XI about here]

VIII. 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. According to our estimate, organized crime increases the total amounts of funds by about 35%. Further results suggest that 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. 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

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

Communities (2008), the number of irregularities related to European Structural 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*".[16]

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.

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

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Table I: Summary statistics

Variable	Description and unit of measurement	Obs.	Mean	Median	S.D.	Min	Max
Public Funds	(‘000s) Euros / # of employees	390	0.584	0.012	1.256	0.000	8.585
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
Unemployment Rate	# unemployed / labour force in 2001	390	0.256	0.253	0.068	0.084	0.496
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
Rainfall	Average mm per year 1851-1860	390	602.835	595.455	68.570	402.762	785.680
Slope	Metre/ 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
Population density 1861	(‘000s) persons / km^2 in 1861	390	0.136	0.096	0.135	0.005	1.258

Table II: Public funds by mafia presence

	Mafia = 0 (1)	*Mafia = 1* (2)	Difference (2) – (1)
Median Public Funds	0.000 (327 obs.)	0.187 (63 obs.)	0.187**

** significant at 5%.

Table III: Public funds and mafia – OLS estimates

	(1)	(2)	(3)	(4)
	Public funds			
Mafia	0.010	0.018	0.016	0.024
	(0.149)	(0.149)	(0.148)	(0.149)
Unemployment Rate	-2.854***	-2.843***	-2.889***	-2.877***
	(0.977)	(0.977)	(0.977)	(0.977)
Industry share	2.855***	2.855***	2.822***	2.823***
	(0.877)	(0.877)	(0.880)	(0.880)
Population density		-0.054		-0.050
		(0.044)		(0.044)
Social Capital			-1.597	-1.555
			(1.618)	(1.624)
Observations	390	390	389	389
R-squared	0.07	0.07	0.07	0.07

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

Table IV: Public funds and mafia – 2SLS analysis

	(1)	(2)	(3)	(4)
	Second stage			
	Public funds			
Mafia	1.151**	1.247**	1.196**	1.292***
	(0.466)	(0.496)	(0.471)	(0.500)
Unemployment rate	-3.546***	-3.567***	-3.629***	-3.649***
	(0.954)	(0.960)	(0.951)	(0.958)
Industry share	2.752***	2.746***	2.712***	2.708***
	(0.924)	(0.926)	(0.928)	(0.930)
Population density		-0.123*		-0.121*
		(0.071)		(0.071)
Social capital			-2.227	-2.167
			(1.729)	(1.735)
	First stage			
	Mafia			
Rainfall 1850-61	-0.019***	-0.019***	-0.019***	-0.019***
	(0.005)	(0.005)	(0.005)	(0.005)
Rainfall 1850-61 Squared	0.015***	0.015***	0.015***	0.015***
	(0.004)	(0.004)	(0.004)	(0.004)
Slope	-0.002***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Altitude	-0.207***	-0.201***	-0.208***	-0.204***
	(0.066)	(0.067)	(0.066)	(0.067)
Population density 1861	0.271*	0.231	0.268*	0.234
	(0.150)	(0.169)	(0.149)	(0.169)
Test overid. P-value	0.1034	0.1459	0.1302	0.1875
First stage *F*	12.9378	11.9703	12.7537	11.8269
Shea Par. R2	0.1639	0.1566	0.1622	0.1552
Observations	390	390	389	389

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

Table V: Instrumental variable analysis. Alternative specifications

	Province fixed effects		LLM fixed effects		Mafia in neighbouring municipalities	
	(1)	(2)	(3)	(4)	(5)	(6)
	First stage	Second stage	First stage	Second stage	First stage	Second stage
	Mafia	*Public funds*	*Mafia*	*Public funds*	*Mafia*	*Public funds*
Mafia		1.308**		1.165**		1.260***
		(0.599)		(0.591)		(0.470)
Mafia - neighbour						0.033
						(0.125)
Rainfall 1850-61	-0.014**		-0.027***		-0.019***	
	(0.006)		(0.008)		(0.005)	
Rainfall 1850-61 Squared	0.011**		0.022***		0.015***	
	(0.005)		(0.007)		(0.004)	
Slope	-0.002***		-0.002*		-0.002***	
	(0.001)		(0.001)		(0.001)	
Altitude	-0.261***		-0.343***		-0.204***	
	(0.074)		(0.104)		(0.067)	
Population density 1861	0.221		0.178		0.233	
	(0.169)		(0.207)		(0.170)	
Test overid. P-value	0.1381		0.1679		0.1798	
First stage *F*	6.43876		6.01082		10.9238	
Shea Par. R2	0.0932		0.0978		0.1415	
Observations		389		389		389

All regressions include population density, unemployment rate, social capital and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table VI: Instrumental variable analysis. Alternative measures of mafia

	Mafia narrow		Mafia per capita	
	(1) First stage	(2) Second stage	(3) First stage	(4) Second Stage
	Mafia narrow	*Public funds*	*Number of mafia episodes*	*Public funds*
Mafia - narrow		1.522** (0.641)		
Number of mafia episodes				8.724** (3.771)
Rainfall 1850-61	-0.014*** (0.005)		-0.003** (0.001)	
Rainfall 1850-61 Squared	0.011*** (0.004)		0.002** (0.001)	
Slope	-0.002*** (0.001)		-0.000* (0.000)	
Altitude	-0.152** (0.065)		-0.029* (0.017)	
Population density 1861	0.279 (0.170)		-0.003 (0.024)	
Test overid. restr. - *p*		0.1335		0.4052
First stage *F*		8.35141		5.16197
Shea Par. R2		0.1207		0.0529
Observations		389		389

All regressions include population density, unemployment rate, social capital and industry share. Instrumented variable, column 2: Mafia-narrow. Instrumented variable, column 4: Number of mafia episodes. Excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table VII: Alternative estimation methods

	(1)	(2)	(3)	(4)
	First stage	Second stage	First stage	Second stage
	Mafia	*Public Funds*	*Mafia*	*Public Funds*
Mafia		1.287***		1.563***
		(0.468)		(0.251)
Rainfall 1850-61	-0.019***		-0.032*	
	(0.005)		(0.019)	
Rainfall 1850-61 Squared	0.015***		0.025	
	(0.004)		(0.016)	
Slope	-0.002***		-0.011***	
	(0.001)		(0.004)	
Altitude	-0.204***		-1.138**	
	(0.067)		(0.483)	
Population density 1861	0.234		0.731**	
	(0.169)		(0.351)	
Estimation method	GMM		Treatment effect model	
Test overid. restr. - *p*		0.1875		
First stage *F*		11.8269		
Shea Par. R2		0.1552		
Observations		389		389

All regressions include population density, unemployment rate, social capital and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table VIII: Coping with weak instruments

	(1) CLRT	(2) Fuller1	(3) Fuller2	(4) Fuller3	(5) Fuller4
	Public Funds				
Mafia	1.292***	1.382***	1.358***	1.335***	1.312***
	(0.462)	(0.534)	(0.525)	(0.517)	(0.508)
Confidence set					
Conditional LR	[0.501, 2.528]				
Anderson- Rubin	[0.302, 2.850]				
Observations	389	389	389	389	389

All regressions include population density, unemployment rate, social capital and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table IX: The effect of mafia on other expenditure items

	(1)	(2)	(3)	(4)
	Culture	*Nursery services*	*Primary school*	*Lower-secondary school*
Mafia	-10.293	-127.559	-234.327***	14.018
	(8.343)	(137.155)	(76.218)	(44.264)
Test overid. restr. *p-value*	0.5119	0.3716	0.1676	0.4092
First stage *F*	11.8269	11.8269	11.8269	11.8269
Shea Par. R2	0.1552	0.1552	0.1552	0.1552
Observations	389	389	389	389

All regressions include population density, unemployment rate, social capital and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table X: Mafia and corruption

	(1)	(2)
	Seized firms	Corruption per capita
Mafia	0.541***	0.072*
	(0.144)	(0.041)
Test overid. restr. - *p*	0.2034	0.1484
First stage *F*	11.8269	11.8269
Shea Par. R2	0.1552	0.1552
Observations	389	389

All regressions include population density, unemployment rate, social capital and industry share. Instrumented variable: mafia. Excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table XI: Public funds and crime culture

	(1)	(2)
	Public Funds	
Other Crime	0.067	0.069
	(0.105)	(1.012)
Estimation method	OLS	2SLS
Test overid. restr. - *p*		0.0051
First stage *F*		3.52344
Shea Par. R2		0.0184
R^2	0.0688	
Observations	389	389

All regressions include population density, unemployment rate, social capital and industry share. Column 2, instrumented variable: Other crime. Column 2, excluded instruments: Rainfall 1850-1861, Rainfall squared, population density in 1861, slope and altitude. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.