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Does Organized Crime Attract EU Funding?

Evidence From Sicily

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Abstract:

This study analyzes the impact of Mafia on the allocation of EU funding. We focus on EU subsidies directed to the 390 Sicilian municipalities from 2007 to 2019. We proxy current Mafia activity by confiscated real estate assets from organized crime and instrument it with geographical shifters of land value. We show that the presence of Mafia increments the amount of EU funds and the number of EU projects assigned to municipalities. We repeat the analysis across different types of investments. A series of robustness checks confirms the reliability of our baseline results.

Keywords: EU Funds, Organized Crime, Public Funds Misappropriation, Sicily

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1. Introduction

According to recent estimates, the total combined annual revenues of Mafias in Italy are equal to 10.7 billion euros (Transcrime 2013).[1] The main source of earnings for organized crime groups are illegal activities such as corruption, drug trafficking, and extorsion. Since the 1970, organized crime also started to re-invest its profits within the legal-economy, by infiltrating politics and administration at the local level (Di Cataldo and Mastrorocco 2020).

In this context, an important source of revenues for criminal organizations is the misappropriation of public funds. For instance, Barone and Narciso (2015) show that municipalities with stronger Mafia presence are between 62 and 64 percentage points more likely to receive public subsidies and they obtain on average a higher amount of funds.

At the same time, among public funding, emerging evidence suggests that also a great fraction of EU funds is lost in fraud and corruption; according to the European Anti-fraud Office (OLAF), 254 recommendations were issued in 2019 mostly concerning the recovery of nearly 485 million EU funds. Only in January 2020, Italian authorities have arrested 94 members linked to two Mafia clans in Sicily that were targeting EU rural development funds worth 5.5 million euros (EU-OCS).

In this paper, we analyze the effect of organized crime on EU disbursements in Sicily, which is of great interest for two reasons. First, Southern-Italian regions receive on average a higher fraction of EU Structural funds, mainly EU regional development funds, as their GDP per capita is below 75% of the EU27 average. In particular, Sicily received more than 36 billion euros from Cohesion policy programs since 2007, while Italy in total received more than 170 billion euros, including

[1] Mafias comprises: Camorra from Campania, 'Ndrangheta from Calabria, criminal organization from Apulia and Sicilian Mafia.

both EU and national resources (Opencoesione). Second, Mafia presence is traditionally stronger in Southern regions (Transcrime, 2013), and in particular, looking at the historical origins of Mafia, it initially developed in Sicily.

Given the high concentration of EU funding and organized crime presence in this region, our analysis aims at improving the understanding of organized crime activity by detecting the (causal) effect of Mafia on the distribution of EU transfers. We aggregate the amount of EU funds and projects received by each of the 390 Sicilian municipalities during the 2007 – 2019 period, that covers two complete EU funding programs each operating in seven years cycles. We look at subsidies from EU Structural funds, that usually require a national co-funding amount and focus on the fraction financed exclusively by EU resources.

To define a causal relationship between organized crime and EU funding, we must deal with endogeneity concerns due to measurement errors, omitted variable bias, and reverse causality. We mitigate these concerns as follows. First, we proxy for Mafia presence, at the municipal level, aggregating data on the confiscations of real estate properties from organized crime during the same period. Second, we use the identification strategy proposed by Barone and Narciso (2015) and instrument Mafia by exogenous shifters of land value, namely rainfall shocks in the 19th century, altitude and slope, conditional on province dummies and a vector of socio-economic controls.

We find that Mafia has a positive impact on the number of EU projects assigned to a municipality and on the amount of EU funds. Additionally, we show that Neighboring-Mafia doesn't seem to impact the allocation of transfers assigned to a single municipality. Furthermore, we look at the impact of organized crime on EU funding subdivided in different types of investments.

Our results are consistent through the analysis and hold when excluding province capitals of the region, and the municipalities that experienced the dismissal of their city council due to mafia infiltrations, confirming that our results are not driven, respectively, by most populated cities or extreme cases of corruption.

The remainder of the paper is structured as follows. Section 2 discusses the most relevant related literature; Section 3 describes our data sources and some descriptive statistics; Sections 4 presents our empirical framework; Section 5 presents our results and robustness checks; Finally, Section 6 concludes.

2. Literature Review

Our study is related to the literature examining the consequences of organized crime presence on different outcomes. One large strand of the literature explores the effectiveness and the economic impact of policies combating corruption; studying the effect of Mafia removal can be seen as indirectly looking at the consequences of organized crime activity.

For instance, many authors analyze one of the most aggressive anti-corruption policies in Italy, namely the "city council dismissal", that consists in the removal of all public officials of a city council when a municipality is found to be infiltrated by Mafia.

Acconcia, Corsetti and Simonelli (2014) find that these episodes often resulted in contractions of public spending, thus they adopt these events as instruments to study the effect of spending cuts on output at the provincial level. Daniele and Geys (2015) measure the effect of city council dismissals on the education of elected politicians, their analysis comprises all the municipalities in Calabria, Campania, Puglia and Sicilia. Using a Difference-in-Difference (DiD) strategy, they find the causal impact of law enforcement against organized crime on politicians' human capital to be positive. Di Cataldo and Mastrorocco (2020) look at the impact of Mafia on the assignment of

public resources. Their DiD estimates provide evidence that infiltrated municipalities do not alter the overall amount of financial resources, in contrast they concentrate on specific components of public spending: they spend more resources in construction and waste management and less on municipal police forces.

While the mentioned works examine the effect of Mafia removal, another strand of literature directly approaches the economic consequences of organized crime. Pinotti (2015) applies synthetic control methods to estimate the counterfactual economic performance of Puglia and Basilicata in the absence of organized crime. Looking at a 30 years period, he finds that the rise of organized crime is correlated with an aggregate economic loss of 16% of GDP per capita. Scognamiglio (2015) documents the effect of a legislative provision allowing the relocation of mafia members to another town in Italy. Using a DiD estimation, she finds that mafia relocation to the northern Italian regions had a positive significant effect on employment in the construction sector.

A series of more recent papers focused on the impact of organized crime on firms at the municipal level, rather than on broad economic sectors. Le Moglie and Sorrenti (2020) use the shock induced to the Italian credit market by the 2007 crisis, to show how provinces with higher organized crime presence had a less severe decline in number of new constituted firms after the crisis. Their results are consistent with the hypothesis that legal economies more infiltrated by organized crime, experienced a lower impact of the crisis. In addition, Mirenda, Mocetti and Rizzica (2019) document the effect of 'Ndrangheta infiltrations on enterprises located in northern and central Italian regions, finding that these infiltrations affect more financially unstable firms and firms reliant on public sector demand. They also show how the revenues of the infiltrated firms increase while the local economic growth in the long-run is negatively affected. Slutzky and

Zeume (2019) contribute to the debate providing evidence that Mafia also acts as a barrier to entry in the market and thus lowers competition, while creating business for firms under its protection.

Within the strand of literature that analyzes the economic impact of organized crime, there are studies that investigate the economic effects of organized crime on public transfers, and they are most closely related to the present paper.

For instance, Barone and Narciso (2015) prove that Mafia has a positive impact on the allocation of public funds. They overcome the endogeneity concerns related to organized crime activity, instrumenting Mafia in Sicilian municipalities with Rainfall in the 19th century and geographical shifters of land productivity. As already mentioned, they conclude that municipalities with greater current Mafia activity are more likely to receive public subsidies and they obtain on average a higher amount of funds. This work is very close to our empirical investigation, not only because we use a very similar identification strategy, but also because the funds considered by them, those granted by Law 488/92, were partly financed by EU resources. Differently from the above mentioned studies, Barone and Narciso (2015) are not looking at the counterfactual analysis of a policy intervention, but focus on the role of Mafia as key factor in the spatial allocation of public transfers, similarly we analyze the effect of Mafia on the spatial allocation of EU resources.

The present study differs in several ways from the last mentioned paper. While using a similar identification strategy for Sicilian municipalities, we examine the effect of Mafia activity primarily on the assignment of EU disbursements. We also analyze a longer and different period, namely from 2007 to 2019. Additionally, we use a different measure of Mafia at the municipal level, for instance the number of seized properties from organized crime instead of mafia-related crimes.

Daniele and Di Poppa (2019) also show the impact of organized crime on public funds allocation, by proving the existence of mafia-infiltrated firms applying for European funding.

Using an Italian law that requires companies applying for more than 150.000 euros to undergo a screening to determine whether they are connected to Mafia, they observe companies mainly from mafia-affected cities and operating in mafia-affected sectors sorting below the cut-off value, in order to avoid the investigation.

Finally, since we look at the effect of organized crime specifically on the allocation of EU funds, our study is related to the existing empirical contributions looking at the effect of European regional policies on the economic performance of treated regions (Becker, Egger and von Ehrlich 2010; Becker, Egger and von Ehrlich 2012; Santos and Tavares 2016; Barone, David and de Blasio 2016; Becker, Egger and von Ehrlich 2017). Many studies focus on objective 1 regions (e.g. Italian Southern regions) that absorb the largest part of resources as their GDP per capita is below 75% of the European average (Giua 2016; Di Cataldo 2017).

3. Data

3.1 EU funding variables

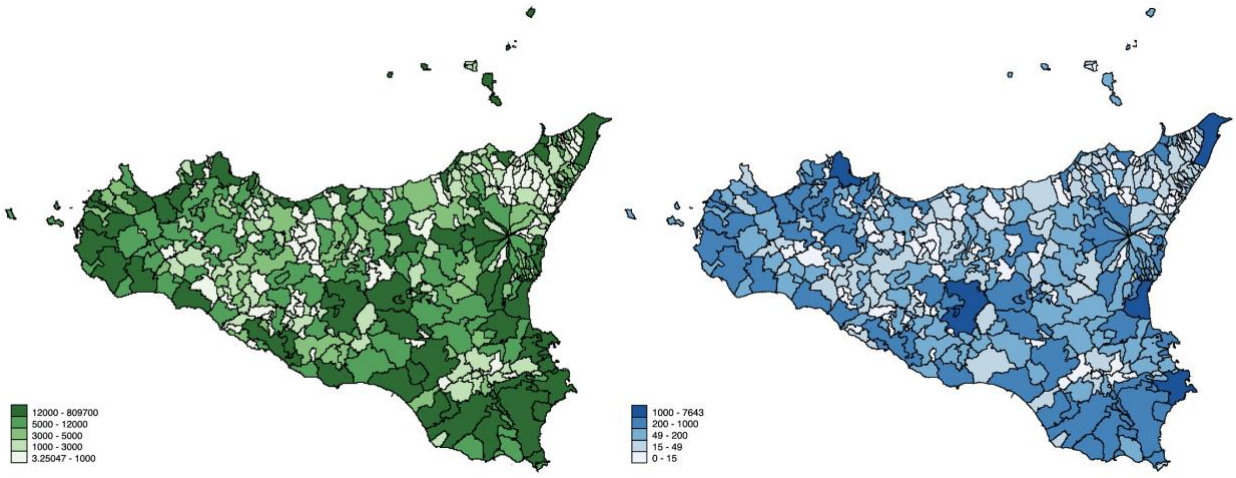
The measures of European funds are based on data made publicly available by *OpenCoesione*, an open government initiative managed by the Department of Cohesion Policy at the Presidency of the Council of Ministers. The portal provides access to all Cohesion Policy projects financed both by EU and national resources.[2] Cohesion policy aims at reducing the regional disparities in the level of development between regions by strengthening economic and social cohesion, and Southern Italian regions (on average poorer than the rest of Italy) are an area that has been receiving large amounts of EU financing. We focus specifically on the portion of financing

[2] Cohesion policy is financed under the European Structural Funds (EU resources), the National Development and Cohesion Fund and the Cohesion Action Plan (both national resources).

originating from EU resources, namely EU Structural and Investment funds for the cycles 2007-2013 and 2014-2020, that comprise the European Regional Development Fund, the European Social Fund and the Cohesion Fund. According to *OpenCoesione*, Italy attracted around 57 billion euros for the first cycle and 46 billion for the second, without including additional national resources. The available information includes: nature of investment (infrastructure, goods and services procurement, incentives to firms or individuals and capital contributions), the theme (which sector receives funding), the localization (which municipality receives funding), the beneficiaries (public or private entities residing in the municipalities), the EU funding and the national co-financing amount.

We restrict our analysis to the Cohesion projects from 2007 to 2019 awarded to beneficiaries living in Sicilian municipalities, namely around 9.7 billion euros. Furthermore, as one project may

Figure 1 *Funds and Projects.*



involve multiple municipalities, making it difficult to uncover the share of payment received by each single municipality, we focus on projects involving exclusively one municipality. We aggregate the data for the whole period. In the upper panel of table 1 we can see the different summary statistics for each measure of EU transfers, namely around 5 billion euros divided across

57000 projects. In figure 1 we can observe respectively how EU funds and EU projects are spatially distributed among the 390 Sicilian municipalities.

3.2 Mafia measures

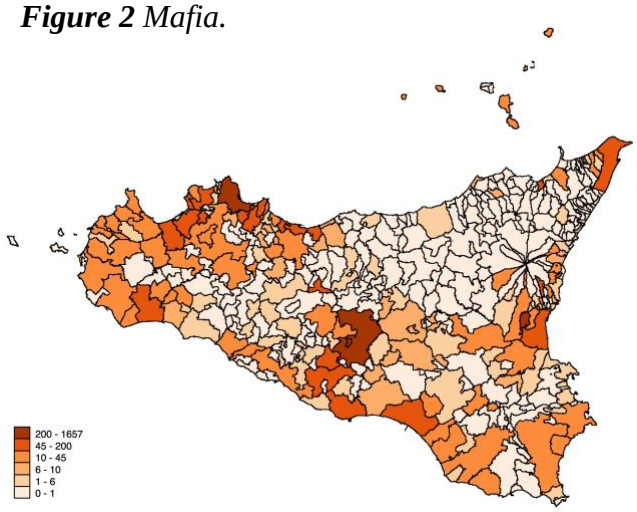
There are many publicly available measures of criminal organization presence at the provincial level, e.g. the number of Mafia related crimes (ISTAT) or the Transcrime Mafia Index (Calderoni 2014), while measuring the presence of organized crime at a more specific level, as at the municipal level, is not easy. Many authors used confidential datasets made available by the Italian Ministry of Interior, that merged information about: mafia-related crimes, seized assets from criminal organizations and dismissed city councils infiltrated by Mafia (Barone and Narciso 2015, De Angelis, De Blasio and Rizzica 2017, Daniele and Geys 2015). To our knowledge, the only publicly available measures of Mafia at the municipal level are dismissed-municipalities and seized assets from criminal organizations.

We decide to adopt the latter as our proxy for Mafia presence; the confiscation of a property can be an accessory penalty when you are found guilty of Mafia related crimes, thus the confiscation order is strong evidence for the presence of organized crime on the territory up until the confiscation occurs: Mafia is operating in the municipality for some time.

The data consists of confiscated firms and real estate properties and is provided by the National Italian Agency Responsible for the Administration and Destination of Assets Seized and Confiscated from organized crime (ANBSC). We restrict our analysis to confiscated real estate properties in Sicilian municipalities from 2007 to 2019. We can observe in figure 2 how our measure is spatially distributed on the Italian island. Furthermore, these events are not concentrated at the beginning or in the end of the period, but they are distributed homogenously in time (Appendix, figure 1A). In table 1, we see that there are on average 13.4 seized properties per

municipality over the period. The number of confiscated real estate properties in Sicily amount to more than 5000 from 2007 to 2019, relatively to around 16000 seized real estate properties on the whole national territory, since year 2000. This is consistent with the fact that most of the confiscations occurred in southern regions where organized crime is traditionally stronger (Transcrime, 2013).

Figure 2 *Mafia.*



3.3 Instrumental variables and controls

We extract the data on rainfall in the 19th century from a study by Pauling et al. (2005) that reconstructs seasonal precipitation in Europe for the period 1500-1900 on the basis of paleoclimate measures.[3] The data is available at $0.5° \times 0.5°$ grid resolution, each Sicilian Municipality is allocated into a cell by minimizing the distance between the municipality and the center of the cell, proceeding as in Barone and Narciso (2015). In total the 390 Sicilian municipalities are assigned to 25 different precipitation cells. In particular, we measure the rainfall shocks in the 19th century as the proportion of the average annual rainfall in 1851-60 on the long-run average annual rainfall

[3] We are grateful to G. Barone for helping with the extraction of the data.

over 1800-50. The data on the other instruments, altitude and slope, are extracted from the Italian National Bureau of Statistics (ISTAT).

Finally, we use additional variables referring to local population density, local employment rate and local educational attainment(i.e. number of high school and college graduates/on total population, excluding children 6 years old or younger). These control variables are extracted from the 2011 Italian Census carried out by ISTAT. The summary statistics for controls and instruments are reported in the lower panel of table 1.

Table 1 *Summary statistics.*

Variable	Obs.	Mean	S. D.	Min	Max
Panel A: ***Dependent variables***					
EU Funds (000's)	390	11642.835	53471.556	3.250	809500
EU Projects	390	147.731	481.002	2	7643
Panel B: ***Explanatory variable***					
Mafia	390	13.364	87.271	0	1657
Panel C: ***Control variables***					
Population Density	390	0.332	0.626	0.003	5.215
Employment rate	390	0.301	0.035	0.223	0.399
Human Capital	390	0.328	0.067	0.177	0.609
Panel D: ***Instrumental variables***					
Rainfall	390	0.982	0.014	0.959	1.026
Slope	390	0.221	0.14	0.018	0.799
Altitude	390	0.419	0.27	0.018	1.37

4. Identification Strategy

We aim at estimating the effect of Mafia presence on the allocation of EU transfers in Sicilian municipalities. First, we try to estimate the effect by OLS, then we carry out an instrumental variable analysis to correct for the possible endogeneity of Mafia. Our analysis exploits cross-sectional/municipality variation.

We rely on two measures of EU funds as our dependent variables, respectively the total amount of funds in euros $EUfunds_i$ and the total number of projects $EUprojects_i$, allocated to a Sicilian municipality from 2007 to 2019. Our explanatory variable is a proxy for *Mafia* activity at the municipal level, namely the number of seized real estate properties from organized crime by the Italian government. We consider the natural logarithmic form of both the dependent and the explanatory variables.

Our two main specifications are respectively:

$$\ln(EUfunds)_{ip} = \beta_p + \beta_2 \ln(Mafia)_{ip} + X'_{ip}\beta_3 + u_{ip} \quad (1)$$

$$\ln(EUprojects)_{ip} = \gamma_p + \gamma_2 \ln(Mafia)_{ip} + X'_{ip}\gamma_3 + v_{ip} \quad (2)$$

where X is a vector that comprises educational attainment, employment and population density to account for heterogeneity across municipalities. Furthermore, as the Sicilian island is subdivided in nine provinces, we include province fixed effects. The standard errors are clustered at the rainfall-cell level, since as previously mentioned, the Sicilian municipalities are located within 25 cells to measure precipitation shocks.

An advantage of focusing on one southern Italian region rather than on the whole South, is that the sample is restricted to an homogenous area in terms of unobservable effects such as culture and social capital, in a country where this elements are considered very diversified (Di Cataldo and Mastrorocco 2020).

As pointed out by Barone and Narciso (2015), the relation between the dependent variables and organized crime could be endogenous for three reasons. First, receiving more EU transfers (or being assigned a higher number of EU projects) could have a positive impact on the expansion of Mafia: in this case the identification would suffer from reverse causality because the relation

between dependent and independent variable wouldn't be one-directional (e.g. Fazekas and King 2018, study the effect of EU Funds on high-level corruption in the Czech Republic and Hungary in 2009–2012.). Second, the measure of organized crime, namely real estate properties confiscated by the government could suffer from measurement error: for example in municipalities where Mafia activity is stronger, part of the evidence that could have resulted in a confiscation order could have been covered up or not reported. [4] Endogeneity could also origin from omitted variable bias, this is the case if determinants of EU transfer allocation are unobserved and correlated to Mafia activity, thus causing Mafia to be correlated with the error term of the regression.

On these grounds, we adopt an instrumental variable (IV) approach and resort to the instruments used by Barone and Narciso (2015). To find instruments that respect the exogeneity and relevance restrictions they go back to the origins of Sicilian Mafia. In their study, they point out that Mafia is known to be born in the second half of the 19th century, in the passage from the Borbone dynasty to unified Italy (1861). In particular, Mafia emerged as an industry for private protection (Gambetta 1993). At the same time, in that historic context there was a great demand for private protection mainly for three reasons. The first was that the end of Feudalism had opened up the market of land, and as there wasn't still legislation protecting the property of newly acquired lands, private protection was needed. Second, the Italian state was still not born (until 1861) and the vacuum of power allowed Mafia to emerge without meeting any opposition. Furthermore, the South of Italy inherited a persistent distrust in public protection from the Spanish domination.

Given this historical framework, Barone and Narciso (2015) conclude that value of land seems one of the most important causes of demand for protection. In other words, the more the land was

[4] Due to "Omertà", the fear of Mafia's revenge. Barone and Narciso (2015) mention Pinotti (2014).

productive in agricultural terms, the more is was valuable and needed protection. Thus, variables affecting the productivity of land would respect the relevance condition and be correlated with Mafia activity. For these reasons, they propose as instruments for current Mafia activity geographical shifters of land productivity, such as: rainfall shocks in the ten years preceding the Italian unification, altitude and slope.

Regarding the exogeneity of the instruments, they claim that these geographical shifters are unlikely to be correlated to current economic conditions because modern agriculture is much less dependent on these factors, and nowadays it plays a smaller role in the economy. Furthermore, the exclusion restriction would not hold if the instrumental variables, conditional on our controls, affected European funding through other channels than organized crime activity, that we are not controlling for.

We proceed in our analysis using the same set of instruments for our measure of Mafia presence, thus our model will exploit cross-sectional variation as the instruments we use are time invariant.

After having selected valid instruments, we can recur to 2SLS estimation to overcome the above-mentioned endogeneity concerns. In particular, we will be able to estimate the impact of Mafia on the assignment of EU funds and projects in two stages. In the first stage (3) we isolate the exogenous variation of Mafia regressing the endogenous variable on the IVs, while in the second stage (4. and 5.) we exploit the obtained exogenous variation to estimate the effect of organized crime on the dependent variables (EU funds and projects).

$$\ln(Mafia)_{ip} = \delta_p + \delta_2 Rainfall_{ip} + \delta_3 Slope_{ip} + \delta_4 Altitude_{ip} + X'_{ip}\delta_5 + s_{ip} \quad (3)$$

$$\ln(EUfunds)_{ip} = \beta_p + \beta_2 \ln(\widehat{Mafia})_{ip} + X'_{ip}\beta_3 + u_{ip} \quad (4)$$

$$\ln(EUprojects)_{ip} = \gamma_p + \gamma_2 \ln(\widehat{Mafia})_{ip} + X'_{ip}\gamma_3 + v_{ip} \quad (5)$$

Possible concerns with our identification strategy could be that outliers might be driving our results. To control for this issue, we include in the our main tables below the specifications excluding the most populated municipalities (Province capitals), and the cities that experienced an aggressive anti-corruption policy (city council dismissal because of mafia infiltrations), in order to isolate the effect of Mafia on EU funds allocation.

5. Results

5.1 OLS Estimation

In table 2 we present the OLS estimates, respectively equations (1) and (2) mentioned above, for the impact of organized crime on the allocation of EU Projects (columns 1 to 4) and on the allocation of EU funds (columns 5 to 8), assigned to beneficiaries resident in a Sicilian municipality during the period.

Columns 1-2 show a positive and significant impact of organized crime on the issuance of Cohesion Projects financed by European resources, in particular the specification in column 2 including both controls and province fixed effects, shows that a 1% increase in Mafia, increases on average the number of EU Projects allocated to a municipality by 0.407%, holding other factors fixed. The results are consistent when excluding the nine province capitals of Sicily (column 3), showing that the effect of Mafia is not driven by the most populated cities (according to ISTAT the population of the province-capitals is equal to more than ¼ of the total Sicilian population).

Our results are also consistent when excluding the towns that experienced the dismissal of the city council due to organized crime infiltrations, suggesting that presence of Mafia is spread on the territory and its impact on EU resources is not driven by the most extreme cases of connections to organized crime.

Table 2 *OLS – Mafia and European funding.*

	EU Projects				EU Funds			
	Total sample		No Province Capitals	No Dismissed Councils	Total sample		No Province Capitals	No Dismissed Councils
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mafia	0.485***	0.407***	0.347***	0.420***	0.432***	0.365***	0.282***	0.393***
	(0.054)	(0.052)	(0.056)	(0.053)	(0.08)	(0.083)	(0.089)	(0.082)
Controls	no	yes	yes	yes	no	yes	yes	yes
Province dummies	yes	yes	yes	yes	yes	yes	yes	yes
Obs.	390	390	381	356	390	390	381	356
R^2	0.354	0.419	0.349	0.430	0.254	0.306	0.238	0.311

The dependent variable and the explanatory variable are measured in logarithms for all specifications. The control matrix includes population density, employment and human capital. The total sample comprises all the 390 Sicilian municipalities. The subsample in columns (3) and (7)excludes the capital-municipalities for each of the nine provinces, while the subsample in columns(4) and (8) excludes all the municipalities that experienced city council dismissal due to Mafia infiltrations. Standard errors are clustered at Rainfall cell level. *Significant at 10% **Significant at 5% ***Significant at 1%

The effect of criminal organizations in diverting EU resources is positive and significant also when looking at the impact on the total amount of EU funds received by a city during the period (columns 5-8). For instance, a 1% increase in Mafia, increases on average the amount of EU Funds allocated to a municipality by 0.365% (column 6), holding other factors fixed. The results are again consistent when excluding Province capitals (column 7) and when excluding the municipalities that had their city council removed because of connections to organized crime (column 8).

5.2 Instrumental variable analysis

As mentioned in the *Identification Strategy* the OLS results could be invalid on the grounds of measurement error, omitted variable bias or reverse causality, since the zero conditional mean assumption $E(u|Mafia) = 0$ would not be holding. To overcome this issue we proceed with instrumental variable analysis by 2SLS estimation.

In table 3 we present the estimates of the First stage, that refers to equation (3). According to Barone and Narciso (2015), we would expect Rainfall shocks in 1851-60 to have a positive effect on value of land (thus on Mafia), while Altitude and Slope are expected to have a negative impact. Indeed, we can observe that Rainfall has a positive and statistically significant effect on Mafia

(column 2), while Altitude has a negative statistically significant impact (columns 1-2). Slope is not significant across the different specifications, but it is included to be coherent with Barone and Narciso's (2015) identification strategy. The excluded instruments are jointly statistically significant, in fact the F-test of the exclusion restriction is always greater than 10. These results are consistent in our additional specifications excluding province capital cities and mafia infiltrated city councils (columns 4-5).

Table 3 First Stage

	Mafia				
	Total sample			No Province Capitals	No Dismissed Councils
	(1)	(2)	(3)	(4)	(5)
Altitude	-1.602***	-0.943***	-0.963***	-1.136***	- 0.949***
	(0.232)	(0.312)	(0.287)	(0.272)	(0.324)
Slope	-1.005	-1.305	-1.125	-0.793	-0.951
	(0.799)	(0.833)	(0.704)	(0.802)	(0.810)
Rainfall	19.638	20.674*		20.518*	20.040
	(14.481)	(12.163)		(11.584)	(12.774)
Rainfall 1751-60			3.512		
			(8.073)		
Controls	no	yes	yes	yes	yes
Obs.	390	390	390	381	356
F-stat	21.74	20.21	20.10	17.01	12.30

The endogenous variable -*Mafia*- is measured in logarithms. The control matrix includes population density, employment and human capital. The total sample comprises all the 390 Sicilian municipalities. The subsample in column (4) excludes the capital-municipalities for each of the nine provinces, while the subsample in columns (5) excludes all the municipalities that experienced city council dismissal due to Mafia infiltrations. Standard errors are clustered at Rainfall cell level. *Significant at 10% **Significant at 5% ***Significant at 1%

In column 3, we offer an informal test for the hypothesis that rainfall shocks in the ten years preceding the Italian unification are expected to be a good predictor of Mafia activity, by showing that, on the other hand, rainfall shocks in the 18th century are not a good instrument for Mafia presence.[5] For instance, we estimate the first stage using rainfall shocks in 1751- 60 instead of

[5] Namely one-hundred years before the Italian Unification.

rainfall shocks in 1851-60, and show that the estimated coefficient of rainfall in 1751-60 is indeed not statically significant.

Having explored the link between the endogenous variable *Mafia* and the instruments, we now address the results of the second stage in table 5; these are the estimates of equations (4) and (5). Mafia has a positive effect on the number of projects (columns 1 to 4) and on the amount of funds (columns 5 to 8), and more importantly the estimated coefficients indicate an upward revision of the OLS estimates. In the specification including the controls (column 2), there is a an upward revision of 0.32 percentage points of the impact of organized crime on the number of cohesion policy projects assigned to a municipality. Similarly, column 6 shows an upward revision of 0.20 percentage points on the effect of Mafia on the amount of funds allocated. These results hold in both models when we do not include the controls (columns 1,5). Furthermore, the results are consistent when excluding the nine most populated municipalities (in columns 3 and 7), and when excluding the extreme cases of Mafia infiltrated city councils, suggesting once again that our results are neither driven by the most populated cities and neither by the most corrupted municipalities included in our data set.

Table 4 *Second Stage.*

	EU Projects				**EU Funds**			
	Total Sample		No Province Capitals	No Dismissed Councils	Total sample		No Province Capitals	No Dismissed Councils
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mafia	0.776***	0.731***	0.610***	0.738***	0.643***	0.573**	0.474**	0.575**
	(0.152)	(0.211)	(0.201)	(0.241)	(0.187)	(0.235)	(0.217)	(0.246)
Controls	no	yes	yes	yes	no	yes	yes	yes
Province dummies	yes	yes	yes	yes	yes	yes	yes	yes
Obs.	390	390	381	356	390	390	381	356
R^2	0.274	0.330	0.286	0.344	0.220	0.276	0.211	0.289

The dependent variable and the explanatory variable are measured in logarithms for all specifications. The control matrix includes population density, employment and human capital. The total sample comprises all the 390 Sicilian municipalities. The subsample in columns (3) and (7) excludes the capital-municipalities for each of the nine provinces, while the subsample in columns(4) and (8) excludes all the municipalities that experienced city council dismissal due to Mafia infiltrations. Standard errors are clustered at Rainfall cell level. *Significant at 10% **Significant at 5% ***Significant at 1%

As pointed out by Barone and Narciso (2015), the main source of downward bias in the OLS estimates could be measurement error (i.e. underreporting of proofs against mafia in municipalities where mafia presence is stronger could lead to less real estate confiscations) or the presence of an omitted variable that is positively correlated with organized crime activity and negatively correlated to the dependent variables.

5.3 Spatial Correlation

In the next specification, we want to take into account the possibility that Mafia is spatially correlated across municipalities, if that were the case we would expect property confiscations spillovers across municipalities and ignoring these would result in omitted variable bias (Barone and Narciso 2015).

We replicate our baseline results adding as a control the natural logarithm of $Neighbor\text{-}Mafia_{i,}$ that measures the number of seized real estate properties in confining municipalities. Table 6 shows that *Mafia* is still positive and statistically significant consistently with our baseline results, while the measure of spatial correlation $Neighbor\text{-}Mafia_{i}$, is not statistically significant in both specifications (columns 1-2), ruling out the mafia spillovers across municipalities.

In other words, we are capturing the impact of local organized crime and not the impact of neighboring organized crime on EU disbursement; These results suggest that there is no effect on EU resources from Mafia coordinating across municipalities, thus the choice of including in our analysis projects allocated exclusively to one municipality seems reasonable. On the other hand, it could be that projects allocated to multiple municipalities are indeed impacted by mafia coordinating across municipalities. Unfortunately the data provided by OpenCoesione doesn't allow to determine to exact share of funding going to each involved municipality.

Nonetheless it would be interesting for further research to look at the impact of Mafia and, in particular, of *Neighboring-Mafia*$_i$ on EU subsidies directed to multiple municipalities. In fact, from 2007 to 2019 almost half of the total amount allocated to Sicily was directed to shared projects across cities and provinces; as these projects benefit a large number of cities they usually involve a larger amount of money, which could attract the interest of criminal organizations. For example, the implementing bodies that receive most funding in Sicily are the Italian railway company (RFI) and the Italian road company (ANAS), that work mainly on shared projects (e.g. highways connecting different cities).

Table 6 *Neighboring Mafia – Measuring spatial correlation*

	EU Projects	**EU Funds**
	2SLS	2SLS
	(1)	(2)
Mafia	0.725***	0.579**
	(0.231)	(0.245)
Neighbor-Mafia	-0.023	-0.046
	(0.05)	(0.052)
Controls	yes	yes
Province dummies	yes	yes
R^2	0.344	0.28
First stage F	26.22	26.22
Obs.	385	385

The dependent variable and both the explanatory variables measured in logarithms. Only Mafia is instrumented. The control matrix includes population density, employment and human capital. We excluded five municipalities that are islands.

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

5.4 Impact on different types of investment

Until now we proved that Mafia has a positive and significant effect on the assignment of EU funding in Sicily. However, the impact of organized crime on EU subsidies may differ according to the economic sectors they are allocated to. The investments of Mafia in the legal economy usually affect sectors that require low technological development, have very little regulation,

include small-medium enterprises and have a great availability of public resources (Transcrime 2013). Furthermore, looking at the Firms seized from organized crime in Sicily during 2007-2019 (figure 3A Appendix) the most affected sectors seem to be construction and wholesale and retail commerce.

To assess whether organized crime has a different impact on EU subsidies depending on the type of investment the project is assigned to, we repeat our analysis dividing the projects by nature of investment as provided by *OpenCoesione*. The projects are classified in 1) *Procurement of goods and services, 2) Infrastructure 3) Incentives for Firms 4) Grants to individuals 5) Capital contributions.* Most projects assigned to Sicilian municipalities are allocated to the first two typologies of investments. We leave the last type of investment out as there are not enough observations included when looking at Cohesion projects assigned exclusively to one municipality.

Table 5 presents the OLS and 2SLS estimation results for the impact of Mafia on the allocation of EU projects and EU funds by types of investments; we obtain the estimates applying the same specification discussed in our baseline results, however we substitute the dependent variable with *EU projects* and funds *EU funds* for each investment type.

In order to compare the effect of *Mafia* across different investments we standardize the coefficients, obtaining the effect of Mafia on EU funding in standard deviation units (the non-standardized estimates can be found in the appendix in table 4A). Consistently with our previous results the effect of Mafia on the allocation of EU funds is positive and significant across all types of investments, suggesting that organized crime in Sicily is interested in attracting EU resources across different sectors. The effect of Mafia seems to be strong on *Infrastructure* related projects, but also on *Goods and Services Procurement* and *Incentives to Firms.* These results appear to be against the common knowledge that organized crime attracts mainly big infrastructure projects,

but it is important to underline that we are excluding from our analysis most of these projects as they usually belong to the resources directed to multiple municipalities. To visually compare the magnitude of the effect of Mafia across projects we include in the appendix the graph of the standardized coefficients (figure 4A).

Table 5 *Nature of Investments - Standardized coefficients*

	EU Projects				EU Funds			
	Infrastructure	Goods and services	Grants to individuals	Incentives to firms	Infrastructure	Goods and services	Grants to individuals	Incentives to firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mafia - OLS	0.433***	0.343***	0.380***	0.325***	0.282***	0.160***	0.132***	0.128***
	(0.073)	(0.036)	(0.066)	(0.043)	(0.065)	(0.021)	(0.030)	(0.027)
R^2 - OLS	0.297	0.431	0.362	0.381	0.217	0.370	0.304	0.256
Mafia - 2SLS	0.614**	0.638***	0.460***	0.714***	0.379*	0.276**	0.259***	0.288***
	(0.255)	(0.186)	(0.171)	(0.215)	(0.194)	(0.107)	(0.063)	(0.093)
R^2 - 2SLS	0.279	0.336	0.355	0.209	0.204	0.328	0.196	0.163
Obs.	388	353	288	349	388	353	288	349

The dependent variable and the explanatory variable are measured in logarithms. The control matrix includes population density, employment and human capital. The first stage F-stat is above 10 for all specifications. Standard errors are clustered at Rainfall cell level. *Significant at 10% **Significant at 5% ***Significant at 1%

5.5 Additional Robustness Checks

In this section we present a series of additional robustness checks to provide additional evidence for our main findings. We start from our baseline estimates in table 4 (columns 2, 6) and implement the econometric specifications with alternative subsets of instruments and then with other measures of organized crime.

Columns 3 and 6 of table 5A (Appendix) show that our previous results are consistent when including only a subset of instruments, namely altitude and slope. Furthermore, we construct a specification with an alternative measure of Mafia, namely firms seized from organized crime, the results are presented in Columns 1, 2 and 4, 5. Both robustness tests presented provide additional evidence in favor of a downward bias of the OLS estimates (table 2, columns 2 and 6).

Another main concern of our analysis is that it focuses on one Italian region, making it difficult to infer external validity of the results in other Italian or European regions. On the other hand, the Italian mafia can be seen as the "prototype" for other criminal organization around the world, such as drug cartels in South America and the Yakuza in Japan (Pinotti 2015), thus we could assume that the results presented in this study can contribute to understand the effect of organized crime presence also in a broader context.

6. Concluding remarks

An emerging literature suggests that organized crime and corruption distort the well functioning of democratic systems as they have the potential to influence key determinants of economic activity (Di Cataldo and Mastrorocco 2020).

In this paper we focus on one way of affecting the economy, namely through the misappropriation of public funding, and in particular EU funding. In September 2020, the executive director of *Europol* warned the EU that Mafia "might have set their eyes" on the Recovery Funds, urging all member states to monitor carefully where the funding goes. Thus, in this moment in time, it is key to provide evidence on the impact of organized crime on the assignment of EU funding.

According to our estimates, municipalities with a stronger Mafia presence receive a higher amount of EU funds and of EU projects. The results hold, when excluding from the analysis the province capitals and the municipalities that had their city council dismissed because of connections to organized crime. This suggests that most populated cities, and cities experiencing a severe anti-corruption policy are not driving the results.

Additionally, our results are consistent when looking at the impact of organized crime on

different types of investment of EU transfers. Furthermore, our results suggest that Mafia in neighboring municipalities has no role in the diversion of EU subsidies assigned to one municipality.

In conclusion our paper provides an assessment of Mafia as key factor in the spatial allocation of EU transfers, and suggests to take into account its presence in a given territory when designing funding policies. The majority of EU funding aims at strengthening economic and social cohesion, helping mostly European regions, such as Sicily, with a GDP per capita below the 75% of the EU average. As long as the poorest areas are also those with a higher presence of organized crime, EU funding policies should take into consideration the possibility that part of the funding may be attracted by criminal organization. A possible policy implication could be to accompany funding with stronger anti-corruption policies, not only at the national but also at the European level.

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Appendix

Table 1a *Summary Statistics - Units of measurement*

Variable	Description and unit of measurement	Obs.	Mean	S. D.	Min	Max
EU Funds	(000's) Euros	390	11642.835	53471.556	3.250	809500
EU Projects	# of Projects	390	147.731	481.002	2	7643
Mafia	# of Confiscated Real Estates	390	13.364	87.271	0	1657
Alternative measure of Mafia	# of Confiscated Firms	390	1.026	6.737	0	127
Population Density	(000's) persons/km^2 in 2011	390	0.332	0.626	0.003	5.215
Employment rate	# of employed/population in 2011	390	0.301	0.035	0.223	0.399
Human Capital	# of high school and college graduates / total population > 6 years old in 2011	390	0.328	0.067	0.177	0.609
Rainfall	(Mean Rainfall mm 1850-1861)/(Mean Rainfall mm 1800-1849)	390	0.982	0.014	0.959	1.026
Slope	$\tan^{-1}(\frac{Range\ Km}{\sqrt{area/\pi}})$	390	0.221	0.14	0.018	0.799
Altitude	(000's) meters	390	0.419	0.27	0.018	1.37

Figure 1a *Properties seized from Mafia by year*

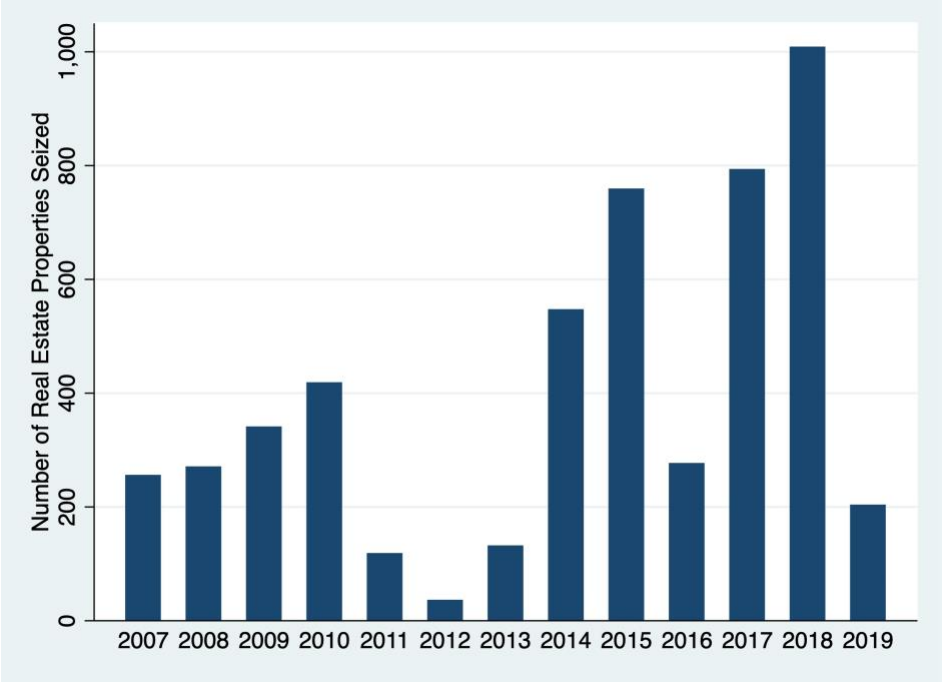

Figure 2a *Real estate properties seized from Mafia by category*

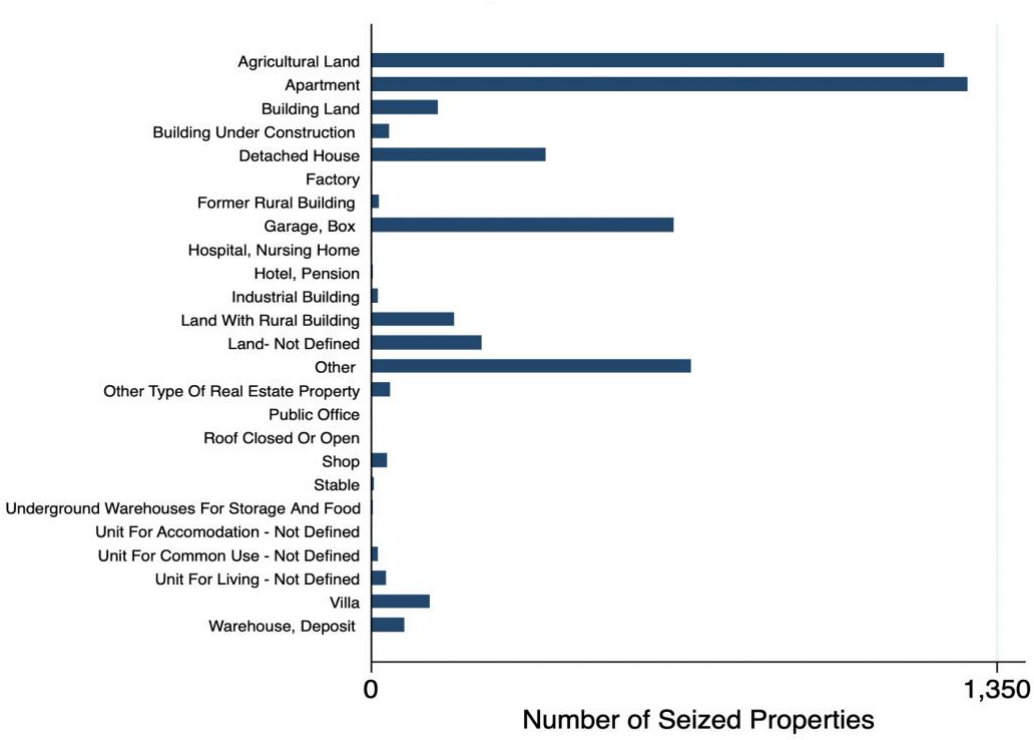

Figure 3a *Seized Firms by category*

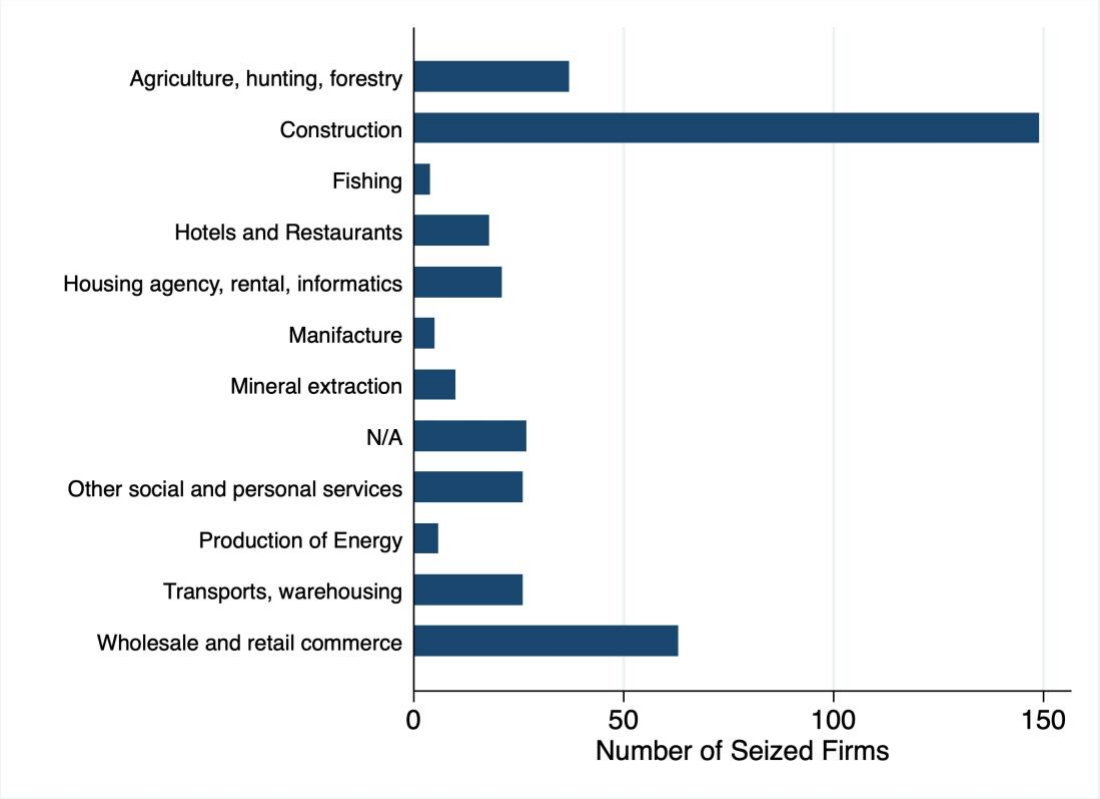

Table 4a *Nature of Investments - Non Standardized*

	EU Projects				EU Funds			
	Infrastructure	Goods and services	Grants to individuals	Incentives to firms	Infrastructure	Goods and services	Grants to individuals	Incentives to firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mafia - OLS	0.219***	0.448***	0.317***	0.293***	0.323***	0.51***	0.479***	0.406***
	(0.037)	(0.047)	(0.055)	(0.038)	(0.075)	(0.066)	(0.111)	(0.087)
R^2 - OLS	0.297	0.431	0.362	0.381	0.217	0.330	0.304	0.256
Mafia - 2SLS	0.290**	0.832***	0.384***	0.643***	0.434*	0.878**	0.94***	0.916***
	(0.122)	(0.242)	(0.143)	(0193)	(0.222)	(0.342)	(0.229)	(0.294)
R^2 - 2SLS	0.279	0.336	0.355	0.209	0.204	0.328	0.196	0.163
Obs.	388	353	288	349	388	353	288	349

The dependent variable and the explanatory variable are measured in logarithms. The control matrix includes population density, employment and human capital. The first stage F-stat is above 10 for all specifications. Standard errors are clustered at Rainfall cell level. *Significant at 10% **Significant at 5% ***Significant at 1%

Figure 4a *Mafia Standardized coefficients across investments types*

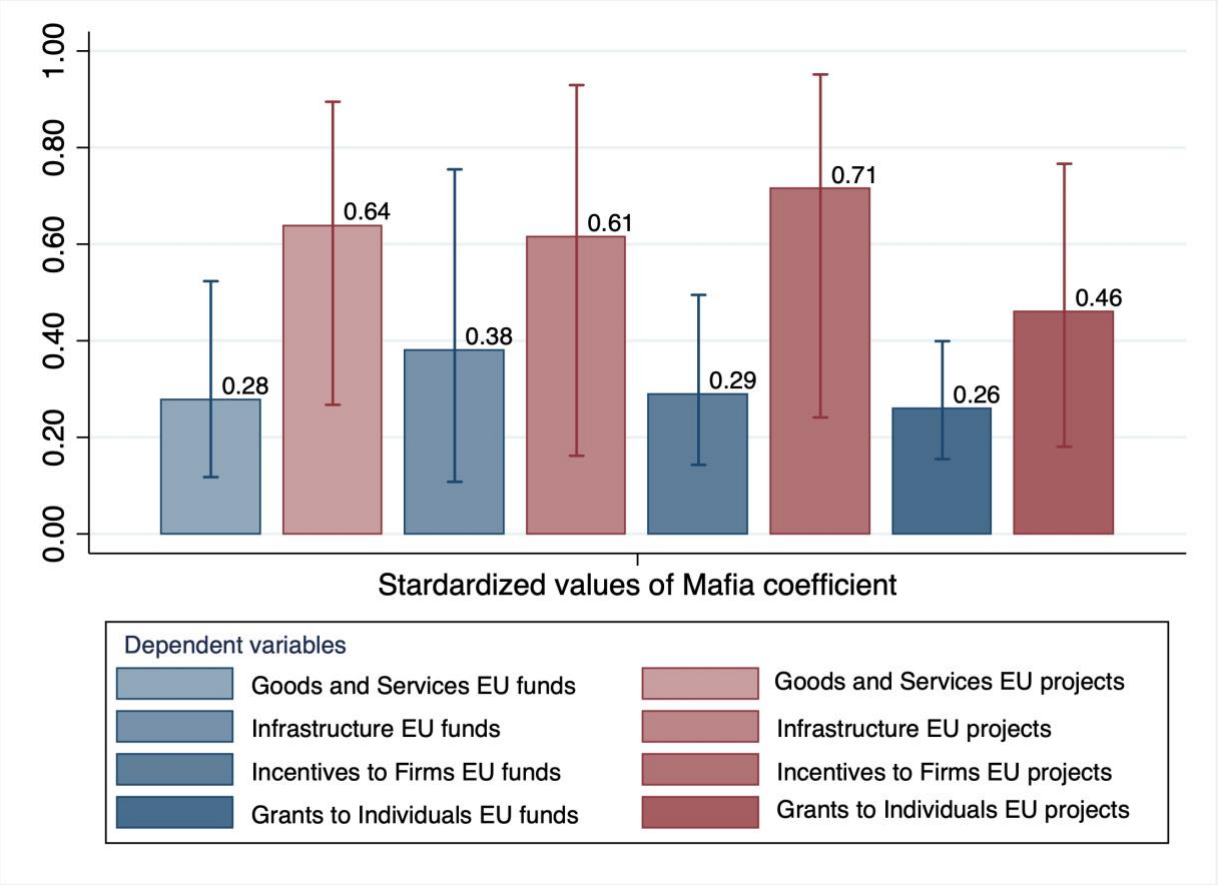

Table 5a *Robustness checks*

	EU Projects			**EU Funds**		
	Alternative measure of Mafia		Subset of instruments	Alternative measure of Mafia		Subset of instruments
	(1)	(2)	(3)	(4)	(5)	(6)
Mafia seized firms	0.994*** (0.059)	2.45*** (0.605)		0.999*** (0.084)	1.85*** (0.052)	
Mafia			0.692*** (0.196)			0.659*** (0.237)
Controls	yes	yes	yes	yes	yes	yes
Province dummies	yes	yes	yes	yes	yes	yes
Obs.	390	390	390	390	390	390
R^2	0.443	0.090	0.350	0.348	0.252	0.247
Estimation method	OLS	2SLS	2SLS	OLS	2SLS	2SLS

The dependent variable and the explanatory variable are measured in logarithms. The control matrix includes population density, employment and human capital. Standard errors are clustered at Rainfall cell level. *Significant at 10% **Significant at 5% ***Significant at 1%