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Organized Crime, Corruption and Growth: Theory and Evidence

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Abstract

We develop a framework for studying the interactions between organized crime and corruption, together with the individual and combined effects of these phenomena on economic growth. Criminal organizations co-exist with law-abiding productive agents and potentially corrupt law enforcers. The crime syndicate obstructs the economic activities of agents through extortion, and may pay bribes to law enforcers in return for their compliance in this. We show how organized crime has a negative effect on growth, and how this effect may be either enhanced or mitigated in the presence of corruption. The latter of these possibilities is evidenced strongly in an exhaustive empirical investigation using a panel of Italian regions for the period 1983-2009.

Keywords: Corruption; Economic Growth; Italy; Organized Crime
JEL Classification: C23; K49; O43

1 Introduction

There is a strong presumption that organized crime typically involves implicit collusion with, or direct participation of, the public sector. In 1994, the United Nation's Naples Declaration officially recognized that organized crime has a "corrupting influence on fundamental social, economic and political institutions", and that the common practice of organized criminal networks is to use "violence, intimidation and corruption to earn profit or control territories or markets".[1] More recently, a survey of public perceptions conducted by the Eurobarometer (2006) revealed that more than half of European citizens believe that most of the corruption in their countries is caused by organized crime.

It is not difficult to understand why criminal syndicates would want to lure public officials - law enforcers, in particular - into corruption. Doing so offers the prospect of greater opportunities to engage in illicit activities with less risk of detection and prosecution. Such activities (including drugs trafficking, money laundering and extortion) are likely to be more successful with the compliance of law enforcement officers who are willing to accept bribes in return for various favours (e.g., turning a blind eye against offences, providing information about police inquiries and falsifying reports about arrests). More generally, organized crime can foster corruption at all levels of public office by targeting different areas - the police, the judiciary and the political administration. This is evidenced in a report by the Center for the Study of Democracy (2010) which focuses on the links between organized crime and corruption in 27 European Member States using a statistical analysis of various indicators and interviews. The report reveals that criminal organizations (especially those involved in prostitution and drugs trafficking)

[1] UN GA Resolution 49/159 Naples Political Declaration and Global Action against Organized Transnational Crime (23/121994); UN GA Resolution 1996/27 Implementation of the Naples Political Declaration and Global Action Plan against Organized Transnational Crime (24/07/1996).

have strong links and in-roads to police forces, using their influence to gain access to undisclosed information on investigations, to guarantee endurance of operations, and to develop and maintain monopolies in local markets. The report also emphasizes the significant relationship between organized crime and political corruption (ranging from government ministers and other high-level politicians, to local mayors and city councilors).[2] It is only in the area of the judiciary where organized crime appears not to have taken a foothold.

The general conclusion of most observers and practioners is that organized crime flourishes most when the functioning of society's public institutions is undermined by corruption. Evidence of this can be found in several empirical studies covering various countries in different regions of the world and at different stages of socio-economic development: examples include Mazzitelli (2007) for West Africa, Sergi and Querimi (2007) for South-East Europe, and Buscaglia and Van Dijk (2003) for a more global sample of territories. Theoretical work on the issue has focused largely on the role of corruption in influencing and compromising strategies to combat organized crime. Becker and Stigler (1974) were the first to point out that the payment of bribes by criminals to law enforcers can weaken the threat of prosecution for criminal activity, suggesting that deterring such activity could be strengthened by remunerating public enforcers sufficiently well and/or paying private enforcers according to performance. These ideas were taken up in subsequent work which raised qualifications and questions about the proposals (e.g., Besley and McLaren, 1993; Mookherjee and Png, 1995). In a similar vein, Bowles and Garoupa (1997) showed why the standard prescription of imposing the maximum fine on criminals may not be optimal when there is complicity between the criminal and arresting officer at the expense of the police department. Chang *et al.* (2000) introduce subjective psychic costs of corruption (moral shame and social stigma), demonstrating how social norms may

[2]The extreme form of this - state capture by organized crime - has been alleged to occur in many of the less developed regions of the world (e.g., Holmes 2010; Shaw 2002).

create conditions under which an increase in fines for criminal activity are counter-productive. Along related lines, Kugler *et al.* (2003) identify circumstances where strategic complementarities between corruption and organized crime mean that tougher sanctions on crime produce higher rates of crime. From different perspectives, Garoupa and Klerman (2004) show that it is optimal to use non-monetary penalties against crime (e.g., imprisonment) more frequently in the presence, than in absence, of corruption, whilst Polinsky and Shavell (2001) suggest that sanctions against corruption, rather than sanctions against crime, are optimal in mitigating criminal behaviour.

Whilst the foregoing research has delivered important results and yielded valuable insights, there is still considerable room for further investigation into the link between corruption and organized crime. A particularly fertile area for investigation is the extent to which this link may have an influence on overall economic performance. This is the theme of the present paper, which takes a step beyond the microeconomic (partial equlibrium) analysis of individual decision making (as exemplified above) towards the relatively unexplored macroeconomic (general equilibrium) analysis of aggregate outcomes (growth and development). The paper uses both theory and evidence in pursuing this new avenue of research.

At the theoretical level, we develop a framework for studying the interactions between organized crime and corruption, together with the individual and combined effects of these phenomena on economic growth. This framework describes an environment in which a criminal organization co-exists with law-abiding productive agents and potentially corrupt law enforcers. The crime syndicate obstructs the economic activities of agents through extortion, and may pay bribes to law enforcers in return for their compliance in this. We first show how the presence of organized crime on its own reduces economic performance by deterring agents from engaging in growth-promoting ventures (capital production). We then show how this effect may

be either exacerbated or mitigated by the coexistence of both organized crime and corruption. In other words, our theoretical analysis suggests that growth may be either higher or lower in a crime-only environment than in a crime-plus-corruption environment.

At the empirical level, we conduct a rigorous econometric analysis with the aim of resolving the above ambiguous result. Using a panel of Italian regions for the period 1983-2009, we find strong evidence that the growth-reducing effect of organized crime is less severe in the presence, than the absence, of corruption. This evidence is based on an exhaustive array of robustness tests, including alternative regression specifications and alternative measures of organized crime.

The remainder of the paper is divided into two main parts. Section 2 presents the theoretical analysis, whilst Section 3 contains the empirical investigation. Some concluding remarks are given in Section 4.

2 Theory

The general framework that we use for our theoretical analysis describes a dynamic, endogenously-growing economy which is populated by heterogeneous agents engaged in different occupations. The engine of growth is capital accumulation, and the set of occupations may include both legal (productive) and illegal (non-productive) activities. The former consist of the production of output and capital, together with the enforcement of governance. The latter consist of illicit profiteering by private individuals and public officials. We begin by describing the benchmark scenario in which the economy is free from any malevolent behaviour. Subsequently, we introduce such behaviour and explore the implications thereof.

2.1 The Economy without Organized Crime or Corruption

We consider an overlapping generations economy in which there is a constant population of two-period-lived agents. Each generation of agents is divided at birth into two groups of citizens - a unit mass of households (or workers) and a unit mass of firms (or entrepreneurs). The former are suppliers of labour when young and consumers of output when old. The latter are (potential) producers of capital when young, and producers and consumers of output when old. All agents are risk neutral and all markets are competitive. We proceed with our formal description of the environment with reference to the behaviour of agents of generation t.

2.1.1 Workers

Each young worker supplies one unit of labour inelastically to old entrepreneurs (producers of output) in return for a wage of w_t. A worker can save this income in two ways. The first is by accessing some storage technology which pays a fixed rate of return of ρ. The second is by making loans to young entrepreneurs (producers of capital), the rate of interest on which is also ρ by virtue of competition between lenders. The proceeds of savings are used to finance retirement consumption.

2.1.2 Entrepreneurs

The ultimate activity of entrepreneurs is the manufacture of final output in the second period of their lives. The inputs to manufacturing are labour (hired from young households of the next generation) and capital (acquired from investment projects undertaken previously by firms of the current generation). A mature entrepreneur employing n_{t+1} units of labour and k_{t+1} units of capital is able to produce y_{t+1} units of output according to

$$y_{t+1} = n_{t+1}^{\alpha} k_{t+1}^{1-\alpha} K_{t+1}^{\alpha}, \tag{1}$$

($\alpha \in (0,1)$) where K_{t+1} denotes the aggregate stock of capital.[3] Labor is hired at the competitively-determined wage rate w_{t+1}, whilst capital is rented at the competitively-determined interest rate i_{t+1}. If an entrepreneur produced κ_{t+1} units of capital when young, then he is a net borrower of capital if $k_{t+1} - \kappa_{t+1} > 0$ and a net lender of capital if $k_{t+1} - \kappa_{t+1} < 0$. His profit is therefore $\pi_{t+1} = n_{t+1}^{\alpha} k_{t+1}^{1-\alpha} K_{t+1}^{\alpha} - w_{t+1} n_{t+1} - i_{t+1}(k_{t+1} - \kappa_{t+1})$ which, for given values of w_{t+1}, i_{t+1}, K_{t+1} and κ_{t+1}, is maximised by choosing n_{t+1} and k_{t+1} so as to satisfy $\alpha n_{t+1}^{\alpha-1} k_{t+1}^{1-\alpha} K_{t+1}^{\alpha} = w_{t+1}$ and $(1-\alpha) n_{t+1}^{\alpha} k_{t+1}^{-\alpha} K_{t+1}^{\alpha} = i_{t+1}$. Since $n_{t+1} = 1$ and $K_{t+1} = k_{t+1}$ in equilibrium, we may state these conditions as

$$w_{t+1} = \alpha k_{t+1}, \tag{2}$$

$$i_{t+1} = 1 - \alpha. \tag{3}$$

In turn, entrepreneurial profits can be written as

$$\pi_{t+1} = (1-\alpha)\kappa_{t+1}. \tag{4}$$

In the first period of life an entrepreneur chooses whether or not to undertake an investment project from which capital is produced. Depending on this choice, either $\kappa_{t+1} > 0$ or $\kappa_{t+1} = 0$. Capital is produced using loans, l_t, acquired from young workers (i.e., workers of the same generation). The capital production technology is given by

$$\kappa_{t+1} = A l_t, \tag{5}$$

($A > 0$). In addition to loans, an investment project requires a certain amount of entrepreneurial effort, e_t, which we assume to be proportional to the scale of the project, as measured by the size of loan: that is, $e_t = \varepsilon l_t$ ($\varepsilon > 0$). Entrepreneurs are heterogeneous in terms of this effort, which is higher

[3] This aggregate externality - a common feature of endogenous growth models - allows us to work with a simple AK technology, where the social returns to capital are constant. Our main results would not change were we to assume diminishing returns to capital, instead.

for some than for others. This may be thought of as reflecting idiosyncratic endowments of technical capabilities (skills, knowledge, expertise and the like) which determine entrepreneurs' efficiency in capital production. We capture this through differences in ε which, for simplicity, is specified to be uniformly distributed on the unit interval with probability density function $f(\varepsilon) = 1$. Accordingly, $\int_{\underline{\varepsilon}}^{\overline{\varepsilon}} f(\varepsilon)d\varepsilon = \overline{\varepsilon} - \underline{\varepsilon}$ gives a measure of entrepreneurs for whom $\varepsilon \in (\underline{\varepsilon}, \overline{\varepsilon})$.

An entrepreneur's final income, m_{t+1}, may be deduced as follows. Recall that the interest rate on loans used for capital production is ρ. Accordingly, either $m_{t+1} = \pi_{t+1} - (1+\rho)l_t$ if an entrepreneur engaged in such production ($\kappa_{t+1} > 0$), or $m_{t+1} = 0$ if an entrepreneur abstained from this ($\kappa_{t+1} = 0$). Equivalently, using (4) and (5), we have

$$m_{t+1} = \begin{cases} Ml_t & \text{if } \kappa_{t+1} > 0, \\ 0 & \text{if } \kappa_{t+1} = 0. \end{cases} \tag{6}$$

where $M = (1-\alpha)A - (1+\rho)$.

An entrepreneur's final utility, u_t, may also be derived straightforwardly. Assuming linear disutility from effort in the production of capital, either $u_t = m_{t+1} - e_t$ or $u_t = 0$ depending on whether or not capital production is undertaken. Given (6), and recalling that $e_t = \varepsilon l_t$, it follows that

$$u_t = \begin{cases} (M-\varepsilon)l_t & \text{if } \kappa_{t+1} > 0, \\ 0 & \text{if } \kappa_{t+1} = 0. \end{cases} \tag{7}$$

As indicated above, the key decision for an entrepreneur is whether or not to engage in capital production when young. The condition for doing so is realised from (7) as $M - \varepsilon \geq 0$, or

$$\varepsilon \leq M \equiv \overline{\varepsilon}. \tag{8}$$

This expression defines a critical level of required effort, $\overline{\varepsilon}$, such that capital production is undertaken (abstained from) by an entrepreneur for whom $\varepsilon \leq \overline{\varepsilon}$ ($\varepsilon > \overline{\varepsilon}$).

2.1.3 Growth

The dynamic general equilibrium of the economy is summarised by a capital accumulation path which describes a process of long-run, endogenous growth. This path is determined as follows.

The quantity $\overline{\varepsilon}$ in (8) gives the fraction of young entrepreneurs who engage in capital production, the total amount of which is therefore $\overline{\varepsilon}\kappa_{t+1}$. This must be equal to k_{t+1}, the total amount of capital that is used by all old entrepreneurs in the production of output. Thus, from (5), $k_{t+1} = \overline{\varepsilon}Al_t$. Since the total amount of loans, l_t, is equal to the total wage incomes of workers, w_t, it follows from (2) that $l_t = \alpha k_t$. Combining these observations, we derive the equilibrium growth rate of the economy as

$$\frac{k_{t+1}}{k_t} = \overline{\varepsilon}A\alpha \equiv g. \tag{9}$$

The key factor in determining growth is the population of capital producers. Any aspect of the environment that influences $\overline{\varepsilon}$ will also influence g. In the present circumstances of perfect markets and perfect governance, it is simply the fundamentals of technology that matter. As shown in (8), $\overline{\varepsilon}$ is determined by M which depends only on the return from, and cost of, undertaking capital production. The higher is A or the lower is ρ the higher is both $\overline{\varepsilon}$ and g as the greater is the number of entrepreneurs who choose to be producers of capital.

2.2 The Economy with Organized Crime

We introduce crime into the model by considering the case in which entrepreneurs are exposed to extortion by an illicit organization - a crime syndicate or cartel - which we refer to as the mafia for shorthand.[4] Like all other

[4]For the purposes of our analysis, we treat the existence of criminal activity as given. The incentives for individuals to engage in such activity is elucidated in the pioneering work of Becker (1968). Our focus is different, being centered on the effects (rather than causes) of crime when this is perpetrated by a well-established, organized criminal network.

agents, the mafia behaves optimally by choosing its racketeering activities so as to maximise its (expected) payoff. Since workers are unaffected by such activties, their behaviour remains the same as before and we do not repeat our description of this.[5]

2.2.1 Law Enforcers

Implicit in the model is a system of law enforcement designed to obstruct and prevent, detect and prosecute, criminal behaviour. For convenience, we refer to enforcers of the law as those immediately responsible for crime prevention - that is, the police, which has a measure of unit mass.[6] In the context of the present environment, it is assumed that the police executes its duties in full accordance with the above objectives for mitigating crime. In return for this, each police official is paid a salary of s_t, which is financed by lump-sum taxes on workers and which is saved in the same manner as workers.

2.2.2 Entrepreneurs

Only those entrepreneurs who choose to produce capital are subject to extortion, since only these agents earn a positive income in accordance with (6). We assume that each of them faces a probability, $p \in (0, 1)$, of being preyed upon ($1 - p$ being the probability of avoiding this). One may think of this probability as reflecting the coverage and quality of policing when law-enforcement is functioning at its most effective level (i.e., when there is no failure in governance, other than the practical and technical difficulties in detecting and prosecuting offenders). The more effective is law-enforcement, the lower is p and the greater is an entrepreneur's protection against preda-

[5] The only change to the circumstances of workers is a lump-sum tax, which is used to pay the salary of law enforcement officials. This is only relevant to computing the dynamic general equilibrium, as we elucidate at the appropriate time.

[6] This is largely for expositional purposes. Our analysis may be extended, or interpreted more broadly, to cover the functioning of higher levels of law enforcement (i.e., the judiciary).

tion.

From each capital producer, the mafia extorts a payment of x^c_{t+1}, which we assume to be a fraction of a capital producer's income, $x^c_{t+1} = \chi^c m_{t+1}$ ($\chi^c \in (0,1)$). Any entrepreneur who refuses to concede this payment is threatened with some personal damage, d^c_{t+1}, which we also assume to be proportional to entrepreneurial income, $d^c_{t+1} = \delta^c m_{t+1}$ ($\delta^c > 0$). This punishment may take various forms with greater or less severity: it may range from the destruction of property (e.g., through arson or bomb attacks) to the infliction of physical violence (including assault on both oneself and one's family, either with or without deadly weapons). The precise details of a mafia's retribution is unimportant to our analysis. What matters is the threat that it exists, which is the means by which the mafia seeks to enforce its illicit profiteering.

Given the above, we may deduce the expected utility of an entrepreneur, $E(u_t)$, in the presence of organized crime. The entrepreneur earns an income of m_{t+1}, as given in (6). For a non-producer of capital ($\kappa_{t+1} = 0$), this is also his final expected utility: that is, $E(u_t) = 0$. For a producer of capital ($\kappa_{t+1} > 0$), utility is determined as follows. With probability p, the entrepreneur is confronted by the mafia, in which case he forfeits x^c_{t+1} amount of income if he succumbs to extortion, or incurs a disutility of d^c_{t+1} if he resists being extorted. With probablility $1-p$, the entrepreneur avoids the mafia, in which case he suffers neither of these losses. Accordingly, either $E(u_t) = p(m_{t+1} - x^c_{t+1} - e_t) + (1-p)(m_{t+1} - e_t) = m_{t+1} - px^c_{t+1} - e_t$ or $E(u_t) = p(m_{t+1} - d^c_{t+1} - e_t) + (1-p)(m_{t+1} - e_t) = m_{t+1} - pd^c_{t+1} - e_t$, where e_t is recalled to be the amount of required effort to engage in capital production. Naturally, an entrepreneur is willing to comply with the mafia's demands if $x^c_{t+1} \leq d^c_{t+1}$ - that is, if the cost of paying the mafia is no greater than the cost of not doing so. From above, we may write this condition as $\chi^c \leq \delta^c$. Assuming that this is satisfied (which we verify subsequently), the expected

utility of an entrepreneur may be computed as

$$E(u_t) = \begin{cases} [(1 - p\chi^c)M - \varepsilon]l_t & \text{if } \kappa_{t+1} > 0, \\ 0 & \text{if } \kappa_{t+1} = 0 \end{cases} \tag{10}$$

Like before, an entrepreneur will choose to engage in capital production if his expected utility from doing so is no less than his expected utility from not doing so. From (10), this condition is given formally as $(1 - p\chi^c)M - \varepsilon \geq 0$, or

$$\varepsilon \leq (1 - p\chi^c)M \equiv \overline{\varepsilon}^c. \tag{11}$$

As in (8), this expression defines a critical level of required effort, $\overline{\varepsilon}^c$, below (above) which an entrepreneur will choose to engage in (abstain from) capital production. Evidently, $\overline{\varepsilon}^c < \overline{\varepsilon}$ for any $p, \chi^c \in (0, 1)$, which shows that crime has the effect of deterring capital production by some entrepreneurs who would have otherwise engaged in this venture. This follows from the fact that the expected payoff from such a venture is reduced when crime exists due to the potential extra cost associated with extortion.[7]

2.2.3 Organized Criminals

The mafia seeks to extort money from capital producers by intimidating them with the threat of violence should they refuse to comply. This way of modelling organized crime is common in the academic literature (e.g., Alexeev *et al.* 2004; Kugler *et al.* 2003; Shelling 1984), and accords closely with the generally accepted definition of such activitity amongst criminologists.[8] As indicated earlier, we treat the crime syndicate as a rational decision maker whose objective is to maximise its expected payoff from extortion.

[7] This is consistent with the empirical observation that entrepreneurs perceive racketeering as an extra risky expense in doing business (e.g., Daniele and Marani, 2010; Kroska and Robeck, 2006; Peri, 2004).

[8] That is, organized crime is the perpetration of illegal activities for material benefit by coordinated groups of individuals who ply their trade through extortion, corruption and subversion using extreme violence (e.g., Kenney and Finkenauer, 1995; Levi, 2002).

We assume that the mafia faces a probability, $q \in (0,1)$, of succeeding in its racketeering by evading arrest and prosecution ($1-q$ being the probability of failing in this). Again, one may think of this probability as depending on the quality and effectiveness of the legal system: the better functioning is this system, the lower is q and the lower is the mafia's prospect of escaping the clutches of the law. We suppose that, in the event of being caught, the mafia incurs a punishment, which includes the seizure of at least some of its illicit earnings. In accordance with other analyses (as well as observed practice), we consider the severity of the punishment as being commensurate with the gravity of the offence (the level of extortion in our case). We capture this by specifying γx_{t+1}^c ($\gamma \in (0,1)$) as the amount of extortion payment that the mafia stands to lose should it suffer legal retribution.[9]

Another cost to the mafia relates to the means by which it seeks to enforce its illicit profiteering. As alluded to already, this involves the use of threats of violence against non-compliant individuals who face a penalty of d_{t+1}^c if they do not succumb to the mafia's demands. Such threats must be credible, and we assume that it is costly for the mafia to ensure this. Specifically, we suppose that the cost of threats is given by Δd_{t+1}^c ($\Delta > 0$), being proportional to the amount of damage inflicted on victims. This cost is incurred *ex ante* and is independent of the number of potential victims: the mafia must arm itself before knowing which individuals are susceptible to extortion, after which the same threat can be applied to all individuals.[10]

With the foregoing in mind, we may compute the mafia's expected payoff, $E(v_t)$, as follows. Its illegal income from each of its prey is x_{t+1}^c. With

[9] This is a pecuniary punishment, but there are obviously non-pecuniary punishments as well (e.g., imprisonment). The former may be considered as encompassing the latter in the sense that it represents the illegal income that could have been earned if a criminal was not incarcerated. In any case, the separate inclusion of a non-pecuniary punishment is a trivial extension to the model that would not alter the main results.

[10] The mafia needs only to demonstrate that it has the capabilities of inflicting harm. At the extreme, its possession of just one explosive device, one firearm or one ruthless thug poses the same threat to all potential victims.

probability q, all of this income is retained. With probability $1-q$, only $(1-\gamma)x^c_{t+1}$ of this income is retained. The mafia's expected earnings from each of its victims is therefore $qx^c_{t+1}+(1-q)(1-\gamma)x^c_{t+1}=[1-\gamma(1-q)]x^c_{t+1}$. The number of potential victims is given by $\overline{\varepsilon}^c$ in (11), and the probability that any one of them is susceptible to extortion is given by p. The product of these terms represents the mafia's extortion base. Accordingly, the mafia's total expected earnings from racketeering is deduced to be $[1-\gamma(1-q)]x^c_{t+1}p\overline{\varepsilon}^c$. Deducted from this is the cost of enforcing extortion, Δd^c_{t+1}. Recalling that $x^c_{t+1}=\chi^c m_{t+1}$ and $d^c_{t+1}=\delta^c m_{t+1}$, where m_{t+1} is given in (6), we arrive at the following final expression for the mafia's expected payoff:

$$E(v_t)=\{[1-\gamma(1-q)]\chi^c p\overline{\varepsilon}^c-\Delta\delta^c\}Ml_t. \tag{12}$$

In choosing its optimal behaviour, the mafia takes into account the influence of its actions on the optimal behaviour of its prey. Specifically, the mafia realises that a greater level of extortion, χ^c, has two effects: the first is to reduce the number of potential victims, $\overline{\varepsilon}^c$ in (11), by inducing more entrepreneurs to abstain from capital production; the second is to undermine the condition for capital producers' compliance in extortion, $\chi^c\leq\delta^c$, which may necessitate the use of more severe and more costly means of enforcing compliance. With these considerations in mind, the mafia chooses its level of extortion and scale of retribution so as to maximise its expected utility. Formally, its problem is given as

$$\begin{aligned}
&\max_{\chi^c,\delta^c}\ E(v_t)=\{[1-\gamma(1-q)]\chi^c p\overline{\varepsilon}^c-\Delta\delta^c\}Ml_t,\\
&\text{s.t.}\quad \overline{\varepsilon}^c=(1-p\chi^c)M,\\
&\qquad \chi^c\leq\delta^c.
\end{aligned}$$

The solution to this problem is derived in an Appendix as

$$\chi^c = \delta^c = \frac{1}{2p}\left\{1 - \frac{\Delta}{p[1-\gamma(1-q)]M}\right\}, \tag{13}$$

$$\overline{\varepsilon}^c = \frac{1}{2}\left\{M + \frac{\Delta}{p[1-\gamma(1-q)]}\right\}. \tag{14}$$

These expressions have the following intuitive properties.

The fact that $\chi^c = \delta^c$ in (13) reflects the mafia's minimisation of costs in implementing its racketeering: the least costly way of exacting illicit payments from capital producers is to threaten them with an equivalent (no greater) punishment should they refuse to comply. The optimal amount of extortion, itself, is observed to be decreasing in Δ, decreasing in $\gamma(1-q)$ and either decreasing or increasing in p. The first property shows that the level of extortion is higher, the lower is the exogenous cost to the mafia of enforcing it. The second property similarly reveals that the amount of extortion is increased when the mafia faces a lower expected punishment for its offence.[11] The third property is a little more subtle, demonstrating that greater racketeering opportunities for the mafia may lead to either higher or lower levels of extortion. This follows from the fact that the extortion base, $p\overline{\varepsilon}^c$, may move either way as the scope for predation increases: on the one hand, a higher fraction of capital producers are able to be exploited, which tends to raise the extortion base and to exacerbate the mafia's demands; on the other hand, fewer entrepreneurs are inclined to undertake capital production, which tends to lower the extortion base and to moderate the mafia's demands.

The above results are reflected in capital production activity, as given in (14). The number of capital producers, $\overline{\varepsilon}^c$, is seen to be increasing in Δ, increasing in $\gamma(1-q)$ and decreasing in p. The first and second of these properties are allied directly to the higher levels of extortion that the mafia

[11] Put the other way, criminal activity is lower when the expected penalty for this activity is higher - an implication that accords with the spirit of Becker (1968).

chooses when faced with lower costs of pursuing such activity (i.e., lower costs of enforcement and/or lower expected costs of prosecution). Under such circumstances, capital production is less profitable and therefore less attractive to a greater number of entrepreneurs. The third property reveals that an increase in exposure to mafia predation, whilst having an ambiguous effect on the amount of extortion, causes a net decrease in the population of capital producers: even if the mafia extorts less, fewer entrepreneurs choose to participate in capital production because of their greater prospect of being preyed upon and their greater expected loss of income, $p\chi^c$.

2.2.4 Growth

The equilibrium growth rate of the economy is derived as before by combining the capital market clearing condition, $k_{t+1} = \overline{\varepsilon}^c A l_t$, with the loan market clearing condition, $l_t = w_t$, and recalling the expression for w_t in (2).[12] Doing this gives

$$\frac{k_{t+1}}{k_t} = \overline{\varepsilon}^c A\alpha \equiv g^c. \tag{15}$$

Evidently, growth is now influenced by factors other than technology since the number of capital producers is influenced likewise. In particular, g^c is reduced by any reduction in $\overline{\varepsilon}^c$ caused by an increase in the extent of criminal activity, as alluded to above. Comparing (15) with (9), making use of our earlier observation that $\overline{\varepsilon}^c < \overline{\varepsilon}$, we arrive at the conclusion that $g^c < g$: growth in a crime-ridden economy is lower than growth in a crime-free economy.[13]

[12] Note that neither the mafia's illegal income, nor law enforcers' legal income, contribute to the amount of loanable funds. The reason for the former is that each generation of mafiosi extracts its income in the second period of life. The reason for the latter is that law enforcers' salaries are merely lump-sum tax transfers from workers, which net out of aggregate savings.

[13] As indicated previously, (8) and (11) imply that $\overline{\varepsilon}^c < \overline{\varepsilon}$ must be true, given that both $p \in (0,1)$ (which we obviously assume) and $\chi^c \in (0,1)$ (which we need to ensure). From (12), the parameter restriction needed for the latter is $[1-\gamma(1-q)]Mp > \Delta > [1-\gamma(1-q)]Mp(1-2p)$. The first inequality ($\chi^c > 0$) is sufficient for delivering $\overline{\varepsilon}^c < \overline{\varepsilon}$.

2.3 The Economy with Organized Crime and Corruption

Our modelling of corruption centers on the behaviour of law enforcers and their relationship with the crime cartel. In our previous analysis we assumed that the police acted with full integrity in executing its crime prevention duties. This meant that capital producers had at least some chance of being protected against mafia predation. We now consider the case in which police officers are corruptible in the sense of being potentially willing to accept bribes from the mafia in return for turning a blind eye to the mafia's activities.[14] Like before, the behaviour of workers is unaffected, and we focus only on the new dimensions of the model.

2.3.1 Law Enforcers

As mentioned previously, police officers earn a salary of s_t when young, which is saved at the rate of interest ρ to finance their consumption when old. A police officer who is corrupt seeks to supplement his old-age consumption by accepting bribe payments from the mafia, which is then free to commit its offences. We assume that the amount of bribe demanded for each offence, b_{t+1}, is proportional to the mafia's income from that offence: that is, $b_{t+1} = (1-\beta)x^{cc}_{t+1}$ $(\beta \in (0,1))$.[15]. Using higher case notation to denote aggregate variables, the total bribe income of each corrupt law enforcer is then given by $B_{t+1} = (1-\beta)X^{cc}_{t+1}$.[16]

Bribe-taking is risky because of the possibility of being caught and prosecuted. We assume that this event is avoided with probability $r \in (0,1)$.

[14] For simplicity, we shall assume that all police officers are susceptible to bribery. Our main results would not change were we to consider some fraction of them as being non-corruptible.

[15] We distinguish x^{cc}_{t+1} from x^{c}_{t+1} since, as we shall see, the level of extortion when corruption exists is different from the level of extortion when corruption is absent.

[16] We do not differentiate between law enforcers. Each one of them earns the same bribe income, whether due to the same number of capital producers under each one's protection, or the sharing of illicit earnings amongst all of them.

Otherwise (with probability $1-r$), corruption is exposed and each perpetrator of it is subject to a punishment of f_{t+1} which may be pecuniary (e.g., a fine) and/or non-pecuniary (e.g., imprisonment). We suppose that this punishment is set by the judiciary in a way that is commensurate with the scale of the mafia's racketeering: specifically, we set $f_{t+1} = \phi X_{t+1}^{cc}$ ($\phi > 0$).[17] The probability that corruption goes undetected reflects the government's imperfect monitoring of such activity and may be regarded as another measure of the quality of governance in model: the better is this quality, the lower is r and the greater is the likelihood that corrupt behaviour is detected.

Depending on whether bribes are refused or accepted, a law-enforcer expects a payoff of either $(1+\rho)s_t$, or $r[(1+\rho)s_t+B_{t+1}]+(1-r)[(1+\rho)s_t+B_{t+1}-f_{t+1}] = (1+\rho)s_t + B_{t+1} - (1-r)f_{t+1}$. It follows that bribes will be accepted if $(1+\rho)s_t + B_{t+1} - (1-r)f_{t+1} \geq (1+\rho)s_t$, or $B_{t+1} \geq (1-r)f_{t+1}$. Under our previous assumptions, this condition may be re-stated as $1-\beta \geq (1-r)\phi$. Intuitively, a police officer is willing to accept a bribe payment that is at least equal to the expected punishment for his crime.

2.3.2 Entrepreneurs

The existence of corruption affects entrepreneurs both directly and indirectly. The direct effect is a loss of protection against mafia predation due to the police's complicity in this activity. This is captured by setting $p = 1$. The indirect effect is a change in the level of extortion due to the mafia's need to pay bribes for this complicity. This is reflected in the optimal choice of $x_{t+1}^{cc} = \chi^{cc} m_{t+1}$, to which we attend later.

Like before, an entrepreneur who abstains from capital production earns

[17] This assumption reflects the idea that the judiciary may be able to observe the amount of extortion, but not the amount of bribe payments. For example, whilst capital producers may be quite willing to report how much the mafia has extorted from them, corrupt law enforcers would want to conceal their bribe income. The most that the judiciary knows is that bribes are proportional to the amount of extortion, and therefore sets its punishment in the same way.

a utility of $u_t = 0$. Unlike before, an entrepreneur who engages in capital production earns a utility of either $u_t = m_{t+1} - x^{cc}_{t+1} - e_t$ or $u_t = m_{t+1} - d^{cc}_{t+1} - e_t$, depending on whether or not he surrenders to extortion, where $d^{cc}_{t+1} = \delta^{cc} m_{t+1}$.[18] The condition for surrendering is unchanged - that is, $x^{cc}_{t+1} \leq d^{cc}_{t+1}$, or $\chi^{cc} \leq \delta^{cc}$. Assuming that this is satisfied, an entrepreneur's payoff under alternative choices is

$$u_t = \begin{cases} [(1-\chi^{cc})M - \varepsilon] l_t & \text{if } \kappa_{t+1} > 0, \\ 0 & \text{if } \kappa_{t+1} = 0. \end{cases} \tag{16}$$

Following our previous analysis, we may deduce from (16) that $(1 - \chi^{cc})M - \varepsilon \geq 0$ is the condition for an entrepreneur to undertake capital production, which we may write as

$$\varepsilon \leq (1-\chi^{cc})M \equiv \overline{\varepsilon}^{cc}. \tag{17}$$

As before, this expression defines a critical level of required effort, $\overline{\varepsilon}^{cc}$, below (above) which an entrepreneur will choose to undertake (forego) capital production. Also like before, a comparison with (8) reveals that $\overline{\varepsilon}^{cc} < \overline{\varepsilon}$ for any $\chi^{cc} \in (0,1)$, which re-establishes the negative effect of extortion on the population of capital producers. Of more interest to us is a comparison with (11), from which we observe that $\overline{\varepsilon}^{cc} \lesseqgtr \overline{\varepsilon}^{c}$ according to $\chi^{cc} \gtreqless p\chi^{c}$. This suggests the possibility that capital production may be deterred by either more or less when corruption is present than when it is absent. A sufficient condition for the former outcome is that the level of extortion is the same in the two environments. As we shall see, however, this is not generally true and the outcome is more ambiguous.

2.3.3 Organized Criminals

In the presence of a corruptible police force, the mafia has the opportunity to pursue its racketeering activities with the compliance of law enforcers. It

[18] We distniguish d^{cc}_{t+1} from d^{c}_{t+1} for the same reason that we distinguish x^{cc}_{t+1} from x^{c}_{t+1}.

does so by extorting payments from capital producers using the threat of violence as a means of enforcement, and by offering bribes to police officers in return for their agreement to overlook such behavior. For each offence committed, the mafia's income is $x^{cc}_{t+1} - b_{t+1}$. As previously, the mafia makes its decisions optimally in a way that maximises its expected payoff.

It is plausible (though not necessary) to imagine that the mafia's prospects for evading arrest and prosecution are better (or at least no worse) when corruption exists than when it is absent. Accordingly, we now define $q' \geq q$ as the probability that the mafia escapes with its ill-gotten gains.[19] We continue to assume that, in the alternative event of being apprehended, the mafia loses a fraction of its final income, which is the income left over after paying bribes. This potential cost to the mafia is given by $\gamma(x^{cc}_{t+1} - b_{t+1})$. The other cost to the mafia is its outlay on enforcing extortion, which is given similarly to before as Δd^{cc}_{t+1}.

Given the above, we may deduce the mafia's expected payoff, $E(v_t)$, as follows. Its net income from each capital producer is $x^{cc}_{t+1} - b_{t+1}$. All of this income is pocketed with probability q', whilst only $(1-\gamma)(x^{c}_{t+1} - b_{t+1})$ of it is kept with probability $1 - q'$. The mafia's expected income per victim is therefore given by $q'(x^{cc}_{t+1} - b_{t+1}) + (1-q')(1-\gamma)(x^{cc}_{t+1} - b_{t+1}) = [1 - \gamma(1 - q')](x^{cc}_{t+1} - b_{t+1})$. The number of potential victims is given by $\overline{\varepsilon}^{cc}$ in (17), all of whom can be preyed upon with certainty at a cost of Δd^{cc}_{t+1}. Collecting these observations together, we arrive at the following expression for the mafia's expected payoff:

$$E(v_t) = \{[1 - \gamma(1 - q')]\chi^{cc}\beta\overline{\varepsilon}^{cc} - \Delta\delta^{cc}\}Ml_t. \tag{18}$$

As before, the mafia chooses its optimal behaviour in acknowledgement of

[19] One may conceive of this probability as depending on r, the probability that corrupt law enforcers also evade prosecution. For example, the mafia may face the possibility of apprehension only if its conspirators are apprehended, in which case the mafia's probability of evading arrest might be $q' = r + (1-r)q > q$, where q may represent the probability that law enforcers do not squeal (maintain a conspiracy of silence).

the behaviour of others. In addition to entrepreneurs' decisions as to whether or not to undertake capital production and whether or not to surrender to extortion, there is the consideration of luring police officers into corruption. Consequently, the mafia takes into account (17) (the engagement of entrepreneurs in capital production), $\chi^{cc} \leq \delta^{cc}$ (the compliance of capital producers in extortion) and $1 - \beta \geq (1 - r)\phi$ (the participation of law enforcers in bribe-taking). The mafia's decision problem is therefore given as

$$\begin{aligned} \max_{\chi^{cc},\delta^{cc},\beta} . \; & E(v_t) = \{[1 - \gamma(1 - q')]\chi^{cc}\beta\overline{\varepsilon}^{cc} - \Delta\delta^{cc}\}Ml_t, \\ \text{s.t.} \quad & \overline{\varepsilon}^{cc} = (1 - \chi^{cc})M, \\ & \chi^{cc} \leq \delta^{cc}, \\ & (1 - r)\phi \leq 1 - \beta. \end{aligned}$$

Solving this problem, as outlined in the Appendix, yields

$$\chi^{cc} = \delta^{cc} = \frac{1}{2}\left\{1 - \frac{\Delta}{\beta[1 - \gamma(1 - q')]M}\right\}, \tag{19}$$

$$1 - \beta = (1 - r)\phi, \tag{20}$$

$$\overline{\varepsilon}^{cc} = \frac{1}{2}\left\{M + \frac{\Delta}{\beta[1 - \gamma(1 - q')]}\right\}. \tag{21}$$

These results can be interpreted similarly to those established earlier.

The result in (19) re-establishes that $\chi^{cc} = \delta^{cc}$, meaning that the mafia exacts extortion payments from capital producers by threatening them with the minimum damage needed for this. Similarly, the level of extortion is observed to be decreasing in Δ (the mafia's resource cost in demonstrating its threats) and decreasing in $\gamma(1 - q')$ (the mafia's expected punishment for its crimes). Additionally, we find that the amount of extortion is increasing in β (the fraction of mafia income left over after paying bribes). Accordingly, lower bribe payments provokes the mafia to extort more, the reason being simply that the mafia keeps more of its illegal income.[20] The result in (20) gives the

[20] Essentially, bribe payments act as a proportional tax on the mafia's illicit activities. A reduction in this tax encourages the mafia to engage more in these activities.

optimal bribe payment, $1-\beta$, which the mafia sets at the lowest possible level that encourages law enforcers to be corrupt (i.e., the level at which law enforcers' corruption participation constraint binds). An implication of this is that a stronger deterrent to corruption (as measured by $(1-r)\phi$) forces the mafia to make higher bribe payments which, in turn, induces a lower rate of extortion.[21]

The result in (21) demonstrates, as before, that the number of capital producers, $\overline{\varepsilon}^{cc}$, is increasing in both Δ and $\gamma(1-q')$ because of the effects of these cost terms on the level of extortion. Additionally, we observe that the number of capital producers is decreasing in β, which is similarly explained by the impact of this bribe factor on the level of extortion.

2.3.4 Growth

The growth rate of the economy is derived in the usual way. Equilibrium in the capital market requires $k_{t+1} = \overline{\varepsilon}^{cc} A l_t$, whilst equilibrium in the loan market implies $l_t = w_t$, where w_t is given in (2).[22] Consequently, we have

$$\frac{k_{t+1}}{k_t} = \overline{\varepsilon}^{cc} A\alpha \equiv g^{cc}. \tag{22}$$

As before, the key determinant of growth is the number of capital-producing entrepreneurs, which now depends on factors related to both crime and corruption. In particular, g^{cc} is reduced by any reduction in $\overline{\varepsilon}^{cc}$ caused by an increase in extortion and bribe-taking, as indicated above. Given our earlier observation that $\overline{\varepsilon}^{cc} < \overline{\varepsilon}$, a comparison of (22) and (9) re-asserts that $g^{cc} < g$: growth in a badly-governed economy is lower than growth in a well-governed economy.[23]

[21] The effect of anti-corruption strategies (or lack of) on criminal activity is an important issue, though it is not one that we pursue in this paper. There are several analyses that do so, indicating the many nuances and complexities of the issue (e.g., Bowles and Garoupa 1997; Chang *et al.* 2000; Jellal and Garoupa 2007; Polinski and Shavell 2001).

[22] As explained earlier, neither the mafia's illegal income nor the salaries of law enforcers contribute to the amount of loanable funds. The same is true of law enforcers' bribe income, which is received in the second period of life.

[23] Like before, our earlier assertion, based on (8) and (17), that $\overline{\varepsilon}^{cc} < \overline{\varepsilon}$ for any $\chi^{cc} \in (0,1)$

2.4 Is Organized Crime More or Less Harmful in the Presence of Corruption?

The basic message of our analysis so far is uncontroversial and confirms what one generally presumes - namely, that an economy performs better when it is free from all crime and corruption than when it is saddled with either or both these. Our primary interest is the question of whether an economy is damaged by more or less if crime occurs alone than if crime co-exists with corruption. We study this as follows.

Whichever type of environment one considers, the ultimate factor in impeding growth is the mafia's extortion of capital producers. It is this which deters capital production by increasing the costs to entrepreneurs of undertaking such activity. The question of which type of environment suffers the most damage is therefore a question of which type of environment suffers the most racketeering. To be sure, a comparison of (15) and (22), together with (11) and (17), shows that whether $g^c \gtrless g^{cc}$ depends solely on whether $\varepsilon^c \gtrless \varepsilon^{cc}$ which, in turn, depends solely on whether $p\chi^c \lesseqgtr \chi^{cc}$. The last of these inequalities compares the expected extortion payment in the presence of crime alone with the extortion payment in the presence of both crime and corruption. By resolving this inequality, we resolve the other two.

From (13) and (19), we find that $p\chi^c \lesseqgtr \chi^{cc}$ according to $p[1-\gamma(1-q)] \gtrless \beta[1-\gamma(1-q')]$. The key parameters in this condition are p (the fraction of potential victims exposed to the mafia in a crime-only environment) and β (the fraction of post-bribe income available to the mafia in a crime-plus-corruption environment). Essentially, these parameters substitute for each other in determining the mafia's potential returns from extortion. As we have seen, a higher value of p implies a higher value of $p\chi^c$ (even if χ^c falls), and a higher value of β implies a higher value of χ^{cc}. It follows that $p\chi^c > \chi^{cc}$

requires us to ensure that the latter is true. From (19), the parameter restriction needed for this is $[1-\gamma(1-q')]M\beta > \Delta > -[1-\gamma(1-q')]M\beta$. Obviously, the second inequality ($\chi^{cc} < 1$) is automatically satisfied. The first inequality ($\chi^{cc} > 0$) delivers $\overline{\varepsilon}^{cc} < \overline{\varepsilon}$.

is more (less) likely the greater (lower) is p relative to β. From above, this translates into a greater (lower) likelihood that $\varepsilon^c < \varepsilon^{cc}$ and $g^c < g^{cc}$.[24]

The above analysis demonstrates how the effects of organized crime on economic activity may depend on the participation in corruption by those responsible for preventing such crime. *A priori*, this dependence is ambiguous in the sense that the damage inflicted by organized crime may be greater or less when corruption exists than when it is absent. This is our key theoretical result which has not, to our knowledge, been established before.

3 Evidence

The ambiguous prediction of our theoretical analysis may appear somewhat surprising. One might typically presume that the combination of organized crime and corruption is more damaging to an economy than organized crime alone. We have articulated the reasons why this may not be the case, and we now proceed to an empirical investigation of the issue using regional Italian data over a 27 year history.

3.1 Estimation Strategy and Techniques

Ideally, one would seek to resolve the issue by first considering an economy's growth performance in the absence of both organized crime and corruption, and then adding each of these factors in turn until both are accounted for simultaneously. In this way, one could assess the growth effect of organized crime both in isolation and in conjunction with corruption. In the absence of this ideal scenario, our empirical strategy involves specifying a growth equation that controls for both organized crime and corruption, amongst other variables. The major element of this equation is an interaction term

[24] Comparing the final outcomes for $\overline{\varepsilon}^c$ and $\overline{\varepsilon}^{cc}$ in (14) and (21), one observes that $\overline{\varepsilon}^c \gtrless \overline{\varepsilon}^{cc}$ according to $p[1-\gamma(1-q)] \lesseqgtr \beta[1-\gamma(1-q')]$ - exactly the reverse condition for $p\chi^c \gtrless \chi^c$, as suggested earlier.

between the two illegal activities, which we use to proxy for the growth effect of organized crime in the presence of corruption.[25] It is this interaction term that commands most of our attention: the finding of a positive (negative) coefficient on this term would support the argument that organized crime has a less (more) severe effect on growth when it is accompanied by corruption.[26]

Given the above, our empirical set-up is represented by the regression equation,

$$g_{i,t} = \alpha + \beta_1 OC_{i,t} + \beta_2 Corr_{i,t} + \beta_3 (OC * Corr)_{i,t} + \sum_{j=1}^{m} \gamma_j X_{j,it} + \mu_i + \varepsilon_{i,t}, \quad (23)$$

where variables are indexed by both region, i, and time period, t. These variables are as follows: g is the growth rate of per capita real GDP; OC is a measure of organized crime; $Corr$ is a measure of corruption; X is a set of standard control variables; μ captures unobserved time-invariant region-specific effects; and ε denotes a time-varying error term. The crucial component is $(OC * Corr)$, which represents the interaction term between organized crime and corruption.

The set of controls, X, comprises the usual explanatory variables that are included in growth regressions (e.g., Barro, 1991; Levine and Renelt, 1992; Sachs and Warner, 1995). These are the log of initial real GDP per capita, the ratio of investment to GDP, the rate of inflation (as measured by the GDP deflator), and the rate of secondary school enrolment. In addition to these baseline variables, we consider an extended group of controls, composed of the rate of population growth, the ratio of trade to GDP, the share of total public spending to GDP, and an indicator of financial development.

Our measure of corruption, $Corr$, departs from the corruption perception indices that are used most commonly in cross-country empirical work.[27]

[25] The use of interaction terms as proxying for conditional effects in the economic growth process has become popular over the years. See, for example, Burnside and Dollar (2004), Ahlin and Pang (2008), Angeles and Neanidis (2009).

[26] In terms of our theoretical analysis, a positive (negative) interaction term would imply that p is large (small) relative to β, in which case $g^c < g^{cc}$ ($g^c > g^{cc}$).

[27] The most popular of these indices are the Corruption Perception Index (published

The measure that we employ is the official number of crimes against public administration per 100,000 inhabitants reported to the police and published by the Italian National Institute of Statistics (ISTAT). The crimes that we consider are based on Statutes no. 286 through 294, which include crimes of peculation and embezzlement. Other crimes against public administration, such as insulting a public officer (Statute 279) and neglect or refusal of an official duty (Statute 295), are excluded. The same measure has been used by Del Monte and Papagni (2001, 2007) in previous empirical analyses of corruption in Italy.[28] Needless to say, the measure may not give a full picture of corruption, and is likely to underestimate such activity, since it is based only on crimes that are reported.[29] Accordingly, the estimated coefficient on $Corr$ may be viewed as representing a lower bound on the effect of corruption.

As regards our measure of organized crime, OC, we follow the existing literature (e.g., Caruso, 2008; Daniele, 2009; Daniele and Marani, 2010; and Pinotti, 2011) by constructing different indices of such crime, based on different combinations of mafia-related offences, and using these alternatively throughout the analysis.[30] Our preferred measure, however, is an index (labelled OC Index 5) composed of the sum of official data on five different types of crime that are indicative of the presence of criminal organizations,

by Transparency International), the International Country Risk Guide Index (published by Political Risk Services), and the Control of Corruption Index (published by the World Bank).

[28]We thank Erasmo Papagni for kindly sharing the data for the years 1961-2001. Data from 2002-2005 can be found online at the ISTAT website. For the most recent data on corruption (2006-2009), we thank ISTAT officers for the collection and transmission of the data.

[29]Moreover, as pointed out by Del Monte and Papagni (2001, 2007), the measure could also be affected by a systematic bias due to differences among regions in reporting crimes. This does not, however, seem to be case. By regressing the statistics on reported crimes of corruption and an index of the length of the judicial processes, the authors do not find any large systematic differences among regions in the proportion of reported and detected crimes to actual ones.

[30]The term Mafia is used to include all the main criminal organizations that are present in the different Italian regions, such as Cosa Nostra in Sicily, Camorra in Campania, N'drangheta in Calabria, and Sacra Corona Unita in Puglia.

either by definition or by inference.[31] The five offences are (i) criminal association (art. 416 Italian Penal Code), (ii) Mafia criminal association (art. 416 bis Italian Penal Code), (iii) homicides by the Mafia, (iv) extortion, and (v) bomb attacks.[32] A few comments on these are worth making.

Since 1982, the Italian judicial system has made a clear distinction between criminal association (art. 416) and criminal association of mafia-type groups (art. 416 bis).[33] Common criminal association is defined as "the association of three or more people who are organized in order to commit a plurality of crimes". The characteristics of this kind of offence are the following: (i) the stability of the agreement amongst the components, meaning the existence of an associative connection intended to be continuous through time, even after the crimes have been committed; and (ii) the existence of a programme of delinquency to commit an indeterminate number of crimes.[34] By contrast, a criminal association is defined to be of the mafia-type "when its components use intimidation, awe and silence (omertà) in order to commit crimes, to acquire the control or the management of business activities (i.e., concessions, permissions, public contracts or other public services), to derive profit or advantages for themselves or others, to limit the freedom of exerting the right to vote, and to find votes for themselves or others during

[31] As pointed out by Daniele and Marani (2010) and La Spina and Lo Forte (2006), even if one cannot always distinguish organized crime from non-organized crime, it is possible to identify some types of offence (e.g., fraud, theft and sexual violence) as being uncharacteristic of Mafia-type groups.

[32] For all crimes, we use rates per 100,000 inhabitants reported by the police to the judicial authority. These data are available by ISTAT, Annals of Judicial Statistics.

[33] Until 1982, Article 416 of the Italian Penal Code ("associazione a delinquere") punished in the same way all groups of three or more people involved in some type of criminal activity. This generic term could not distinguish between small groups of bank-robbers and larger criminal networks with a powerful control over the territory. This changed in 1982 with the introduction of the crime "associazione a delinquere di stampo mafioso" provided by Article 416 bis (Law 646/82).

[34] This definition is similar to that given by the UN Convention against Transnational Organized Crime (2004) which describes organized crime as a "...structured group of three or more persons existing for a period of time and acting in concert with the aim of committing one or more serious crimes or offences [...] in order to obtain, directly or indirectly, a financial or other material benefit".

the electoral campaign".[35] By including both types of criminal association, we account for different forms and different scales of organized crime.

The ultimate of all crimes, that one often associates with mafia-type organizations, is homicide. As emphasised by MacDonald (2002), all judicial-based measures of crime are generally subject to under-reporting. This may be especially true for offences committed by criminal cartels, whose use of intimidation and violence can undermine the process and outcome of judicial investigations, particularly in regions where the crime syndicate wields a high degree of power and influence. At the same time, there is evidence to suggest that under-reporting tends to be smaller for very serious crimes (e.g., Fajnzylber *et al.*, 2002; Soares, 2004), hence the inclusion of mafia-related homicides in the index of organized crime.

Another felony that is prominently linked with organized crime is extortion. Indeed, this is often regarded as the most typical mafia offence, being a primary means of obtaining illegal income by preying on businesses. In Italy, the commonly-used term for extortion is the *pizzo*, meaning the black tax that the mafia imposes on businesses to fund its various operations. According to the Italian shopkeepers association, Confesercenti (2009), "the pizzo ensures the everyday activity of criminal organizations, it increases its domain, it confers more prestige to the clans, and measures the rate of silence in a given area, headquarter, or community". This is echoed elsewhere in the literature, and it is well-documented that almost all the mafia families exercise their power over a territory through the racket of extortion.[36] As Confesercenti (2009) also points out, official data on racketeering is often susceptible to the aforementioned problem of under-reporting. Nevertheless, the staggering scale of the offence is transparent for all to see: for example,

[35] The last two activities of Mafia-type organizations were introduced into the Italian penal code in 1992 as part of the measures adopted after the Capaci and Via D'Amelio's massacres (where the judges Giovanni Falcone and Paolo Borsellino were killed). Additionally, art. 416 bis provides for the confiscation of mafia-owned properties.

[36] See, for example, Daniele and Marani (2010).

the year 2009 saw a total of 160,000 commercial activities in various Italian regions (mainly Sicily, Campania, Puglia and Calabria) being subject to extortion, with total revenues estimated to be near 9 billion euros.[37]

A further crime that is typically attributed to criminal organizations is bomb attacks. For the most part, this form of extreme violence is used to threaten and intimidate businessmen who resist being extorted, or politicians who refuse to collaborate. The obvious distinguishing feature of this offence is its visibility when actually committed. Consequently, official data on bomb attacks is much less prone to the problem of under-reporting, and may be used as additional information on other crimes (extortion, in particular) that are committed with the aid of such violence.[38]

As mentioned, the sum of the above five mafia-related offences comprises our baseline index of organized crime (OC Index 5). To test the robustness of our benchmark findings, we also use a variety of other indices which include crimes of arson, serious robberies and kidnappings. Arson is considered for the same reason as bomb attacks, being indicative of extortionary activity (and more general intimidation) on the part of criminal groups. Serious roberries (meaning those committed in banks and post offices) are considered since they typically require a high degree of organization and collaboration

[37]More precisely, the percentage of shops subject to extortion by mafia-type organizations is as high as 80% in the cities of Catania and Palermo (Sicily), 70% in Reggio Calabria (Calabria), and 50% in Naples (Campania) and the north of Bari and Foggia (Apulia). In the suburbs and hinterlands of these cities, the percentages are even higher, with almost all commercial activities being subject to extortion (including shops, restaurants, construction companies, and others). The average value of the pizzo for small businesses in these geographic areas amount to 100-200 euros per month in Naples and 200-500 euros per month in Palermo. More elegant shops in the city centre pay almost 500-1000 euros in Naples and 750-1000 euros in Palermo. The average monthly pizzo is even higher for supermarkets, which are forced to pay the mafia up to 3000 euros in Naples and up to 5000 euros in Palermo. Construction sites may pay as much as 10,000 euros per month in Palermo. Asmundo and Lisciandra (2008) have estimated that in Sicily, the annual total revenues from extortion in 2009 were higher than 1 billion euros, which corresponds to more than 1.3 percent of regional GDP.

[38]Of course, the picture is still incomplete since the mere threat of bomb attacks may preclude the need for them.

amongst a plurality of individuals.[39] Kidnapping is considered because of the historical record of many mafia organizations in specializing in this offence, as alluded to in previous studies (e.g., Ciconte, 1992; Pinotti, 2011).[40]

The general prediction of theoretical models (including our own) is that both organized crime and corruption distort economic growth. If so, then the coefficients β_1 and β_2 in (23) would be negative and statistically significant. As indicated earlier, our primary focus is on the growth effect of organized crime conditional on the presence of corruption. This effect is captured by the coefficient β_3 in (23), a positive (negative) value of which would indicate that organized crime is less (more) damaging to growth in regions where corruption is more pronounced. The low correlation between the two key variables, which ranges from 0.09-0.31 depending on the measure of organized crime, allows for sufficient variation to estimate the relationship.

Our estimation methods include both OLS and dynamic panel techniques (difference-GMM and system-GMM) that have been used in the empirical growth literature by an increasing number of researchers (e.g., Beck *et al.*, 2000; Roodman 2007). The GMM estimations are the most appropriate since they are based on techniques that control for (i) potential endogeneity of the regressors, (ii) region-specific effects, and (iii) heteroskedasticity and auto-correlation within regions.[41] On the other hand, a difficulty associated with these estimators relates to the choice of the number of lags of the endogenous and predetermined variables. In order to restrict the number of instruments so as not to excessively exceed the number of regions (and thus avoid over fitting of the instrumented variables), we use a lag structure of two to four

[39] Serious robberies are also included in the OC index proposed by ISTAT.

[40] According to Ciconte (1992), among 620 kidnapping cases that have been registered in Italy in the period 1969-1989, approximately 200 can be attributed to 'Ndrangheta and only 8, of more than 400, billions Italian lire that have been paid for kidnapping for extortion have been intercepted.

[41] An advantage of these estimators is that they avoid a full specification of the serial correlation and heteroskedasticity properties of the error term, as well as any other distributional assumption.

lags for difference-GMM and two to three lags for system-GMM.[42]

In both the system- and difference-GMM estimations, we test the validity of the instruments by applying two specification tests. The first is the Hansen (1982) J-test of over-identifying restrictions which we use to examine the coherency of the instruments. The second is the Arellano and Bond (1991) test for serial correlation of the disturbances up to second order. This test is important since the presence of serial correlation can cause a bias to both the estimated coefficients and standard errors. The appropriate check relates only to the absence of second-order serial correlation since first-differencing induces first-order serial correlation in the transformed errors.

3.2 Data

We use a panel of 19 Italian regions for the period 1983-2009.[43] Depending on our measure of organized crime, the period considered in different estimations may vary due to data availability.[44] Table A in the Data Appendix provides definitions, sources and the exact period availability of the data, whilst Table 1 presents some summary statistics. Following the standard approach, we construct 7 non-overlapping 4-year period averages (1983-86, 1987-90, ..., 2007-09) in order to minimize business cycles effects. This implies a maximum sample size of 133 observations when we use our baseline measure of organized crime (OC Index 5), though sometimes we end up working with

[42] In each case we have to collapse the instrument set so that we create one instrument for each variable and lag distance, rather than one for each time period, variable, and lag distance. In large samples collapse reduces statistical efficiency, but in small samples it can avoid the bias that arises as the number of instruments climbs toward the number of observations (Roodman, 2006).

[43] We exclude Valle d'Aosta, since it is the smallest and richest region and is usually excluded in the empirical analysis of Italian regions, being treated as an outlier.

[44] For instance, data on homicides by the Mafia, criminal association, extortion, arson and serious robberies are available from 1975, whilst data on Mafia criminal association and bomb attacks are available only from 1983 (after the change in the Italian Penal Code). The longest data are on the sum of extortion, kidnapping for extortion and serious robberies, being available since 1961 from CRENOS.

fewer observations due to missing data.[45]

3.3 Baseline Results

We begin our analysis by estimating equation (23) first with OLS and then with difference- and system-GMM to account for the potential endogeneity of all the right-hand-side variables. The OLS results are reported in Table 2, while the GMM results appear in Table 3 (difference-GMM in Panel A and system-GMM in Panel B). Each of the five columns shows the results for a different measure of organized crime. Column 1 reports the results using the simplest index of organized crime - namely, mafia criminal association. The subsequent columns give the results based on indices that are constructed by adding, in turn, each of the following types of organized crime: homicides by the mafia, criminal association, bomb attacks, and extortion. The index used in the last column (OC Index 5) is the most complete measure and represents our baseline measure of organized crime.

With regard to instrumentation, when using GMM techniques, the small number of Italian regions constrains us in reducing the maximum number of lags to four for difference-GMM and to three for system-GMM, in order to maintain the number of instruments at a minimum. Despite this tight restriction, in each case the instruments appear to be valid according to the Hansen (1982) specification test, whilst the Arellano and Bond (1991) test does not reject the null hypothesis of no second-order serial correlation, at any acceptable level of significance.

Both Table 2 and Table 3 illustrate the typical findings of growth regressions: there is conditional income convergence, a positive statistically significant effect of investment, and a negative statistically significant effect

[45] When we use the measure of OC available since 1961, we construct 13 non-overlapping 4-year period averages (1961-64, 1965-68, ..., 2008-2009) with a maximum sample size of 247 observations.

of inflation.[46] As found elsewhere in the empirical growth literature, both at the cross-country level (e.g., Benhabib and Spiegel 1994) and for the case of Italy (e.g., Di Liberto 2008), the coefficient on education is estimated to be negative. This result may be due to the specific measure of education that we use to proxy for human capital (secondary school enrolment rates) or due to the distorted structural composition of the Italian labor force and the inefficient allocation of human capital across sectors.

With regard to the variables of most interest to us, our results confirm those of previous studies, showing that the coefficients on corruption and organized crime are negative and statistically significant in all regressions at least at the 5% level. Interestingly, the interaction term coefficient is positive and significant, at the 1% level in the GMM regressions. Together, these findings indicate that each type of illegal activity has an adverse impact on growth, but that the impact of organized crime is less severe in the presence of corruption. The general implication of this is that the extent to which corruption occurs is an important factor in determining the negative growth effect of organized crime. The specific implication is that the presence of corruption tends to mitigate this effect. Our findings are qualitatively very strong, though there is obviously variation in the quantitative magnitude of the coefficients depending on the particular measure of organized crime.

3.4 Robustness Checks

In what follows we test the robustness of our baseline results under various modifications of our analysis. These include consideration of different regression specifications and the use of alternative measures of organized crime.

[46] Note that income convergence takes shape only when we control for fixed effects in the difference-GMM regression.

3.4.1 Robustness to Different Regression Specifications

As previously discussed, a difficulty associated with the dynamic GMM estimators relates to the choice of the number of lags of the endogenous variables that are used as instruments. So far, our system-GMM results have been obtained by using a length of two to three lags in order to limit the number of instruments. As a robustness test, we reduce the length of the maximum lags to two so that we only use the second lagged value of a variable as its instrument. The results are shown in Column 2 of Table 4, while Column 1 reproduces Column 5 of Panel B in Table 3 for comparison purposes. Our findings remain intact and the coefficient estimates are very stable.

We further check the robustness of our baseline findings by adding (one at a time) more control variables usually found in growth regressions: these include the rate of population growth, the share of total public spending to GDP, the ratio of trade to GDP, and a measure of financial development. The results are reported in Columns 3-6 of Table 4. Once again, our main results remain unaltered, with some of the additional regressors having the expected sign and being statistically significant (public spending and financial development).

In some Italian regions (for instance Puglia, Basilicata, Lazio, Liguria, Molise) organized crime is a relatively recent phenomenon. Thus, it is possible that our results may be driven by variations in organized crime across time. In order to control for this variability, we estimate the regression by adding interaction terms of corruption, organized crime and decadal dummies.[47] The results are reported in Column 7 of Table 4, and they show that decadal differences in organized crime do not seem to matter for growth. It is also possible that our findings are driven by regional differences in organized crime experience. We account for such regional dissimilarities by adding

[47] Since our baseline measure of organized crime is available for the period 1983-2009, we account for the two decades 1980s and 1990s, excluding the 2000s so as to avoid the so-called dummy-trap.

interaction terms of corruption, organized crime and territorial dummy variables for regions where organized criminality is more widespread.[48] The results are reported in Column 8 of Table 4, and they show that our main findings are still robust. Further, the region-specific estimates of the interaction between organized crime and corruption are not statistically significant.

3.4.2 Robustness to Alternative Measures of Organized Crime

For the most part of the preceding analysis, we have used OC Index 5 as our preferred measure of organized crime. It is important to verify that our results can be established using other measures that have been adopted in the literature. To this end, we construct additional indices of organized crime by considering different combinations of mafia-related offences and applying them in estimations of (23). Being highly correlated, these indices are not expected to produce results that are substantially different from those based on our OC Index 5. Table 5 confirms this.

Column 1 replicates Column 5 of Table 3 (Panel B) for comparison. As discussed earlier, this baseline measure is constructed as the sum of official data recorded on five different types of crime that are defined as being proof, or deemed symptomatic, of the presence of criminal organizations (i.e., criminal association, mafia criminal association, homicides by mafia, bomb attacks, and extortion). Column 2, instead, reports the results using an index that excludes criminal association and extortion, but which proxies the latter by arson and bomb attacks as the primary means of exacting payments from businesses (e.g., Confesercenti 2009; Daniele and Marani 2010). The subsequent columns take OC Index 5 and add successively arson (Column 3), kidnapping for extortion (Column 4), and both arson and kidnapping for

[48] As before, the regions have been classified on the base of the data on mafia-type criminal association (art. 416 bis of the Italian Penal Code) averaged for the period 1983-2009. The regions with the highest number of these crimes, in diminishing order, are: Sicily, Calabria, Campania, Puglia, Basilicata, Molise, Lazio, and Liguria.

extortion (Column 5).

Added to the above are results based on three further measures of organized crime. The first of these (Column 6) is the index of organized crime proposed by Daniele and Marani (2010). This differs from our baseline index in its exclusion of homicides by the Mafia but inclusion of arson. The second (Column 7) is the measure produced by the Italian National Institute of Statistics (ISTAT), as used by Caruso (2008). This is based on the definition of criminal organization given by the Italian Minister of Interiors, and includes the crimes of homicides by the Mafia, bomb attacks, arson and serious robberies.[49] The third (Column 8) is an index constructed more broadly from data on extortion, kidnapping for extortion and serious robberies (available from CRENOS). This is not strictly associated with organized crime, but may be regarded as closely proxying it for reasons given earlier, and has the appeal of covering a relatively long time span (beginning from 1961).

As Table 5 shows, the use of alternative measures of organized crime makes little difference to our original results. The growth effects of our three key variables - organized crime, corruption and the interaction between these - remain statistically significant and in the same direction (i.e., negative, negative and positive). An additional set of results presented in Column 9 of the Table relate specifically to the interaction term, our principal focus of attention based on our theoretical analysis. One might raise the question about whether the effect of this term is specific to organized crime, or whether it extends to other types of crime. To address this question, we conduct a falsification test, where organized crime is replaced by a measure of normal crime. A natural choice of the latter is intentional homicide, given that such crime is well-reported and given that it has a well-known distortionary

[49] Rather than using directly the index given by ISTAT, we construct an index as the sum of organized crime offences identified by this institute. We do so because of the relatively short time span of the original data, which covers 1995-2003, 2006 and 2008-2010. By contrast, our reconstructed measure provides coverage for 1983-2009.

effect on growth (e.g., Cárdenas and Rozo 2008; Detotto and Otranto 2010). Our results confirm this effect, whilst also demonstrating that its maginitude is not conditional on the presence or absence of corruption. This implies that our previously robust finding of a positive interaction term is likely to reflect an association between organized crime (rather than general crime) and corruption.

To this point, our indices for organized crime have been constructed as the sum of various mafia-related crimes. As a final robustness check of our results, we use measures of organized crime obtained from Principal Component Analysis (PCA).[50] Table 6 reports our results using alternative measures of organized crime based on the PCA procedure. Column 1 relates to crimes of criminal assocation, mafia association and mafia homicides. Column 2 extends this to include bomb attacks, whilst Column 3 makes a further extension to include extortion (corresponding to our baseline OC Index 5). Column 4 adds arson to the list of offences and excludes criminal association and extortion, and Column 6 refers to the list of offences suggested by ISTAT. In each and every case, our main results are unchanged.

4 Conclusion

This paper has sought to cast further light on the macroeconomic implications of organized crime and its interaction with corruption. These two phenomena are amongst the most vivid examples of poor quality governance and badly-functioning institutions. Their adverse effects on growth and development are well-documented, and the fight against each of them remains high on the agendas of national and international agencies. What is less

[50] Generally speaking, PCA is a statistical technique that is used for data reduction. It is appropriate when one has data on a number of variables that are correlated with each other (possibly because they are measuring the same phenomena), in which case one can reduce the number of these observable variables into a smaller number of artificial variables (the principal components) that account for most of the variation in the observables.

well-understood is the extent to which their impacts might be reinforced or subdued through linkages between them. Making in-roads to this has been our primary objective in this paper.

At the theoretical level, our analysis shows how organized crime alone creates an unfavourable climate for business activity by raising the costs of this activity through extortion. The upshot is that growth is lower than would otherwise be the case. This is what one would expect, but our modelling strategy is designed to go much further in demonstrating how the impact of organized crime may be conditional on the presence of corruption. As our results indicate, this conditionality could go either way - organized crime may be more or less damaging if it co-exists with corruption.

At the emprical level, our analysis provides clear evidence that resolves the above ambiguity. The key aspect of this is the inclusion of an interaction term between organized crime and corruption in our growth regressions. Using different methodologies and datasets, we find that the coefficient on this term is consistently positive and statistically significant. The implication is that organized crime is less damaging to growth in the presence, rather than the absence, of corruption. This finding, in turn, highlights the importance of treating jointly the two illegal phenomena of organized crime and corruption in the context of growth analysis.

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Appendix

A. Solution to the Mafia's Problem in the Absence of Corruption

The results in (13) and (14) are obtained by setting up the Lagrangian,

$$L = \{[1-\gamma(1-q)]p\chi^c(1-p\chi^c)M - \Delta\delta^c\}Ml_t + \lambda_t(\delta^c - \chi^c),$$

where λ_t is the Lagrange multiplier. The optimality and complementary slackness conditions are

$$[1-\gamma(1-q)]p(1-2p\chi^c)M^2 l_t - \lambda_t = 0, \tag{A1}$$

$$-\Delta M l_t + \lambda_t = 0, \tag{A2}$$

$$\lambda_t(\delta^c - \chi^c), \quad \lambda_t \geq 0, \quad \delta^c \geq \chi^c. \tag{A3}$$

From (A2), we have $\lambda_t = \Delta M l_t > 0$, which implies that $\delta^c = \chi^c$ from (A3). Substitution into (A1) gives the result in (13), which may be substituted into (11) to arrive at the result in (14).

B. Solution to the Mafia's Problem in the Presence of Corruption

The results in (19), (20) and (21) are obtained by setting up the Lagrangian,

$$\begin{aligned} L = \{[1-\gamma(1-q')]\chi^{cc}\beta(1-\chi^{cc})M - \Delta\delta^{cc}\}Ml_t \\ +\lambda_{1t}(\delta^{cc} - \chi^{cc}) + \lambda_{2t}[1-\beta-(1-r)\phi], \end{aligned}$$

λ_{it} $(i = 1, 2)$ is the Lagrange multiplier. The optimality and complementary slackness conditions are

$$[1-\gamma(1-q')]\beta(1-2\chi^{cc})M^2 l_t - \lambda_{1t} = 0, \tag{B1}$$

$$-\Delta M l_t + \lambda_{1t} = 0, \tag{B2}$$

$$[1-\gamma(1-q')]\chi^{cc}(1-\chi^{cc})M^2 l_t - \lambda_{2t} = 0, \tag{B3}$$

$$\lambda_{1t}(\delta^{cc} - \chi^{cc}), \quad \lambda_{1t} \geq 0, \quad \delta^{cc} \geq \chi^{cc}, \tag{B4}$$

$$\lambda_{2t}[1-\beta-(1-r)\phi] \geq 0, \quad \lambda_{2t} \geq 0, \quad 1-\beta \geq (1-r)\phi. \tag{B5}$$

From (B2), we have $\lambda_{1t} = \Delta M l_t > 0$, which implies that $\delta^{cc} = \chi^{cc}$ from (B4). Substitution into (B1) gives the result in (19), which may be substituted into (17) to arrive at the result in (21). From (B3) we have $\lambda_{2t} = [1-\gamma(1-q')]\chi^{cc}(1-\chi^{cc})M^2 l_t > 0$, which implies that $1-\beta = (1-r)\phi$ from (B5). This is the result in (20).

Data Appendix
Table A
Description of Variables and Sources

Variables	Description	Sources
GDP growth pc	Log difference of GDP per capita in thousands of millions of lire (constant 1990 prices)	ISTAT- Annals of Statistics and CRENoS-1961/2009
Initial GDP pc (log)	Log of initial GDP per capita in thousands of millions of lire (constant 1990 prices)	ISTAT- Annals of Statistics and CRENoS -1961/2009
Investment	Share of gross private investment (% of GDP)	ISTAT- Annals of Statistics and CRENoS -1961/2009
Education	Percentage of population in age range 14-18 registered in high school	ISTAT- Annals of Statistics and CRENoS -1961/2009
Inflation	GDP deflator	ISTAT- Annals of Statistics and CRENoS -1961/2009
Population growth	Population growth rate	ISTAT- Annals of Statistics - 1961/2009
Public spending	Share of total public spending (% of GDP)	ISTAT- Annals of Statistics - 1961/2009
Trade	Share of trade (% of GDP)	ISTAT- Annals of Statistics - 1961/2009
Financial development	Share of value added of financial and banking sector (% of GDP)	ISTAT- Annals of Statistics and CRENoS -1975/2009
Corruption	Number of crimes against Public Administration (PA) based on Statues no. 286 through 294. Excluding crimes against PA that do not involve corruption such as Statute 279 (insulting a public officer) and Statute 295 (neglect or refusal of an official duty) reported to the police, per 100,000 inhabitants. These crimes include embezzlement and misallocation of public funds.	ISTAT- Annals of Judicial Statistics -1961/2009
OC Index 5	Sum of the following crimes: Mafia criminal association, homicides by Mafia, criminal association, bomb attacks, extortion (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1983/2009
Extortion	Number of crimes of extortion denounced (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1975/2009
Criminal Association *(art.416)*	Number of crimes of criminal association (per 100,000 inhabitants) defined as: *"the association of three or more people who are organized in order to commit a plurality of crimes"*	ISTAT- Annals of Judicial Statistics -1975/2009
Mafia Criminal Association *(art.416 bis)*	Number of crimes of Mafia criminal association (per 100,000 inhabitants) defined as: *"the association is of the Mafia type when its components use intimidation, awe and silence in order to commit crimes, to acquire the control or the management of business activities (i.e., concessions, permissions, public contracts or other public services), to derive profit or advantages for themselves or others, to limit the freedom of exerting the right to vote, and to find votes for themselves or others during the electoral campaign."*	ISTAT- Annals of Judicial Statistics -1983/2009
Homicides by Mafia	Number of homicides by mafia (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1975/2009
Bomb Attacks	Number of bomb attacks (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1983/2009
Arsons	Number of arsons (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1975/2009
Robberies in Banks	Number of robberies in banks (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1975/2009
Robberies in Post Offices	Number of robberies in post offices (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1975/2010
Kidnapping for extortion	Number of kidnapping for extortion (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1975/2011
OC Index ISTAT	Sum of the following crimes: homicides by Mafia, bomb attacks, arsons, serious robberies (in banks and post offices) per 100,000 inhabitants	ISTAT- Annals of Judicial Statistics -1983/2009
OC Index CRENOS	Sum of the following crimes: extortion, kidnapping for extortion, serious robberies (in banks and post offices) per 100,000 inhabitants	ISTAT- Annals of Statistics and CRENoS - 1961/2009
OC Index Daniele- Marani	Sum of the following crimes: extortion, bomb attacks, arsons, criminal association, Mafia criminal association (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1983/2009
Homicides	Number of intentional homicides (per 100,000 inhabitants)	ISTAT- Annals of Judicial Statistics -1960/2010
PCA OC Index 5	Principal Component Analysis of the crimes included in OC Index 5	ISTAT- Annals of Judicial Statistics -1983/2009

Table 1
Summary Statistics

Variable	Mean	Std Dev	Min	Max	Obs
GDP p.c. growth (%)	2.63	2.56	-3.95	11.63	257
Initial GDP p.c. (1990 lire)	18,900,000	8,068,528	4,165,179	39,000,000	257
Investment (% GDP)	24.81	6.68	15.81	71.55	240
Education	62.06	25.27	11.84	104.79	260
Inflation (%)	19.77	6.98	5.9	-4.52	260
Population growth (%)	4.06	3.67	0.12	16.01	257
Public spending (% GDP)	19.46	5.53	9.62	33.52	200
Trade (% GDP)	33.95	28.08	1.22	223.44	207
Financial development (% GDP)	20.03	3.33	12.29	27.54	140
Corruption	2.35	1.98	0.19	10.2	257
OC Index 5	10.67	7.41	2.78	43.12	160
Extortion	5.29	3.55	0.89	19.03	200
Criminal Association	1.85	0.96	0.44	6	200
Mafia Criminal Association	0.3	0.5	0	2.95	160
Homicides by Mafia	0.24	0.71	0	6.73	200
Bomb Attacks	2.37	4.28	0	24	160
Arsons	13.4	12.72	2.02	101.13	200
Robberies in Banks	2.34	1.68	0	7.38	160
Robberies in Posts	1.16	0.96	0	6.81	160
Kidnapping for extortion	0.24	0.2	0	1.11	200
OC Index ISTAT	20.51	15.53	4	76.61	120
OC Index CRENOS	38.93	40.6	3.19	295.12	200
OC Index Daniele and Marani	25.95	18.62	7.44	124.78	160
Homicides	1.54	1.62	0.21	12.85	257
PCA OC Index 5	1.25	1.65	-1.48	8.2	160

Notes: Data on GDP per capita growth, investment, inflation, secondary school enrolment, trade, public spending, financial development and population growth are from CRENOS and the Italian National Institute of Statistics (ISTAT), Annals of Statistics (various years). For these variables, summary statistics are based on average data for the period 1961-2009. Data on crimes are from ISTAT, Annals of Judicial Statistics (various years). The period of time considered for the averages depends on the availability of data (see Table A in Data Appendix for a detailed description of the availability of data).

Table 2
OLS Estimations

Dependent Variable: GDP pc growth	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
Initial GDP per capita (log)	-0.534	-0.589	-0.132	-0.871	-1.326
	(0.509)	*(0.448)*	*(0.869)*	*(0.260)*	*(0.088)*
Inflation	-0.269	-0.280	-0.263	-0.279	-0.292
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education	-0.045	-0.048	-0.044	-0.046	-0.040
	(0.001)	*(0.000)*	*(0.002)*	*(0.001)*	*(0.003)*
Investment	0.078	0.074	0.078	0.075	0.067
	(0.069)	*(0.084)*	*(0.067)*	*(0.058)*	*(0.073)*
Corruption	-0.248	-0.238	-0.419	-0.277	-0.492
	(0.019)	*(0.019)*	*(0.000)*	*(0.028)*	*(0.000)*
Organized crime	-1.051	-0.459	-0.257	-0.110	-0.131
	(0.046)	*(0.014)*	*(0.036)*	*(0.002)*	*(0.000)*
Corruption*Organized crime	0.173	0.075	0.072	0.014	0.021
	(0.065)	*(0.126)*	*(0.011)*	*(0.036)*	*(0.002)*
Regions/Obs	19/133	19/133	19/133	19/133	19/133
R^2	0.350	0.355	0.356	0.357	0.393

Notes: Dependent variable is the GDP per capita growth rate. *p*-values in parentheses. Constant term not reported. Regressions based on OLS. The measures of OC are as follows: Mafia crim. assoc. (Column 1); Mafia crim. assoc. + homicides by Mafia (Column 2); Mafia crim. assoc.+ homicides by Mafia + crim. assoc. (Column 3); Mafia crim. assoc.+ homicides by Mafia + crim. assoc. + bomb attacks (Column 4); OC Index 5: Mafia crim. assoc.+ homicides by Mafia + crim. assoc.+ bomb attacks+ extortion (Column 5).

Table 3
GMM Estimations

Panel A: Difference-GMM	[1]	[2]	[3]	[4]	[5]
Initial GDP per capita (log)	-7.47	-6.29	-9.18	-8.87	-8.97
	(0.000)	*(0.031)*	*(0.000)*	*(0.000)*	*(0.000)*
Inflation	-0.369	-0.405	-0.482	-0.361	-0.422
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education	-0.038	-0.052	-0.066	-0.020	-0.033
	(0.038)	*(0.054)*	*(0.003)*	*(0.223)*	*(0.046)*
Investment	0.284	0.248	0.372	0.147	0.255
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Corruption	-0.297	-0.256	-0.394	-0.472	-0.635
	(0.043)	*(0.043)*	*(0.007)*	*(0.000)*	*(0.000)*
Organized crime	-3.082	-0.786	-0.220	-0.262	-0.140
	(0.000)	*(0.000)*	*(0.015)*	*(0.000)*	*(0.000)*
Corruption*Organized crime	0.424	0.114	0.201	0.026	0.039
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Regions/Obs	19/114	19/114	19/114	19/114	19/114
Number of instruments	21	21	21	21	21
Hansen *J*-test (*p*-value)	0.338	0.256	0.258	0.256	0.239
AR(1) test (*p*-value)	0.005	0.003	0.004	0.003	0.002
AR(2) test (*p*-value)	0.717	0.341	0.442	0.933	0.900
No. of lags of endogenous variables used as instruments	2_4	2_4	2_4	2_4	2_4
Panel B: System-GMM					
Initial GDP per capita (log)	-1.60	-0.60	-1.20	-3.06	-1.73
	(0.059)	*(0.424)*	*(0.207)*	*(0.001)*	*(0.151)*
Inflation	-0.351	-0.386	-0.345	-0.322	-0.308
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education	-0.079	-0.092	-0.080	-0.055	-0.053
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Investment	0.218	0.256	0.176	0.107	0.108
	(0.000)	*(0.000)*	*(0.001)*	*(0.006)*	*(0.007)*
Corruption	-0.206	-0.196	-0.749	-0.367	-0.795
	(0.000)	*(0.002)*	*(0.000)*	*(0.000)*	*(0.000)*
Organized crime	-2.045	-0.720	-0.521	-0.160	-0.126
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Corruption*Organized crime	0.316	0.143	0.210	0.017	0.039
	(0.000)	*(0.000)*	*(0.000)*	*(0.039)*	*(0.000)*
Regions/Obs	19/133	19/133	19/133	19/133	19/133
Number of instruments	22	22	22	22	22
Hansen *J*-test (*p*-value)	0.272	0.279	0.491	0.32	0.348
AR(1) test (*p*-value)	0.004	0.003	0.002	0.003	0.002
AR(2) test (*p*-value)	0.244	0.133	0.841	0.147	0.25
No. of lags of endogenous variables used as instruments	2_3	2_3	2_3	2_3	2_3

Notes: Dependent variable is the GDP per capita growth rate. *p*-values in parentheses. Constant term not reported. Regressions based on Difference-GMM (Panel A) and System-GMM (Panel B). All control variables are instrumented for. The measures of OC are as described in Table 2.

Table 4
Robustness Tests to Additional Controls and Dummy Interactions

Dependent Variable: GDP pc growth	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Initial GDP per capita (log)	-1.73	-2.66	-0.65	-1.13	-2.33	-1.27	-0.96	-4.92
	(0.151)	*(0.165)*	*(0.686)*	*(0.325)*	*(0.027)*	*(0.321)*	*(0.503)*	*(0.366)*
Inflation	-0.308	-0.333	-0.311	-0.342	-0.364	-0.115	-0.331	-0.491
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.000)*	*(0.000)*
Education	-0.053	-0.044	-0.039	-0.039	-0.042	-0.047	-0.053	-0.039
	(0.000)	*(0.021)*	*(0.055)*	*(0.014)*	*(0.079)*	*(0.003)*	*(0.008)*	*(0.526)*
Investment	0.108	0.219	0.239	0.268	0.214	-0.012	0.223	0.212
	(0.007)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.822)*	*(0.000)*	*(0.183)*
Corruption	-0.795	-0.813	-0.848	-0.851	-0.812	-0.330	-0.796	-3.433
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.000)*	*(0.032)*
Organized crime	-0.126	-0.102	-0.195	-0.167	-0.167	-0.148	-0.144	-0.779
	(0.000)	*(0.018)*	*(0.040)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.001)*	*(0.039)*
Corruption*Organized crime	0.039	0.036	0.051	0.054	0.051	0.020	0.045	0.250
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.020)*	*(0.000)*	*(0.054)*
Population growth			0.31	0.16	0.159	0.261		
			(0.021)	*(0.169)*	*(0.112)*	*(0.001)*		
Public spending				-0.163	-0.164	0.050		
				(0.003)	*(0.001)*	*(0.326)*		
Trade					0.009	-0.016		
					(0.298)	*(0.061)*		
Financial development						0.164		
						(0.043)		
Corr*OC*1980s							0.019	
							(0.437)	
Corr*OC*1990s							0.000	
							(0.931)	
Corr*OC*Campania								-0.069
								(0.246)
Corr*OC*Calabria								-0.074
								(0.213)
Corr*OC*Sicilia								-0.073
								(0.169)
Corruption*OC*Puglia								0.019
								(0.926)
Corruption*OC*Basilicata								0.064
								(0.425)
Corruption*OC*Molise								-0.104
								(0.210)
Corruption*OC*Lazio								-0.255
								(0.401)
Corruption*OC*Liguria								0.246
								(0.191)
Regions/Obs	19/133	19/133	19/133	19/133	19/130	19/111	19/133	19/134
Number of instruments	22	15	17	19	21	23	18	31
Hansen *J*-test (*p*-value)	0.348	0.072	0.079	0.074	0.103	0.666	0.077	0.778
AR(1) test (*p*-value)	0.002	0.003	0.008	0.004	0.009	0.006	0.003	0.001
AR(2) test (*p*-value)	0.25	0.572	0.276	0.322	0.419	0.317	0.368	0.234
No. of lags of endogenous variables used as instruments	2_3	2_2	2_2	2_2	2_2	2_2	2_2	2_2

Notes: Dependent variable is the GDP per capita growth rate. *p*-values in parentheses. Constant term not reported. Regressions based on System-GMM. All control variables are instrumented for. OC measured by the baseline index, OC Index 5.

Table 5
Robustness to Alternative Measures of (Organized) Crime

Dependent Variable: GDP pc growth	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**	**[9]**
	OC Index 5	*MA+HM+BA+Ar*	*OC5+Ar*	*OC5+KE*	*OC5+Ar+KE*	*Daniele and Marani*	*ISTAT Caruso*	*1961-2009*	*Homicides*
Initial GDP per capita (log)	-1.73	-1.62	-2.66	-2.37	-1.92	-1.95	-1.98	-1.97	-8.22
	(0.151)	*(0.185)*	*(0.000)*	*(0.001)*	*(0.001)*	*(0.001)*	*(0.002)*	*(0.025)*	*(0.000)*
Inflation	-0.308	-0.306	-0.316	-0.316	-0.324	-0.325	-0.257	-0.177	-0.322
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education	-0.053	-0.053	-0.031	-0.036	-0.041	-0.042	-0.07	0.004	-0.028
	(0.000)	*(0.000)*	*(0.002)*	*(0.011)*	*(0.002)*	*(0.001)*	*(0.000)*	*(0.691)*	*(0.002)*
Investment	0.108	0.106	0.048	0.097	0.083	0.090	0.056	0.204	0.022
	(0.007)	*(0.009)*	*(0.424)*	*(0.008)*	*(0.104)*	*(0.057)*	*(0.215)*	*(0.000)*	*(0.280)*
Corruption	-0.795	-0.809	-0.811	-0.761	-0.769	-0.752	-0.281	-0.551	-0.772
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.057)*	*(0.000)*	*(0.000)*
Crime	-0.126	-0.12	-0.076	-0.044	-0.045	-0.042	-0.040	-0.029	-0.614
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.015)*	*(0.000)*	*(0.000)*
Corruption* Crime	0.039	0.039	0.014	0.009	0.010	0.009	0.006	0.007	0.021
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.049)*	*(0.000)*	*(0.734)*
Regions/Obs	19/133	19/133	19/133	19/133	19/133	19/133	19/114	19/171	19/133
Number of instruments	22	22	22	22	22	22	22	22	22
Hansen *J*-test (*p*-value)	0.348	0.347	0.280	0.284	0.246	0.257	0.548	0.360	0.227
AR(1) test (*p*-value)	0.002	0.002	0.002	0.002	0.002	0.002	0.008	0.000	0.019
AR(2) test (*p*-value)	0.250	0.262	0.470	0.506	0.505	0.513	0.087	0.203	0.817
No. of lags of endogenous variables used as instruments	2_3	2_3	2_3	2_3	2_3	2_3	2_3	2_3	2_3

Notes: Dependent variable is the GDP per capita growth rate. *p*-values in parentheses. Constant term not reported. Regressions based on system-GMM. All control variables are instrumented for. OC is measured as follows: OC Index 5 (Column 1); Mafia association+ homicides by Mafia + bomb attacks + arsons (Column 2); OC Index 5 + arsons (Column 3); OC Index 5 + kidnapping for extortion (Column 4); OC Index 5 + arsons + kidnapping for extortion (Column 5); OC index proposed by Daniele and Marani (2010): extortion + bomb attacks + arsons + criminal association + Mafia criminal association (Column 6); ISTAT OC index: homicides by Mafia + bomb attacks + arsons + serious robberies (Column 7); OC index which includes: serious robberies + kidnapping for extortion + extortion (Column 8).

Table 6
Robustness to Alternative PCA Indexes of Organized Crime

Dependent Variable: GDP pc growth	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
	Index 3	*Index 4*	*Index 5*	*Index 6*	*ISTAT Index*
Initial GDP pc (log)	-0.28	-0.82	-0.22	-1.67	-2.48
	(0.745)	*(0.411)*	*(0.805)*	*(0.080)*	*(0.000)*
Inflation	-0.35	-0.363	-0.349	-0.373	-0.255
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Education	-0.083	-0.086	-0.083	-0.080	-0.060
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Investment	0.188	0.215	0.188	0.197	-0.001
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.967)*
Corruption	-0.225	-0.137	-0.197	-0.144	-0.279
	(0.000)	*(0.002)*	*(0.002)*	*(0.079)*	*(0.000)*
Organized crime	-0.609	-0.515	-0.463	-0.571	-0.765
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Corruption*Organized crime	0.268	0.138	0.174	0.105	0.112
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Regions/Obs	19/133	19/133	19/133	19/133	19/133
Number of instruments	22	22	22	22	22
Hansen *J*-test (*p*-value)	0.318	0.272	0.280	0.239	0.046
AR(1) test (*p*-value)	0.002	0.002	0.002	0.001	0.004
AR(2) test (*p*-value)	0.893	0.132	0.259	0.239	0.273
No. of lags of endogenous variables used as instruments	2_3	2_3	2_3	2_3	2_3

Notes: Dependent variable is the GDP per capita growth rate. *p*-values in parentheses. Constant term not reported. Regressions based on system-GMM. All control variables are instrumented for. Index 3: PCA of Mafia criminal association, homicides by Mafia, criminal association; Index 4: PCA of Mafia criminal association, homicides by Mafia, criminal association, bomb attacks; Index 5: PCA of crime variables in baseline measure OC Index 5; Index 6: PCA of Mafia criminal association, homicides by Mafia, bomb attacks, arsons; ISTAT Index: PCA of crime variables in ISTAT Index.