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Hindering Human Capital Accumulation: a Hidden Cost of the Silent Mafia?

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Abstract

Since the 1970s, mafias have embedded outside South Italy though employing steadily less violence in establishing their illegal business. Could this rooting and social adaptation in the most productive areas of the country impair human capital accumulation? We provide evidence of a decline in human capital in those areas that were initially wealthy and innovative before mafias established their presence and influence. Our estimates suggest that, for the top 75% of mafia-infiltrated provinces, a reduction by 25 percentiles in their position within the mafia ranking could increase the number of university graduates per capita by 4-21%.

Keywords: Organised crime, mafia, human capital, education, tertiary education.

JEL Classification Numbers: K42, J24, H75, R11.

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1 Introduction

A distinctive feature of any society is its ability to accumulate human capital. A distinctive feature of mafias is their mastery in developing structural relations within society. Can organised crime hinder the accumulation of human capital through its interaction with society? This is an important issue, as researchers have shown that both the initial level and the changes in human capital are instrumental in economic growth and societal welfare.\footnote{See for instance Sunde and Vischer (2015) and the references therein.} We address this question by focusing on Central and North Italy, the latter in particular being the most economically developed and productive part of the country. Here, since the 1970s, security forces have progressively uncovered a massive presence of organised crime, which has adapted to the social fabric by gradually using less violence yet more illegal collusion with businessmen and politicians. In this paper, taking Central and North Italy as the empirical context, we focus on university graduates to study the impact of mafias on human capital.

To identify the presence of organised crime we exploited a natural experiment that occurred in Italy largely during the period spanning the mid-1950s to early 1980s. This experiment is known as forced resettlement: courts in southern Italy forced convicted criminals suspected of belonging to clans into exile from the south mostly to the north. Using this event as an exogenous source of variation, we instrument mafia with the number of high-ranking bosses per capita who were forced to resettle to central and northern provinces.

The main contribution of the present work lies in the empirical evidence that the mafias’ colonisation outside South Italy since the 1950s has depressed human capital accumulation in this part of the country which was free from indigenous mafias before. Given our empirical results, we can focus, for example, on all the provinces above the 25th percentile in the mafia ranking, that is on the upper 75% of the distribution where mafias are more pervasive. Considering this group, one can ask what would be the impact of a policy that would reduce the mafia presence in each province by shifting down the provinces position in the mafia ranking by 25 percentiles. Our examination then shows that such a policy would lead to an increase in tertiary education in each province by a value in the range of 4-21% given the prevalence of mafias in that province. This outcome is particularly important because in Italy the level of tertiary attainment among 25-64 year-olds is one of the lowest among the OECD countries, while the output growth rate since the mid-1990s has been very low. Generally, our findings suggest that a region, which is initially free from mafias and is wealthy, innovative and prosperous, can experience a fall in human capital once organised crime is allowed to spread its roots, altering the industry structure and corrupting the fabric of the society.
The earlier literature that has examined the interlinkages between education and crime has mostly investigated the impact of education on crime, establishing that years of education as well as the completion of high school reduce criminality.\(^2\) The current work examines the relationship between education and crime from the opposite direction, namely the impact of crime on education and focuses on mafias. The interest in investigation this relationship lies in the fact that the mafia is an institution in the sense that it is an organisation based on a system of internal rules which does not naturally end when affiliates are gone (at least so far). Its permanent nature thus implies that if it roots in a new territory, it establishes a permanent interaction with the socio-economic fabric of that territory in order to grow. Now, if such interaction hinders human capital accumulation, there would be a further and continuous pernicious effect of crime on society, but also a feedback loop activating a vicious education-crime cycle. In several advanced economies, judicial evidence has shown that mafias have rooted in territories where they originally did not exist. One leading case is Central and Northern Italy. Here since the 1990s many important investigations have documented that *Cosa Nostra*, 'ndrangheta, Camorra, and *Sacra Corona Unita* have been effectively transplanted from their native places in South Italy.\(^3\) In these virgin areas, organised crime has adapted to the more economically developed society using progressively less and less violence, but extensive illegal collusion with firms, beyond the usual collusion with some politicians.\(^4\) Regions outside South Italy have therefore experienced a silent shock with the mafias’ rooting, and the hypothesis that we test in this paper is whether such a shock has impacted human capital. But why would mafia hamper human capital? In a nutshell because it distorts the economic incentives of the agents: the incentive of youngsters to commit to education, and aim for a university degree, and the incentive of firms to demand personnel with high-level education.\(^5\)

We are not the first to conjecture that mafias can stifle human capital accumulation. Earlier, Coniglio et al. (2010) examined data from Calabria – a southern region which is the poorest in Italy – and argued that in municipalities where organised crime is present there is a negative incentive to acquire education and a positive incentive to migrate. Their work is innovative in signaling a channel in which the mafia can effect pernicious long-run

\(^2\)See Lochner (2020) for a survey in this field, including the impact of educational attainment and school quality on crime, as well as the effects of juveniles’ interaction with the justice system and schooling achievements.


\(^4\)Such a new modality of the mafia interaction with the local community did not pass unobserved by merit judges in Milan who dubbed it the *silent mafia*.

\(^5\)For a review of the evidence on the relationship between crime and economic incentives, including the causal effect of education on crime see Draca and Machin (2015).
consequences on the local territory. Yet it faces the difficulty of identifying organised crime in a relationship where mafia and education are potentially endogenous. An important contribution on mafia and human capital has been made by Acemoglu et al. (2020) who provided a theory for the mafia’s expansion in Sicily, South Italy, during the late 19th century. They used this theory to identify the mafia and show that it adversely affected various public goods and human capital. As to the latter, they found that literacy significantly decreased in the 1910s and 20s, and there was a long-term effect on high-school completion rates, although smaller and less precise, in the 1970s. Our results complement and extend theirs in that for a different period, geography, human capital indicator and, to some extent, society, we find that mafias’ rooting in a territory lowers its accumulation of human capital. In particular, this study is distinct from the previous literature in considering a more recent period starting in the mid-1950s with forced resettlement, and by investigating mafias and tertiary education in areas where, unlike South Italy, mafias did not originally exist. Our empirical context thus includes the wealthiest and most productive areas of the country, arguably endowed with more social capital, and where Italian mafias were not borne but transplanted. Our findings thus suggest that mafias can affect human capital independently of geography, culture, social capital, and levels of economic development. Furthermore, the present paper indicates that transplanted mafias can be as effective as indigenous mafias in depressing human capital accumulation.

Another important strand of the literature studies the human capital level of elected local politicians when mafias are active in the territory. Dal Bo et al. (2006) present a model where groups attempt to influence policies through both corruption and violence inducing an equilibrium in which lower-ability politicians take office. Pinotti (2013) documents the existence of abnormal upswings in the homicide rate in regions of southern Italy affected by mafia during electoral periods, and shows that the extent of such increases negatively correlates with the schooling level of the elected politicians and positively correlates with their probability of being involved in scandals. Daniele and Geys (2015) consider law enforcement improvements, and specifically the impact of a law allowing the dissolution of local government due to mafia infiltration: they show that in southern Italy dissolution led to a significant increase in the politicians’ average education level. Always in South Italy, Daniele (2019) shows that negative shocks in individuals’ expected payoffs – captured by mafias’ murder of local politicians – lower the human capital of elected politicians by discouraging high-ability individuals from entering politics. Our findings also complement these

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6 For example, several researchers have shown that there are regional differences on the matter of trust between the South and the North Italy – see among others Guiso et al. (2004) and Bigoni et al. (2016).

7 More generally, for the relationship between mafias and politics see Daniele and Dipoppa (2017), Alesina et al. (2019), Acemoglu et al. (2013), De Luca and De Feo (2017).
studies by showing that the adverse impact of mafias on human capital also extends to an unexpected pernicious effect on tertiary education in those areas in which organised crime is deeply-rooted.

Dealing with the mafias’ effect on human capital, our paper indirectly relates to the impact of mafias on local economic development. In this branch of the literature important works include Pinotti (2015) who shows that the presence of mafias significantly reduced GDP per capita in southern Italy; and Cataldo and Mastrorocco (2020) who shows that infiltrated local governments misallocate public resources in construction, waste management and municipal police. Arguably, the slowdown in human capital accumulation induced by mafias that we document in this paper has contributed to the fall in the output growth rate in Italy over the last two decades.

The rest of the paper is organised as follows. In section 2 we describe the transmission channels through which we argue that the presence of the mafia hampers human capital accumulation. Section 3 discusses the choice of Central and North Italy as the empirical context. In section 4 we provide information on the data and the construction of the index used to capture the presence of organised crime in the central and northern areas. Section 5 discusses the empirical model and our identification strategy. Section 6 first presents a spatial visualisation of the correlation between organised crime and human capital at the individual provincial level, and then sets out our empirical findings and the robustness analysis. Section 7 concludes.

2 Transmission Channels: Mafia to Human Capital

In this work we investigate the mafias’ adverse impact on the stock of graduates per capita at the province level, which is determined by the supply of and the demand for higher education. We argue that this phenomenon occurs because mafias adversely affect the socio-economic fabric of the territories in which they root and exert their control. Such a mutation in the territory alters both individuals’ incentives to acquire and supply graduate education, and the firms’ incentives to demand graduate education, as described in sections 2.1 and 2.2, respectively.

2.1 Mafias and the Individuals’ Incentive to Acquire Higher Education

The incentive to acquire higher education, to a large extent, depends on the assessment of the expected effort and payoff associated with schooling versus other options not requiring
high-level education including crime. Focusing on the choice between acquiring tertiary education and engaging in crime, we can rely on the Becker (1968) and Ehrlich (1973) crime utility models and the literature since then to understand how mafias impact a youngster’s choice. Indeed, adapting their models to the current work, the youngster would choose whether to study at university or engage in crime by carrying out a cost-benefit analysis under uncertainty. The model then predicts that, given deterrence, the choice depends on the economic incentives, specifically on earnings associated with choosing crime (positively), and on earnings associated with a university degree (negatively). Now, when a mafia permeates an area, it impacts these economic incentives particularly by increasing the perceived benefit of engaging in crime, while reducing the benefit of a university degree. To see how, it is useful to start from mafia control of the territory, a mafia hallmark, and then consider how it affects the environment where a youngster forms his beliefs on education versus crime, that is family, school and neighbourhood.

Mafias control of the territory is very often reported in judicial acts, e.g. (Salvadori, 2011, pp. 501-502). Controlling the territory means the supplying of protection services on any type of economic transactions, the setting up of criminal activities in various sectors, the establishment of a fine-grained network of relations in several different institutional environments, and the acquisitions of proper means to control the local community as a whole (Sciarrone, 1998). Territorial control implies that citizens are aware of the mafia’s power in their small town or neighbourhood, not to mention its widespread potential for human, social and economic dissolution (Pizzuti, 2010, p. 16). While citizens can be subjugated by the mafia through some kind of extortion, they can also collude with its members hoping to gain the upper hand in business and politics. This suggests that the more mafias permeate a territory, the larger the number of opportunities to earn money by teaming up with them, and thus the larger the economic incentives for a youngster to engage at some level with the mafia instead of investing in education.

Certainly, in a mafia-controlled environment, juveniles can observe examples of apparently successful careers not requiring a diploma. These examples range from collusion to affiliation: two options allowing mafias to interact with a broad range of youngsters in different ways according to their attitudes. Citizens also know that bosses are rich and powerful, a fact which can easily charm the deprived. In particular, a young admirer may perceive no actual alternative to illegality, where his family may have experienced no upward social mobility, as widely documented by (Balestrini, 2004). Arguably, all mafias offer a ladder for social advancement (Varese, 2017, p. 38), and many minors are hired in degraded and high

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8See Gambetta (1996) and Bandiera (2003) as to mafia and the business of private protection.
9For an inner view description see (Catozzella, 2011, p. 44); see also (Portanova et al., 2011, pp. 179-232).
unemployment neighbourhoods, and come from families in hardships (Cascini and Di Bella, 2021).

Thus, teaming up with the mafia is regarded as a shortcut to easy money and success by two groups; firstly, the potential affiliates dreaming of becoming a boss but underestimating the difficulty of achieving such a career; and secondly, the potential external colluders, the majority among the ones that can team up with the mafias, and who overlook the risk of being subjugated by the mafia or convicted by the State.

But how could a youngster even get close to the mafia? First, the presence of an affiliate in a youngster’s family provides him with a vivid example of how to enter society and make a career. Moreover, the mafias’ presence often occurs in families which are in business with the mafia, even though none of the family members is an affiliate. Also in this case a youngster can observe illegal sources of income being earned without higher education, for example by parents serving as front men.

Second, during adolescence, teens may play or interact also with peers from mafia families who start behaving like bosses and bully the others. At school or in the neighborhood, such an interaction tends to mislead a youngster as he/she discovers that authority and leadership, as well as easy money, can stem from the abuse of power, violence and crime. When the school is unable to protect the victims, or to make the bull change his behaviour, the others may end up i) emulating that behaviour; ii) offering their friendship to feel important; or iii) refraining from action to avoid being further victimised. These three possibilities precede three typical options that appear a few years later outside school, wherever mafias control the territory: affiliation, cooperation or subjugation. Clearly, it can also happen that some students resist, or cannot withstand the pressure and drop out, two cases in which the education process can slow down or even stop. These interactions are described, among the others, by Balestrini (2004) and by (Catozzella, 2011, p. 47) in which the latter reveals his school experience marked by the presence of two sons of mafia families already on the boss trajectory, but also outstanding at football. He reports that he and all his schoolmates “could not avoid to be envious, could not avoid to some extent to assimilate their attitudes, their parlance, their characters, (...) whatever thing they did.”

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10 It is worth noting that mafias vary in their degree of openness. As it turns out, 'ndrangheta almost exclusively hires on the base of kin relationships, whereas other mafias try to minimize the number of blood relatives accepted into each family, (Varese, 2011, p. 33).

11 As to the latter, Massari (2021) notes that in Central and Northern Italy, secrecy reasons led to a reduction in the number of the affiliates, and to an expansion of a large group of individuals without formal or blood links with mafias families, but who gravitated to them for convenience and business; the Santapaola clan in Cosa Nostra offers a leading example of the application of this tactic.

12 90% of those whose father is affiliated join the criminal syndicate and the father teaches him little by little what he himself has been taught (Belnome, 2013).
But youngsters also perceive the presence of organised crime in a neighborhood indirectly. They may interact with peers casually hired by mafias on the streets who do not necessarily come from mafias families. Minors might be employed, for example, as pushers, lookouts, dogsbodies, armorers, debt collectors, killers, or even to execute extortion and vandalism.\textsuperscript{13} These teens are inhabitants of a degraded mafia-controlled environment where it is possible to earn easy money, where a stay in a juvenile detention centre improves the criminal CV, and where mafia stories belong to the collective imagination and inspire rises to power. Also for these teens, school is mostly a stage to find a social reward for their boss attitude, while for their schoolmates it is often a contagious experience, discouraging a career based on studying.\textsuperscript{14}

Yet, how common are such school and neighborhood experiences? To tackle this question we need to rely on some evidence of juvenile crime and mafia presence in a territory. In one of several Milan hinterland neighborhoods controlled by mafias, specifically Quarto Oggiaro between 2007-2010, out of 587 arrests and 3828 suspects, some 128 and 725 respectively were minors. Galli (2011) described them as lost generations living in the myth of a former boss. More generally, evidence from the judicial authorities points to thousands of affiliates who can contaminate the environment a youngster grows up in. To illustrate, only in the Lombardy region, and focusing on just one mafia, 'ndrangheta, there are no less than 30 criminal districts, i.e. locali, (DIA, 2018b, p. 309), and each locale counts at least 49 affiliates (Gratteri and Nicaso, 2010, p. 326) to be opened.\textsuperscript{15} Extending the analysis to other mafias, DIA’s biannual reports state that Cosa nostra and Camorra, although less visible, were not generally less influential than 'ndrangheta in term of importance and penetration power. This picture is all the more relevant as mafias spread non homogeneously in a region (DIA, 2018b, p. 310), so that there are areas featuring a concentration of affiliates. Moreover, some cooperating witnesses stated that in Central-North Italy not all the mafia members were formally affiliated: often only those who held a prestigious role in the syndicate and direct relationships with members in other regions were affiliated (Massari, 2021).

In a mafia-controlled territory examples of properly paid graduate jobs are scarce. This matters as mafias distort the youngsters’ incentives, also impacting on the perceived likelihood of finding a graduate job. As widely documented, the presence of mafias reduces

\textsuperscript{13}See Cascini and Di Bella (2021).
\textsuperscript{14}This paragraph is based on an interview offered to Alessandro Flamini by Don Claudio Burgio, chaplain of the Beccaria juvenile prison in Milan and it is available upon request.
\textsuperscript{15}Although in the North a locale can be opened even with less than 49 affiliates (Dalla Chiesa, 2017), notice that a locale is the result of an aggregation process in the territory. Consequently, the actual number of affiliates is under reported for it has to count the gangs not yet big enough to open a district, not to mention districts still undiscovered by the security forces. It is revealing that, at the end of the 1980s, just in the provinces of Lecco and Como alone, there were 1500 affiliates (Portanova et al., 2011, p. 204)
the legal entrepreneurial initiative; furthermore, an inadequate payoff despite a diploma can easily occur when the playing field is not level – a likely circumstance in the presence of mafia since it hampers competition.\textsuperscript{16} Consequently, firms have a lower incentive to innovate and demand high-skilled workers. While this phenomenon will be considered in the next section devoted to the demand for higher education, it also matters for the supply of higher education. In fact, lower wages and vacancies for graduate personnel reduce the juveniles’ incentive to aim for a university degree. Clearly, a youngster can graduate and leave, which contributes to reducing the stock of graduates in an area. Yet, what is relevant here is that the local scarcity of graduate jobs portrays a misleading scenario for the teen where education is unworthy.

To further understand why mafias hinder education, particularly in hinterland areas, one should recognize their significant drawing power on youngsters. Youngsters can overvalue the present to the detriment of the future (DIA, 2018a, p. 384-403), and mafias offer quick and substantial returns, even without affiliation. In contrast, aiming at a university degree generally defers financial independence for several years.\textsuperscript{17} Moreover, juveniles allowed to enter mafias obtain, as of the initiation ritual, a status change in terms of prestige and honour.\textsuperscript{18} The drawing capacity of mafias is also attributable to the limited information on the costs of a mafia lifestyle, considering in particular that the minimum age for affiliation can be 14.\textsuperscript{19} In this respect, the Italian security force specialising in the mafias asserts that these criminal organisations secure the lifeblood necessary for their regeneration from youngsters, sometimes not even 18-years old, unemployed or in low-skilled occupations (DIA, 2018a, pp. 397-403) – one important reason being the opportunity to leverage on minors non-imputability and limited punishability.\textsuperscript{20}
Finally, teaming up with mafias and acquiring higher education tend to be substitutes. In a territory controlled by mafias, long before the college age, the trajectories towards higher studies and criminality tend to diverge. Many students drop out before college, or reach that age with skills possibly useful for crime but not for university education. One reason is that these activities severely compete for time/effort allocation as both require dedication. The difficulty of combining mafia and college is then exacerbated if one does not belong to a wealthy mafia family, thus not benefiting from a fast track for the criminal career.\(^{21}\)

### 2.2 Mafias and Firms’ Incentives to Demand Higher Education

Turning to the mafia’s presence and firms’ motivation to demand high-skilled labour, this is the second channel whereby mafias affect human capital. For this channel, it is useful to have both an inter- and an intra-sector perspective.

At the inter-sector level, organised crime skews the flow of funds towards low-tech sectors, distorting the likelihood of entrepreneurial success in their favour which, as consequence, leads to a decrease in the demand for high-skilled labour. This distorting process is largely caused by drug-trafficking (UNODC, 2011), which has been the main illegal business of mafias since the 1970s. Drug-trafficking generates huge flows of money that risk being seized by anti-mafia institutions already during the investigation stage, and therefore need prompt money laundering.\(^{22}\) To put it differently, the mafia’s main problem is to legally justify its huge wealth, rather than to select the investment activities that can provide a larger return. Investigations in the 2000s and 2010s repeatedly reveal that mafias provide liquidity to low-tech companies, which are not conspicuous for high returns (Cross, 2015b).

High-tech companies, employing more university graduates, tend not to be the beneficiaries of illegal financial flows for a second reason. Mafias aim to expand their wealth and power by controlling the territory in which they root. Bosses consistently have an interest in taking over and heading the local, labour-intensive, high cash flow companies (Transcrime,

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\(^{21}\) Campaniello et al. (2016), using the US 1940 Population Census, document that, on average, mobsters had one year less education than their census closest (non-mobster) neighbours. For Italy, anecdotal evidence shows that mafia defendants rarely have a diploma, while affiliates convicted with long sentences tend to be more interested in university studies during imprisonment.

\(^{22}\) To understand why quick money laundering is a concern for mafias, one must realise that wealth accumulation is a key motivation for mafia activities. Since 1982 a law known to history by the name of its promoters, Rognoni and La Torre, strikes at this motivation. In particular, it allows the prompt seizure of goods and assets belonging to mafia suspects and their families, and turns the seizure to confiscation if suspects cannot prove the lawful origin of their possessions. This law thus imposes on mafias the urgency of money laundering because it includes the seizure as a preventive measure already in the earlier stage of the penal action.
The observed strategy consists of initially offering liquidity for shares, and providing useful illegal services, including protection, elimination of competitors, toxic waste disposal. Then, the firm is taken over, if necessary using intimidation (Cross, 2015a). After obtaining control of the firm, it is possible to carry out other money-laundering operations such as the use of fake invoices. Although high-tech companies may express a demand for mafia services, it is more difficult to provide them with these services and encourage their expansion. For example, the output of export-oriented firms cannot be imposed on the local market controlled by the mafia; nor could such firms’ competitors, which are established in other territories/countries, readily be eliminated by the mafia.

Thus, commercial centres, hotels, restaurants or construction enterprises, which are examples of low-tech companies, do intercept money laundering flows and can easily grow. These are among the main activities controlled by or doing business with organised crime as shown also by Transcrime (2013). However, any low-tech sector tends to be permeable to mafias, as indicated for instance by the Blue Call case, a one thousand-employee call centre, or the TNT case, a multinational company in the transport service (Cross, 2015a). Growth of these sectors, as a consequence, would lead to an increased demand for low-skilled labor. In contrast, in those environments in which criminal organisations have spread their roots deep into the fabric of the society and where trust is elusive, high-tech start-ups would not find it easy to survive, and this, in turn, causes a decline in the demand for high-skill/high-quality labour. In this respect, Gambetta (2000) analyses how the mafia, by exploiting and reinforcing distrust, has lasted for almost two centuries, Meier et al. (2016) provide evidence that mistrust and in-group favouritism can be sustained by informal institutions such as organised crime, and Dearmon and Grier (2009) show how trust significantly interacts with investment in both physical and human capital.

At the intra-sector level, mafias reduce competition among firms, and therefore limit the stimulus to innovate which, in turn, erodes the benefits of employing university graduates. Indeed, when the mafia establishes itself in a new area, entrepreneurs can either reduce or eliminate competition by obtaining an illegal workforce or services from the mafia, often in exchange for other services or favours as a *quid pro quo* in lieu of money. This slows down the entrepreneurs’ need for innovations to survive and prosper and, as a result, the demand

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23 Furthermore, high-tech companies are prone to failures and require highly specialised management.

24 Lots of entrepreneurs initially colluded with mafias but then ended up subjugated by mafias and/or convicted by the State. See for example (Balzarotti, 2012, pp. 852-1052) regarding the Perego case: one of the largest companies in Lombardy which for decades colluded with 'ndrangheta until bankruptcy and the owner’s conviction and sentencing to 12 years.

25 Notice that low-tech sectors create a larger number of vacancies and therefore help build social consensus locally.
for labour will tend to shift away from high-skill workers, a key factor for innovation, towards low-skill workers.

In summary, these transmission channels explain how organised crime corrupts the fabric of the society by reducing both the supply of and the demand for high-skill/high-quality labour, thereby hampering the accumulation of human capital.

3 Why Central and North Italy as Empirical Background?

To test if mafias hinder human capital growth, we focus on Central and Northern Italy. The relevance of this area for studying the relationship at issue is well exemplified by the history of one of its provinces, Imperia, over the the last 70 years. In 2018 this administrative division was placed last both for the per-capita number of graduates nationwide, and undergraduates in the northern and central areas. Imperia also caught the attention for ranking penultimate in the country in terms of economic return to schooling.\textsuperscript{26} What about innovation and business? Two statistics are revealing: Among the 110 Italian provinces, in 2016 Imperia lays at the bottom for the number of innovative start-ups, but at the top for bars and restaurants.\textsuperscript{27} Interestingly, a close-up on Imperia’s crime statistics shows that in 2018 it was one of the provinces with the greatest number of narcotics-related felonies (87th place). Moreover, it was in the top-ten in the nation for risk of money laundering.\textsuperscript{28} But what is really surprising about Imperia is that in 1951 it ranked sixth amongst the northern province in terms of graduates per capita, long before infiltration by the mafia, which began with the arrival of the exiled mafia bosses in the late 1950s.

Turning to the whole area outside South Italy, what about the mafia’s presence therein, and why is this territory interesting for our research question? Varese (2011) identifies some key factors which are conducive to mafia’s transplantation: on the one hand, the demand for mafia services, determined by the local conditions and, on the other hand the supply of mafia members, as determined by workers’ migration from mafia territories along with mafia bosses’ (willing/unwilling) migration. Central and Northern Italy are the most economically developed parts of the country. The North, in particular, is the most productive

\textsuperscript{26} It takes 65 years for a graduate to reach the cumulative income of an undergraduate in the same cohort (Gianotti, 2019).
\textsuperscript{27} Respectively, 109th for innovative start-ups and 3rd for bars and restaurants (Il Sole 24 Ore, 2019).
To complete the picture, Imperia is 7th for firms per capita, 74th for patent applications per capita for the period 1989-2016, 79th for exports/GDP, 60th for total employment, and 90th for youth unemployment.
\textsuperscript{28} This is consistent with the large number of bars and restaurants, along with the large number of firms per capita but also the high unemployment rate.
area (Southern Italy’s GDP is slightly over half that of the North-West’s GDP in per capita terms), and ranks well above the median of the European Union. Until the 2010s, when the gravity of the judicial sentences won the media attention, the general public believed – or seemed to believe – that the area was equipped with a social capital immune to the mafia, despite the contrasting evidence already reported by decades of investigations. Yet, as argued by (Varese, 2011, p. 11) a high level of social capital among the population is not sufficient to prevent transplantation. One important reason for this is that mafia addressed the demand for illegal services by offering to a sufficiently large section of the local population protection against competition, a cheap workforce, and more generally capital and employment.\footnote{In fact, investigations that took place in the 2000s and 2010s revealed that the number of entrepreneurs and politicians that approach mafias for useful illegal services is significant and on the rise (Balzarotti, 2012). Further evidence is provided by the increasing number of entrepreneurs and freelance professionals, the so-called grey area, who have been arrested for committing mafia crimes (DIA, 2018a, pp. 402-403).}

Since the 2010s it has been well accepted that the area features a massive silent presence of organised crime. Interestingly, the investigations showed that Cosa nostra, ‘ndrangheta and camorra - just to mention the main Italian mafias - had already spread their roots in this part of the country four decades before.\footnote{Already in 1994, for example, the investigation named *I fiori della notte di San Vito* jailed 378 people indicted for being associated with the main Italian mafias. See also (Portanova et al., 2011, 21-54, 179-232) and the judicial references therein for a description of the presence of Cosa Nostra, ‘ndrangheta, Camorra, and Sacra Corona Unita in the Milan province as of the late 1950s.} In fact, the establishment of organised crime outside southern Italy had been inadvertently facilitated by the institute of forced resettlement dating back to three laws issued in 1954, 1965 and 1982. As a consequence of these laws, courts in southern Italy exiled convicted high-ranking bosses, suspected of belonging to clans, to the central and northern provinces mostly during the period spanning the mid-1950s to early 1980s.\footnote{It is worth noting that the crime of ‘mafia association’ has been introduced in the Italian Penal code in 1982 with Article 416 bis. Before 1982 it was impossible to convict criminals for mafia association.} Surprisingly, this special legal arrangement of forced resettlement remained in force until 1990. Hence, for decades, high-ranking bosses who de facto belonged to organised crime were relocated to the central and the northern provinces. It is widely accepted among scholars, as well as anti-mafia prosecutors and law enforcement officials, that forced resettlement was a formidable co-factor in the mafias’ transplantation and rooting in Central and Northern Italy.

The area we are considering has also experienced a further factor contributing to the supply of mafia members therein, and the mafia transplantation. There was a massive migration of workers, particularly during the 1960s and the 1970s, from the mafias’ regions of origin, towards central and northern regions. Varese (2011) argues that migration flows, which are important per se, should also be analysed in terms of the skill level of the workers. In fact, low-skilled migrants are more likely to be vulnerable and unionised, so they can be
easily subjugated by organised crime, and thus contribute to mafia entrenchment in a new territory. This was particularly notable in the construction sector.\textsuperscript{32}

Finally, another contributing factor was arguably the degraded environment in which migrant families lived, which pushed some migrants or sons of migrants to engage in crime and team up with mafias.\textsuperscript{33} In fact, most of the migrant families were low-income and found accommodation in public housing often illegally managed by mafias, whereupon the latter could easily organise cheap labor to supply a booming construction sector (Portanova et al., 2011, pp. 33, 44-45, 17).\textsuperscript{34}

Returning to the Imperia province, it happened to be one of those provinces most heavily exposed to forced resettlement, and also received one of the greatest influxes of southern migrants of the lowest education level in all of Northern Italy.\textsuperscript{35}

4 Data and the Construction of the Mafia Index

To carry out our investigation, we assembled a new annual dataset covering information on up to 72 provinces across Central and Northern Italy. The decision to use data at the province level, rather than at a more disaggregated level, was dictated by the necessity to gather sufficient information to identify the presence of organised crime and the level of tertiary education.

Our dataset contains three types of variables: the first one is a proxy for the level of human capital in a province, namely the university graduates \textit{per capita} provided by Unioncamere. The second is a set of variables that captures the presence of organised crime. In particular, we use special crimes data extracted from the Italian National Institute of Statistics, ISTAT to build a mafia index, and data for exiled high-ranking bosses made available in 1974 by the Minister of the Interior. The third group comprises the control variables made available by Unioncamere (value added), Unione Provincie d’Italia (households’ deposits), the Institute for Research on Population and Social Policies (migration data), and ISTAT (graduates and population in 1951, and the educational level of migrants from South to Central and

\textsuperscript{32}Clear evidence of this mechanism is shown by (Varese, 2011, pp. 34-53) with respect to the Val Susa valley in the Turin’s province; see also (Portanova et al., 2011, pp. 33, 44-45).

\textsuperscript{33}See Cascini and Di Bella (2021).

\textsuperscript{34}A leading example is provided by Biagio Crisafulli. He arrived in North Italy before the age of four with a southern migrant family living in a degraded neighborhood, and became therein a \textit{Cosa Nostra} \textit{boss} exerting a large influence on youngsters, as reported by Galli (2011) and Giuzzi (2011).

\textsuperscript{35}A counter-example to Imperia is provided by the Udine province in Friuli Venezia Giulia. In 1951 Udine ranked poorly for higher education, 37th in the northern provinces. Next in the 1960s-1980s it was not much exposed to forced resettlement, and experienced a smaller flow of southern migrants who featured a level of education among the highest. In the 2000s then, Udine proved to be a very low intensity province as to mafia, but very high intensity as to graduates per capita.
In constructing the dataset we took into account the fact that the provinces associated with the stock of high-ranking bosses exiled to North Italy are a subset of the northern provinces to which the data on the presence of organised crime refers. This is because forced resettlement mostly occurred from the mid-1950s to the early 1980s, but after 1992 some provinces were reorganised to create six new provinces. Clearly, the fact that six provinces did not exist at the time of the forced-resettlement period does not overrule the reality that convicted bosses were sent to those territories which later on belonged to the new provinces. Since this province mismatch between the forced resettlement data and the data on the presence of organised crime could potentially bias the analysis, we constructed six synthetic provinces corresponding to the new six provinces, and determined for each province its actual number of resettled bosses. This was achieved by retrieving information on the municipality where each boss was sent to, and locating the province where that municipality is currently situated.

**Mafia Index**

The results of several mafia trials held during the 2000s and 2010s showed that organised crime adopted new modalities to adapt to the society into which they were transported. These modalities have been aptly described as the *silent mafia* and feature widespread collusion with both private firms and public administrators, as well as a particular expression of intimidation that avoids high visibility offences like murders and/or mass killings.\(^{36}\) As a mutation of mafia evolving to root and expand in prosperous and productive areas, the silent mafia is thus less readily detected by the previous mafia indices based on the violent crimes traditionally committed by organised criminals in the southern areas.

For this reason, we developed a new mafia index to tackle the problem by following the investigation approach of the National Anti-mafia Directorate, (DNA), and the District Anti-mafia Directorates, (DDAs), which considers two sets of crime variables.\(^{37,38}\) Firstly we used the set of crimes whose exclusive competence belongs to DDAs, according to article 51 c. 3 bis of the Italian Code of Penal Procedure, C.P.P. These crimes, for which provincial data are available for the whole 2005-2012 period, are: mafia-type murders; mass killings; kidnappings; drugs trafficking; mafia-type associations; criminal associations. This set of crimes has been increasing continuously since 1991 when article 51 c. 3 bis first appeared.

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\(^{36}\)See sentence n. 436/2015 delivered by Court of Cassation (2015).

\(^{37}\)DNA and DDAs are the two judicial authorities that, respectively, coordinate and carry out anti-mafia investigations in Italy.

\(^{38}\)Dalla Chiesa (2017) provides a mafia index for Northern Italy. The index is based on a variety of sources balanced by subjective evaluation. It is a categorical index, and is consistent with the one proposed in the current study.
in the Code. Such an expansion reflects the evolution of anti-mafia investigation techniques in response to the tactical changes of mafia-type organisations. Secondly, as suggested by the DNA and DDAs, there are other crimes which are tell-tale crimes, and therefore should be included in article 51 c. 3 bis.\textsuperscript{39} In this respect, the DNA \textit{(2014, pp. 428-437)} argued that cooperation between the DDAs prosecutors, ordinary prosecutors, and other institutions working in the same district would be key for the prompt detection of such tell-tale crimes.

Two cases clearly make the point. While there are few criminal proceedings for slavery and human trafficking, which are an exclusive competence of the DDAs, there is a considerable number of criminal proceedings for pimping and pandering, whose competence instead belongs to ordinary prosecutors. Yet, the two groups of crimes are closely connected, as maintained by NGOs working in this field and reported by the DNA. Also, according to DDA prosecutors, arson is a very indicative criminal signature. Interestingly, it cannot be under-reported as it is impossible to hide. In fact, when it occurs it has to be professionally dealt with by the fire brigade. Although not all arson is necessarily mafia-type arson, when it happens security forces and judicial authorities believe there is a strong likelihood that it is: it is an effective tool used by the mafia, perfectly consistent with its character as captured by article 416 bis, c. 3.

For this reason, whenever data were available, we followed the DNA and DDAs’ operating procedure and incorporated tell-tale crimes in our set of variables. These signature tell-tale crimes include extortion; trafficking in stolen goods; usury; criminal damages; criminal damages by arson; arson; threats; pimping and pandering. These crimes often appear in the sentences and the official documentation produced by anti-mafia institutions.

On the basis of these two patterns of criminality, we assembled 14 observed variables, which are correlated, to monitor a latent variable, namely organised crime. With these variables, we finally used factor analysis to build the Mafia Index.\textsuperscript{40}

\textsuperscript{39}See \textit{(DNA, 2014, pp. 895-896 and 375-379)} regarding manufacturing and sale of goods made by usurping industrial property titles (art. 517 ter in P.C.) and counterfeiting of geographical indications or appellations of origin of food products (art. 517 quarter in P.C.), which are tell-tale crimes for the more serious crimes of counterfeit, alteration or use of distinctive signs of original works or industrial products (art. 473 in P.C. and referred to in art. 51 c. 3 bis in C.P.P.) and introduction in the country and commerce of false signs products (art. 474, P.C. and referred by art. 51 c. 3 bis in C.P.P.). Similarly for activities of unauthorised waste management (art. 256 in D.Lgs. 152/2006) and illegal trafficking of waste (art. 259 in D.Lgs. 152/2006), which are the most significant tell-tale crimes for the more serious crime of organised activities for the illegal trafficking of waste (art. 260 in D.Lgs. 152/2006 and referred by art. 51 c. 3 bis in C.P.P.).

\textsuperscript{40}The index construction followed seven steps: I. computation of the underlying factors that explain the pattern of correlation within our set of organised crime related variables. II. verification of the validity of factor analysis using Bartlett and KMO measures. III. Varimax rotation conducted to minimise the complexity of factors by maximising the variance of loading on each factor. IV. Extraction of the first two factors which explained more than 80% of the total variation based on various criteria (e.g. Kaiser Criteria). V. Production of corresponding factor scores for each province-year employing a regression method. The importance of the factors depended upon the percentage of variance explained by each of them. VI.
4.1 Control Variables

Our control variables aim to account for three factors: the presence of mafias, and the supply of and demand for human capital. With regard to human capital, specifically, we consider what affects the incentive to acquire higher-level education (supply of human capital by households), and the incentive to employ those with such education (demand for human capital by firms).

Value-added is a proxy for production-related variables (Aghion et al., 2009): it is a useful signal of the efficiency of today’s employees and, via an imitation effect, incentivises tomorrow’s workers to acquire human capital to be competitive. It also carries information on the efficiency of fixed capital stock, which proxies the capacity of a province to provide job vacancies for highly skilled labour.

We also control for households’ deposits and the joint effect of southern migrants and their education level. The former variable measures wealth, and it is acknowledged that organised crime prefers to colonise rich areas (Gratteri and Nicaso, 2016, p. 133). Furthermore, households’ deposits are key in the private financing of tertiary education and therefore affect the supply of human capital. As to migrations flows from regions of southern Italy, particularly to the northern provinces, Buonanno and Pazzona (2014) find that its interaction with forced resettlement was crucial to favouring the transplantation of mafias. Following Varese (2011), we extend the analysis of the migrations factor to the joint impact of migrations and the education level of migrants. In this way, we take into account the possibility that migration flows from Southern regions could contribute differently to mafia entrenchment in a province, depending on the skill level of the migrants as described in Section 3. To proxy this effect we computed the average number of education years (ranging from primary school to university) associated with southern migrants, whom have been classified in terms of their specific destinations to Central and Northern Italy; then, we multiplied that variable for the number of southern migrants to those destinations standardised by population.

Next, we controlled for the size of the provinces’ capital, which is proxied by a dummy that is one when the capital of the province is also the capital of the region. This provincial particularity carries three important pieces of information. First, students inhabiting large cities are more exposed to the university environment because large cities have their universities. Second, the presence of universities within the city reduces the indirect cost of tertiary education: living in their parents’ homes during the university years eliminate board and lodging expenditures. These two factors, therefore, provide an incentive for the acquisition development of a composite index as a weighted sum of the scores for each province-year, where the weight presents the percentage of the variation explained by the factors. VII. Standardisation of the index within 0 and 1 to eliminate the negative values.
of tertiary education. Third, large cities exhibit a high agglomeration force leading to more densely populated areas which foster inventiveness (Akcigit et al., 2017), and knowledge-intensive business services (di Giacinto et al., 2018). The resulting scale of activity enhances the local total factor productivity growth (Cingano and Schivardi, 2004). This suggests that large cities offer more job vacancies for graduates than small cities.

Finally, we control for provinces’ special rights: in Central and Northern Italy, Trentino Alto Adige is the only region where its provinces, Trento and Bolzano, feature full autonomy. This difference from all the other provinces is captured with a dummy. Table 1 reports the cross-province summary statistics of the aforementioned variables and the Mafia Index.

5 Empirical Model and Identification Strategy

To examine the impact of organised crime on human capital accumulation, we estimate the following cross-sectional fractional Probit model:

\[
E (HC_i | \mathbf{X}_i, M_i, \epsilon_i) = \Phi (\mathbf{X}_i \alpha + \beta OC_i + \epsilon_i),
\]

where \(i\) captures the unit (province), \(\Phi\) is the Probit function, \(HC\) indicates human capital, \(\mathbf{X}\) is the vector of control variables, \(OC\) denotes the presence of organised crime, and \(\epsilon\) captures the omitted factor independent of the exogenous variables \(\mathbf{X}\) and potentially correlated with the presence of organised crime. In this model we focus on \(\beta\) which measures the impact of organised crime (\(OC\)) on human capital (\(HC\)).

In order to address a potential endogeneity issue, our identification strategy is based on the episode of forced resettlement described in Section 3. Yet, how did judges in South Italy determined the locations in the rest of the country to resettle the high-ranking bosses? Available data on forced resettlement refer to the stock as of 1974, and until 1982 the laws that governed forced resettlement (number 1423 in 1956 and 575 in 1965) did not specify any criterion for the assignment.

This natural experiment proved to be useful to instrument the organised crime variable. As in Buonanno and Pazzona (2014) and Scognamiglio (2018), we employ information on the concentration of exiled convicted criminals in each province. Specifically, we use the number of convicted criminals per province population as an instrument. Furthermore we use an interaction dummy to account for the fact that forced resettlement was larger in the northern provinces, and that, as a result, its contribution to the formation of organised crime might have occurred differently due to a more advanced industrial development in this area than in the central provinces.
Prima facie evidence on the relevance of this instrument is provided by Figure 1 which plots human capital (standardised graduates) against forced resettlement (standardised exiled mafia bosses). Figure 1 shows a negative relationship: provinces more exposed to forced resettlement in the past feature lower levels of human capital recently. Turning to the validity of this identification strategy, the error term in (1), $\epsilon_i$, has to be orthogonal to the instrument, forced resettlement. This means assuming that high-ranking bosses individually exiled to Central and North provinces hampered human capital exclusively through the development of mafia associations in the new territories. But why should this be the case?

There are two reasons for this to happen. The first is that bosses can provide examples of social elevation and opportunities for illegal advantages only if they operate in a gang, and in this way adversely impact the incentive to acquire higher education, as argued in section 2.1. A mafia boss, by definition, is a chief who commands on a number of affiliates to run mafia activities in his area, activities which require an organised group and are clearly perceived by the local society. Certainly, drug-trafficking, providing or imposing illegal services to firms, committing election fraud, distorting public procurement, disposing of toxic waste with arson, are all activities that affect the local public opinion and require a group of affiliates to be carried out. Activities that provide significant illegal profits either to mafias or both to mafias and their external partners, signal that to team up with mafias at some level can be a valid alternative to attaining tertiary education.\textsuperscript{41} The words of the repentant Belnome \textit{(2013)} are an apt illustration of this point: “When we went out in the evening with the guys in clubs we never paid anywhere, you saw everybody who watched and greeted you with fear or only to make people think that they knew you, and you saw all this with proudness and pleasure ...”.\textsuperscript{42}

We now turn to the second reason why a resettled boss can hamper human capital not as an individual but exclusively through the development of a mafia association. The fact is that only an organised group rooted in a territory can adversely impact demand for high-skilled labour in terms of firms’ demand for personnel endowed with higher-level education. In section 2.2 we described the inter- and intra-sector channels whereby this impact occurs. Here we present various roles simultaneously played by a group, which cannot be played by a single boss. It is important to realize that the ensemble of these roles creates a synergy that contributes to making mafias strong. A group is necessary to discourage the competitors of a firm with threats or damages, as well as to organise fake invoices and money laundering activities. It is also required to establish connections with corrupted law

\textsuperscript{41}The 2010s final conviction sentences for mafia members include plenty of these activities.
\textsuperscript{42}Belnome was born in Lombardy and managed to reach the mafia’s highest echelons from the bottom commanding over more than fifty affiliates. Based on his personal experience, he wrote a repentant memorial with the very intent to reveal to youngsters the mafias’ false myths and promises.
enforcement officials to avoid finance police inspections. A number of associates, with the intimidation power of the gang, is required to offer a creditor an efficient (although illegal) debt collection service, making a debtor pay possibly through verbal violence and, only if he/she resists, through physical violence; or to offer the opposite service, namely to protect a firm from angry creditors. A band of affiliates rooted in the local society is necessary to gather intelligence on firms that are financially troubled but otherwise retain a solid capital structure. This information enables the mafia to leverage their difficulties in order to take them over with a minor share, as prelude to stealing their assets prior to bankruptcy owing to bad management. Conversely, a group is also necessary to make a company increase its monopolistic power in the territory via corruption and the sharing of the social capital of both the company and the mafia association.

A significant number of affiliates and their families is even required to provide votes in electoral campaigns in exchange for future utilities, which are functional to the control of the territory. A group is therefore essential to run mafia business and, for this reason, mafias tend to be structured criminal organizations deeply rooted in a territory.\textsuperscript{43}

Finally, the very crime of mafia association in the Italian penal code, as defined by art. 416 bis, is based on the number of affiliates and the efficacy of its special criminal methods.\textsuperscript{44}

All these arguments imply that exiled mafia bosses in the new territory could impact on graduates per capita only if they first develop a mafia association therein.

To carry out the empirical investigation, we build a fractional Probit model with endogeneity by following the control function approach developed by Rivers and Vuong (1988).\textsuperscript{45} We then model the potentially endogenous explicative variable in equation (1) as a linear function of the exogenous regressors $X_i$, and at least one additional exogenous variable that causes variations in $HC_i$ but which is not included in $X_i$:

\[ OC_i = \gamma X_i + \delta FR_i + v_i, \]  

where $FR$ stands for forcibly resettled high-ranking bosses and $v$ is the error. We next, assume that

\[ \epsilon_i = \kappa v_i + e_i, \quad e_i \mid X_i, FR_i, v_i \sim \text{Normal } (0, \sigma_e^2), \]

and first we compute the OLS residuals $v_i$ from the regression of $OC_i$ on $(X_i, FR_i)$, which

\textsuperscript{43}See for example Balzarotti (2012) for revealing judicial evidence.

\textsuperscript{44}In particular, mafia association occurs “when the number of affiliates is larger than or equal to three and they use the force of intimidation as the member encumbrance and the condition of subjugation and the code of silence that it derives therefrom to commit crimes, to directly or indirectly acquire the management and, therefore, the control of economic activities, concessions, authorisations, tenders, and public services or to gain profits or unjust advantages for the organisation itself or for others.”

\textsuperscript{45}See Wooldridge (2010) for a discussion of this method.
are the control functions. Then we use the fractional probit of $HC_i$ on $X_i$, $M_i$, $\tilde{\nu}_i$ to estimate the coefficients.

6 Findings

We start the analysis by a visual inspection of the prevalence of mafia and human capital at the individual provincial level. We consider two alternative sets of provinces for Central Italy. The first adopts the definition for Central Italy provided by ISTAT and is portrayed in Figure 2; whereas the second adopts a geographical definition based on latitudinal lines, and is portrayed in Figure 3. As we shall observe, in both cases we obtain very similar patterns. Figure 2 and 3 plot the prevalence of mafias and human capital at the province level. Provinces appearing darker show more prevalence. Panels A and B show that the north-west and north-east tend to differ. Specifically, the north-western area features a greater organised crime presence and fewer per capita graduates than the north-east. Knowing that the north-west is part of the country with the highest GDP per capita, this finding is surprising as normally one expects that organised crime spreads more efficaciously in areas that are less economically developed. Put differently, the common argument that organised crime is strong in southern Italy because it is a low-income area is inconsistent with what we observe here for to Northern Italy.

We next estimate equation (1), assuming first that the explanatory variables are exogenous. Since the dependent variable of our model is a fraction, we estimate the relationship with the Fractional Probit Model. According to Papke and Wooldridge (2008), and to the best of our knowledge, this is the most reliable estimation method when the dependent variable is a fraction. Subsequently, we also estimate the model allowing for the possibility that organised crime could be endogenous, and we instrument this variable with the number of high-ranking bosses belonging to clans who faced forced exile to Central and Northern Italy provinces.

Table 2 presents the parameter estimates with robust standard errors for the exogenous and the endogenous cases. For brevity, we only focus on the coefficients of the organised crime index on per capita university graduates. We should first note that the coefficient estimation of the Mafia Index is always negative and in the endogenous case highly significant. Secondly, the sign and significance of this coefficient for the endogenous case are robust to the addition of control variables. These results altogether indicate that organised crime affects tertiary education negatively.

We next scrutinise the first stage results and find that the model yields a positive and significant association between our instrument (Std. Exiled Bosses) and the Mafia Index.
in line with our expectation. The fact that the first stage estimates deliver similar coefficients with and without control variables, and that the first stage F-statistics are above ten suggests that the instrument is valid. Considering the significant estimates of the control functions, that is \( \hat{\nu} \), the findings provide support for the presence of endogeneity. Thus, taking endogeneity into account is necessary to pin down the precise impact of organised crime on the accumulation of human capital.

To better assess the impact of our causal variable within the Fractional Probit model, we follow Wooldrige (2010) and report in Table 2 the estimates of the partial effect averaged across provinces (APE). Considering our main specification provided by the endogenous case with controls, the APE estimate implies a 0.24 elasticity of graduates per-capita to the Mafia Index. This elasticity can help us provide a prediction for the impact of a reduction of the mafia presence on higher-level education. We can focus, for example, on all the provinces above the 25th percentile in the mafia ranking, that is on the upper 75\% of the distribution where mafias are more pervasive. Considering this group, we then ask what would be the impact of a policy that would reduce the mafia presence in each province by shifting down the province’s position in the mafia ranking by 25 percentiles.\textsuperscript{46} This exercise suggests that such a policy would lead to an increase in tertiary education in each province by a value in the range of 4-21\% given the prevalence of mafias in that province.

We next investigate the relationship between mafia and human capital adopting the geographical definition for Central Italy. Table 3 reports the results, which are very similar to the ones contained in Table 2. In particular, the APE is the same, corroborating the finding that a reduction in mafia presence leads to significant improvements in higher-level education.

\subsection*{6.1 Robustness Analysis}

A relevant aspect of the current analysis is the robustness of the results in relation to potential outliers, the credibility of the forced resettlement instrument, and the consistency of the results when we adopted an alternative mafia index for Northern Italy.

Regarding the first aspect, Figure 4 presents the residual plot corresponding to the results displayed in Table 2 column 5. The figure shows that the relationship at issue is not driven by any outliers.

As to the second aspect, the credibility of the instrument, following various scholars (e.g. Angrist and Lavy (1999); Angrist and Krueger (2001); Levitt (1996); Murray (2006); Acemoglu et al. (2001)) we provided in Table 4 evidence in support of the credibility of forced

\textsuperscript{46}This means that each province is allowed to gain 18 positions in the mafia index ranking: in terms of policy achievement, a good albeit unexceptional result.
resettlement as an instrumental variable. According to Murray (2006), the reduced form regressions with the dependent variable of interest and the instrumental variable acting as the independent variable offer valuable information to check the validity of the instrument. Table 4 provides the findings of such reduced form regressions in which we regress the instrument variable (forced resettlement) on the dependent variable (per capita graduations) in each province. Columns 1 and 2 indicate the specification with and without control variables and, panel A and B show the findings across models with the alternative definitions of Central Italy. All the coefficients are negatively significant suggesting that, in line with our analysis, forced resettlement contributed to the deterioration of human capital.

We also tested the random assignment of the instrument with respect to the dependent variable. In order to check that bosses have not been exiled to the provinces of interest on the basis of some of their human capital determinants, we examined the relationship between standardised exiled bosses and graduates per capita in 1951 prior to the forced resettlement period in 1960. Our results suggest that the forced resettlement of mafia bosses was not based on some features related to the human capital of those provinces regardless of the definitions we chose for central provinces (see Panel A and Panel B in Table 5).

Finally, we also used an alternative measure of mafia to test our hypothesis, namely the index proposed by Dalla Chiesa (2017). While this measure is a categorical index on the narrow interval [1, 2, ..., 5], it is the only possible alternative to our index because it has been expressly constructed to portray the mafias’ specificity in Northern Italy. Results, available upon request, provide support for the endogenous case.

7 Conclusions

In this paper we examine whether organised crime affects the accumulation of human capital. This is a key question as human capital stands out as one of the main drivers in achieving and maintaining high societal welfare levels. Our analysis focuses on advanced education, and the empirical fields are Central and North Italy where organised crime has adapted to the social fabric with less violent crime and more illegal collusion with business. This is a new modality that has been dubbed silent mafia.

While this territory is the richest and most productive area of the country, ranking above the median for the European Union, since the late 1950s it has experienced mafia infiltration and rooting. We document that this somewhat silent presence of mafias outside of southern Italy has been detrimental to human capital accumulation. In particular, the empirical findings provide evidence of a significant fall in levels of tertiary education within the central and northern provinces. Considering the policy implications, our results permit a prima-
facie prediction for the impact of a reduction in the mafia presence on tertiary education. Focusing specifically on the top 75% of mafia-infiltrated provinces, the empirical findings suggest that a policy reducing the mafia pervasiveness by 25 percentiles - referring to the province’s position in the mafia ranking - would serve to increase graduates per-capita by 4-21% depending on the extent of mafia prevalence in each province.

This result is important both to the public and to policymakers because it suggests that a region which is initially wealthy, innovative and prosperous, could experience a decline in human capital, arguably its most precious resource, once mafias expand and become rooted there. Although the decline may not be visible initially, the changes will ultimately affect the long-run development and the welfare of the society. Furthermore, the finding that the mafia presence in the central and northern provinces impacted human capital accumulation may also contribute to explaining why Italy, and in particular the North-West, since 1995, has experienced a slowdown in total factor productivity growth, as shown by (Calligaris et al., 2016). Other wealthy European areas outside Italy, where it has been established that mafias have already expanded, could be experiencing a similar phenomenon and it would be interesting to investigate this issue further in future research.

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Figure 1: Reduced-form relationship between Human Capital and Forced Resettlement
Figure 2: Prevalence of Mafia and Human Capital (ISTAT North and Center)

Panel A. Prevalence of Human Capital (Standardized Graduates); period 2005-2012

Panel B. Prevalence of Mafia (Organized Crime Index); period 2005-2012
Figure 3: Prevalence of Mafia and Human Capital (Geographical North and Center)

Panel A. Prevalence of Human Capital (Standardized Graduates); period 2005-2012

Panel B. Prevalence of Mafia (Organized Crime Index); period 2005-2012
Figure 4: Residual Plot of Forced Resettlement against the Mafia Index
Table 1: Descriptive Statistics

<table>
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<th>Variable</th>
<th>N. obs</th>
<th>Mean</th>
<th>Stad. Dev.</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
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</thead>
<tbody>
<tr>
<td>Mafia index</td>
<td>72</td>
<td>0.38</td>
<td>0.17</td>
<td>0.36</td>
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<td>0.96</td>
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<td></td>
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<td>(0.16)</td>
<td>(0.33)</td>
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<td>Standardized Uni. Graduates</td>
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<td>0.001</td>
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<td>0.002</td>
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</tr>
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<td></td>
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<td>(0.0009)</td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.009)</td>
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<tr>
<td>Standardized Exiled Bosses (per 100000)</td>
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<td>1.38</td>
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<tr>
<td></td>
<td></td>
<td>(1.84)</td>
<td>(1.43)</td>
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<td>(6.6)</td>
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<tr>
<td>Standardized Value Added</td>
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<td>0.038</td>
<td>0.067</td>
<td>0.008</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.07)</td>
<td>(0.036)</td>
<td>(0.068)</td>
<td>(0.008)</td>
<td>(0.17)</td>
</tr>
<tr>
<td>Population</td>
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<td>650242</td>
<td>354345</td>
<td>88195</td>
<td>3887930</td>
</tr>
<tr>
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<td></td>
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<td>(673207)</td>
<td>(366225)</td>
<td>(140052)</td>
<td>(3887930)</td>
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<td>0.26</td>
<td>0.23</td>
<td>0.05</td>
<td>1.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.35)</td>
<td>(0.26)</td>
<td>(0.24)</td>
<td>(0.05)</td>
<td>(1.16)</td>
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<tr>
<td>Standardized Household Deposit</td>
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<td>0.016</td>
<td>0.027</td>
<td>0.004</td>
<td>0.08</td>
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<tr>
<td></td>
<td></td>
<td>(0.03)</td>
<td>(0.016)</td>
<td>(0.028)</td>
<td>(0.004)</td>
<td>(0.08)</td>
</tr>
</tbody>
</table>

Note. This table reports the descriptive statistics for two definitions of Central Italy. For each variable the numbers without parenthesis refer to the geographical definition for Central Italy based on latitudinal lines, and the numbers in parenthesis refer to the ISTAT definition for Central Italy.
Table 2: The Impact of Mafia on Human Capital (ISTAT Definition for Central Italy)

<table>
<thead>
<tr>
<th></th>
<th>Exogenous</th>
<th>Exogenous</th>
<th>1st stage</th>
<th>2nd stage</th>
<th>1st stage</th>
<th>2nd stage</th>
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<tbody>
<tr>
<td></td>
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<td>(5)</td>
<td>(6)</td>
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<tr>
<td>ln Mafia Index</td>
<td>-0.007</td>
<td>-0.006</td>
<td>-0.13***</td>
<td>-0.096**</td>
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<td></td>
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<tr>
<td></td>
<td>(0.008)</td>
<td>(0.01)</td>
<td>(0.034)</td>
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<tr>
<td>APE Mafia Index</td>
<td>-0.0001***</td>
<td>-0.00008***</td>
<td>-0.0017***</td>
<td>-0.0012***</td>
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<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
<td>(0.00002)</td>
<td>(0.00001)</td>
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</tr>
<tr>
<td>(\hat{\nu})</td>
<td>0.13***</td>
<td>0.096**</td>
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<td>(0.035)</td>
<td>(0.044)</td>
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<tr>
<td>Std. Exiled Bosses</td>
<td>0.086*</td>
<td>0.01**</td>
<td></td>
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<tr>
<td></td>
<td>(0.05)</td>
<td>(0.04)</td>
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<tr>
<td>First stage F-stat</td>
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<td>yes</td>
<td>yes</td>
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<tr>
<td>N.obs</td>
<td>66</td>
<td>66</td>
<td>66</td>
<td>66</td>
<td>66</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Columns 1 and 2 report the Fractional Probit estimates of the impact of mafia on human capital in the exogenous case without and with controls, respectively. It adopts the ISTAT definition for Central Italy. Columns 3 and 5 report the first stage OLS estimates of the impact of the forced resettlement stock in 1974 on mafia without and with controls, respectively. Columns 4 and 6 report the second stage Fractional Probit estimates of the impact of mafia on human capital without and with controls, respectively. APE Mafia index is the estimate of the average partial effect of the impact of mafia on technology.

Note 2: \(\hat{\nu}\) is the control function. The data for forced resettlement consist of the stock of high-ranking bosses exiled to central and northern provinces in 1974; the data for migrations and the education level of migrants refer to the 1960s and 1970s; for the other variables we used pooled data for the period 2005-2012. Robust standard errors in parenthesis. In all the specifications, there is a dummy equal to one if provinces are autonomous (Bolzano and Trento). Controls are value added, households’ deposits, southern migrants’ education level, and the size of the provinces (i.e. dummy is equal to one if the province is also the capital of the region in which it is located). Number of observations reflects the administrative-territorial division of the provinces after 1992. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 3: The Impact of Mafia on Human Capita (Geographical Definition for Central Italy)

<table>
<thead>
<tr>
<th></th>
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<th>Exogenous</th>
<th>1\textsuperscript{st} stage</th>
<th>2\textsuperscript{nd} stage</th>
<th>1\textsuperscript{st} stage</th>
<th>2\textsuperscript{nd} stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>ln Mafia Index</td>
<td>-0.007</td>
<td>-0.007</td>
<td>-0.13***</td>
<td>-0.091**</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.009)</td>
<td>(0.036)</td>
<td>(0.039)</td>
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<tr>
<td>APE Mafia Index</td>
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<td>-0.0001***</td>
<td>-0.0018***</td>
<td>-0.0012***</td>
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<td></td>
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<tr>
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<td>(0.0001)</td>
<td>(0.00003)</td>
<td>(0.00001)</td>
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<td>$\hat{\nu}$</td>
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<td>0.087**</td>
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<td>(0.037)</td>
<td>(0.043)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std. Exiled Bosses</td>
<td>0.086*</td>
<td>0.093**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.04)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First stage F-stat</td>
<td>32</td>
<td>23</td>
<td></td>
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<tr>
<td>Controls</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
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<td>N.obs</td>
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<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
</tbody>
</table>

Note 1: Columns 1 and 2 report the Fractional Probit estimates of the impact of mafia on human capital in the exogenous case without and with controls, respectively. It adopts the geographical definition for Central Italy. Columns 3 and 5 report the first stage OLS estimates of the impact of the forced resettlement stock in 1974 on mafia without and with controls, respectively. Columns 4 and 6 report the second stage Fractional Probit estimates of the impact of mafia on human capital without and with controls, respectively. APE Mafia index is the estimate of the average partial effect of the impact of mafia on technology.

Note 2: $\hat{\nu}$ is the control function. The data for forced resettlement consist of the stock of high-ranking bosses exiled to central and northern provinces in 1974; the data for migrations and the education level of migrants refer to the 1960s and 1970s; for the other variables we used pooled data for the period 2005-2012. Robust standard errors in parenthesis. In all the specifications, there is a dummy equal to one if provinces are autonomous (Bolzano and Trento). Controls are value added, households’ deposits, southern migrants’ education level, and the size of the provinces (i.e. dummy is equal to one if the province is also the capital of the region in which it is located). Number of observations reflects the administrative-territorial division of the provinces after 1992. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.
Table 4: Evidences on the Credibility of the Instrument: Reduced Form Regression

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<thead>
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<td><strong>Panel A - ISTAT definition for Central Italy</strong></td>
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<tr>
<td>Std. Exiled Bosses</td>
<td>-0.01**</td>
<td>-0.0093***</td>
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<td>(0.0049)</td>
<td>(0.0029)</td>
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<td><strong>Panel B - Geographical definition for Central Italy</strong></td>
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</tr>
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<td>-0.009***</td>
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<td>(0.0033)</td>
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<tr>
<td>Controls</td>
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<td></td>
</tr>
</tbody>
</table>

Notes. Robust standard errors in parenthesis. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Evidences on the Credibility of the Instrument: Randomness with respect to Graduates per Capita in 1951

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</thead>
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<td><strong>Panel A - Geographical definition for Central Italy</strong></td>
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<td></td>
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<td>Std. Exiled Bosses</td>
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<td>4.1</td>
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<td><strong>Panel B - ISTAT definition for Central Italy</strong></td>
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Notes. Robust standard errors in parenthesis. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.