Impact case study (REF3)

REF2021

Institution: University of Essex

Unit of Assessment: 16

Title of case study: Changing law enforcement practices and informing policy debate on prison reform in Italy which influenced nationwide changes in legislation

Period when the underpinning research was undertaken: 2014-2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Giovanni Mastrobuoni	Professor Economics	August 2014 - Dec 2017 (2018 - unpaid leave) July 2019 - present

Period when the claimed impact occurred: 2014-2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

Mastrobuoni's research on reducing criminal activity**,** led to the first independent evaluation of a recent IT innovation "predictive policing". This research has been pivotal in the continued use of KeyCrime's predictive policing software called 'delia®' in the city of Milan which has been shown to dramatically reduce crime. Importantly this research enabled KeyCrime to grow from a start-up to partnering with IBM, PSS and sdg Group delivering innovative software to police forces outside Italy.

Mastrobuoni's research on prison conditions that reduce criminal recidivism is the single piece of research that informed changes in the basic standards for prison conditions in Italy. The Commissioner for prison reform in Italy and the Guarantor of the rights of persons deprived of personal liberty in Milan drew on the Essex research to evidence the role that prison conditions play in the tendency of a convicted criminal to reoffend.

2. Underpinning research

Mastrobuoni's paper [R1, initially published as a working paper in 2014] is the first independent and quasi-experimental evaluation of a recently popularized IT innovation, called "predictive policing", which collects and analyses data on past criminal events (specifically commercial robberies) to predict future events. Police patrols are given these predictions and are asked to plan their routes accordingly to increase their clearance or arrest rates and reduce crime [R2]. The system is shown to dramatically increase clearance rates by 30% and reduce crime by 64% (due to repeat offending, crime rates are shown to be a highly non-linear function of clearance rates).

Essex research shows that predictive policing improves clearing crimes committed by criminals of all ability levels. Mastrobuoni and Rivers [R3] developed a methodology on how to measure such ability levels. Microdata on bank robberies are used to estimate individual-level disutilities of imprisonment, which are strictly related to the robbers' abilities. In particular, the identification rests on the money versus apprehension trade-off that robbers face inside the bank when deciding whether to leave or collect money for an additional minute. The distribution of the disutility of prison is not degenerate, generating heterogeneity in behaviour. The results show that unobserved heterogeneity in robber ability is important for explaining outcomes in terms of haul and arrest. Furthermore, higher ability robbers are found to be more likely to use firearms and to work with partners. Predictive policing is also pivotal in arresting these more able criminals.

Arrests and subsequent incarcerations generate an incapacitation effect that is shown to reduce

crime but while in prison it is extremely important to rehabilitate inmates. Essex research evaluates the type of prison conditions that are more likely to reduce criminal recidivism.

Mastrobuoni and Terlizzese [R4] use quasi-random variation in the fraction of time served in the Italian "open prison" of Bollate to estimate the effect of rehabilitation efforts on recidivism. The assignment to prison conditions may be endogenous, and the paper restricts the analysis to inmates who, due to overcrowding in nearby prisons, are displaced to a rehabilitating prison (Bollate), controlling for observed and unobserved measures of potential selection. Spending one more year at the rehabilitating prison (and one less year at an ordinary one) reduces recidivism by between 10 and 15 percentage points (from a mean recidivism of about 40 percent). For the group of displaced inmates, which is shown to be negatively selected, the effects of rehabilitation efforts on recidivism are larger. While the research found evidence that over time Bollate inmates become more likely to work outside the prison, more than a single mechanism, seem to underlie these effects.

3. References to the research

[R1] Mastrobuoni, G. (2020) Crime is terribly revealing: Information Technology and Police Productivity. *Review of Economic Studies,* 87 (6), 2727 – 2753. https://doi.org/10.1093/restud/rdaa009

[R2] Mastrobuoni, G. (2019) Police disruption and performance: Evidence from recurrent redeployments within a city. *Journal of Public Economics,* 176, 18-31. https://doi.org/10.1016/j.jpubeco.2019.05.003

[R3] Mastrobuoni, G, Rivers, D. (2019) Optimising Criminal Behaviour and the Disutility of Prison. *The Economic Journal,* 129 (619), 1364–1399. https://doi.org/10.1111/ecoj.12602

[R4] Mastrobuoni, G. Terlizzese, D. (2020) Leave the Door Open? Prison Conditions and Recidivism. Collegio Carlo Alberto Working Paper. ISSN: 2279-9362. https://www.carloalberto.org/wp-content/uploads/2019/06/no.580.pdf

[R5] Mastrobuoni, G. Blanes, J. Police Patrols and Crime. *IZA Institute of Labor Economics Discussion Paper series.* (2018) http://ftp.iza.org/dp11393.pdf

Grants

[G1] Mastrobuoni, G. Evidence based Crime Prevention: Policing with Big Data. British Academy July 2016 – July 2017. £115,254.800

4. Details of the impact

Validation of predictive policing software

Mastrobuoni's research on the economics of crime evaluates both reducing criminal activity through predictive policing but also the tendency of a convicted criminal to reoffend. His research on bank robberies to estimate individual-level disutilities of imprisonment, based on a collaboration with the Italian Banking Association (Associazione Bancaria Italiana), [R3] led to an ongoing collaboration with an Assistente Capo in the Italian Police who established an innovative start-up company 'KeyCrime', specialising in a predictive policing software called 'delia®'.

The founder of KeyCrime approached Mastrobuoni to research the impact of data analysis on police investigations. The results of the long-run pilot in Milan alongside the academic evaluation of KeyCrime's predictive policing software by Mastrobuoni [R1] created significant interest in the software (which was later named delia®), guided it's development and enabled the founder to leave the police force in 2017 in order to run the company as a viable business [S1].

The evaluation by Professor Mastrobuoni guided the development of this predictive policing software from early on in the company's inception, which subsequently influenced the efficacy of police investigations in Milan. On the collaboration the Founder and CEO of KeyCrime confirms: '… *Research and the first independent evaluation of any predictive policing software, 'Crime is Terribly Revealing' by Professor Mastrobuoni enabled KeyCrime to validate its results [R1]...The software has produced validated results in the area of prevention and repression of crime which*

can be seen in the data made public by the system's users, the Polizia di Stato in Italy. Other institutions have also supported the use of KeyCrime such as the office of Prosecutors of Milan who, in their annual report cite it as a useful tool to support their investigation'. [S1]

The evaluation undertaken by Mastrobuoni [R1] also cemented the formal adoption of the software by law enforcement agencies in Italy in 2018 [S2]. It is embedded into Italy's national police force, the Polizia di Stato, in the Province and city of Milan where they have reported a 58% reduction in commercial robberies in the city of Milan and 89% reduction in the province of Milan for bank robberies over the period that the software has been deployed [S3].

The Founder and CEO of KeyCrime states: *'The publication of the paper [R1] has, without any doubt, brought additional attention to the company KeyCrime s.r.l - an innovative start-up formed at the beginning of 2018 - as well as credibility due to the scientific and statistical validation detailed in Professor Mastrobuoni's paper. This validation is a fundamental element for us and has helped guide the direction of our investment in R&D to extend the approach that the paper described'.* [S1].

KeyCrime now has 20 employees and has received millions of euros of finance from venture capital firms. In 2018 formal partnerships with companies sharing a common vision to help make communities safer were announced with IBM and sdg Group (one of the most important company in the Multinational Analytics Market) to propose delia® software to the global market for corporate use and to deliver a delia® based solution at the consumer level. While in 2020, PSS, an important Spanish system interrogator, has partnered with KeyCrime to resell delia® predictive policing software to the Spanish and Latin American markets [S3a].

Following the pilot phase after the evaluation of the software by Mastrobuoni [R1], a statement by Milan's Head of the State Police in the Giornale scientifico a cura di O.N.A.P December 2014 confirmed the benefits achieved by the predictive policing software which was subsequently formally adopted

"*The uses of KeyCrime, which was experimented in Milan's Police headquarter, have largely met and overcame our expectations. It has proven itself not only capable of meeting our operative needs, but also of indirectly contributing to let the administration's cost plummet, in a period in which the resources have to be rationalized and well managed in order to grant high security standards in our cities. Thanks to the use of this system, Milan's Police headquarters succeeded in significantly reducing bank and commercial-related robberies, becoming a deterrent; this was also possible thanks to the success in identifying numerous perpetrators of such crimes".* [S4]

Reducing recidivism

Professor Mastrobuoni's research on evaluating the prison conditions that are more likely to aid rehabilitation and reduce criminal recidivism [R3] was used by the Commissioner for prison reform in Italy and the Guarantor of the rights of persons deprived of personal liberty in Milan to evidence the role that the condition of prisons plays in the tendency of a convicted criminal to reoffend. This was the only research cited in the House of Representatives by the Commissioner for prison reform in January 2018 in relation to the XVII legislature and recorded by the Bulletin of the Joints and Parliamentary Committees Justice [S5]. The Guarantor utilises Mastrobuoni's research to evidence that prisons with a higher rate of condition, (such as Bollate), should be considered as a model for the entire penitentiary system to improve reductions of recidivism and positive reintegration of convicted criminals at the end of their sentence [S6]. Subsequent recommendations set out by the prison reform commission and the Guarantor, include a booklet published in 2018, 'Norms and Normality' which contains a set of standards for the incarceration of adults in Italy including that the standards of detention should not be just 'minimum' [S7].

The Guarantor of the rights of persons deprived of personal liberty by the Municipality of Milan's (est. 2012), whose mandate includes the promotion of rights and opportunities of persons deprived of their liberty, cites Mastrobuoni's research [R4] in its 2015 Annual Report [S8].

5. Sources to corroborate the impact

[S1] Testimonial from Mario Venturi, CEO, Keycrime

[S2] Procura Della Repubblica Presso Il Tribunale Di Milano. Bilancio di Responsabilita Sociale 2018 (page 40)

[S3] KeyCrime website https://www.keycrime.com/results

[S3a] Details of KeyCrime Partners from website (screenshot).

[S4] Quotation from Milan head of State Police in 'La chiave del crimine' Osservatorio Nazionale Abusi Psicologici (2014)

[S5] XVII Legislatura - II Commissione – Seduta del 25 Gennaio 2018 (cited page 39)

[S6] Questione Giustizia article

[S7] Norme e Normalita

[S8] Ombudsman of the Milan Municipality Annual Report 2014-2015 (cited page 34)