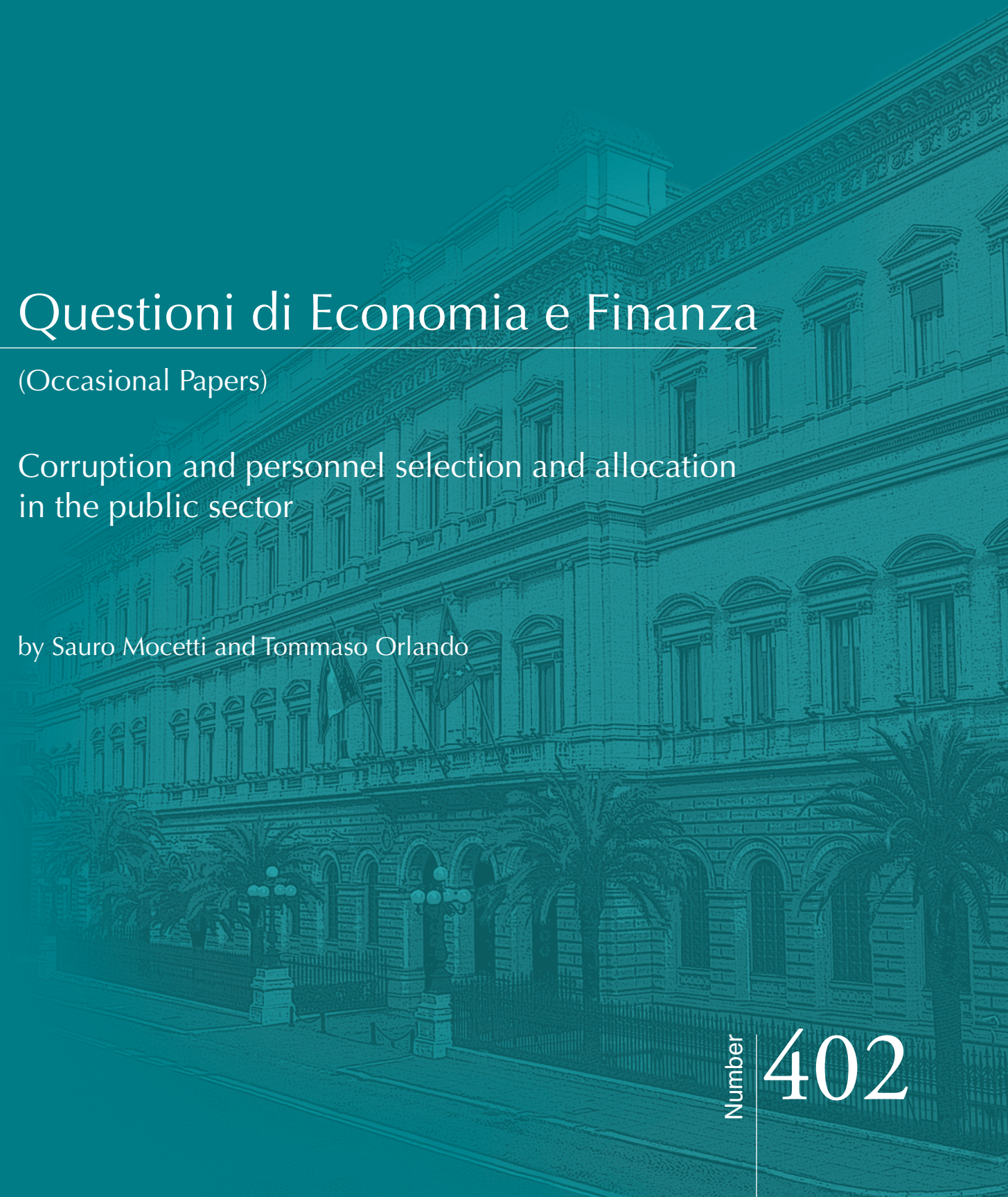
BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional Papers)

Corruption and personnel selection and allocation in the public sector

by Sauro Mocetti and Tommaso Orlando



October 2017

Number 402

BANCA D'ITALIA
EUROSISTEMA

Questioni di Economia e Finanza

(Occasional papers)

Corruption and personnel selection and allocation in the public sector

by Sauro Mocetti and Tommaso Orlando

Number 402 – October 2017

The series Occasional Papers *presents studies and documents on issues pertaining to the institutional tasks of the Bank of Italy and the Eurosystem. The* Occasional Papers *appear alongside the* Working Papers *series which are specifically aimed at providing original contributions to economic research.*

The Occasional Papers *include studies conducted within the Bank of Italy, sometimes in cooperation with the Eurosystem or other institutions. The views expressed in the studies are those of the authors and do not involve the responsibility of the institutions to which they belong.*

The series is available online at www.bancaditalia.it .

ISSN 1972-6627 (print)
ISSN 1972-6643 (online)

Printed by the Printing and Publishing Division of the Bank of Italy

CORRUPTION AND PERSONNEL SELECTION AND ALLOCATION IN THE PUBLIC SECTOR

by Sauro Mocetti and Tommaso Orlando*

Abstract

We construct local-level statistical indicators of corruption based on the number of reported crimes, on citizens' trust in local public institutions, on perceptions of administrations' integrity and on the quality of public expenditure and we examine the impact that the presence of corruption, as measured by these indicators, has on personnel selection and allocation in the public sector. Using a difference-in-differences estimation strategy on Italian data, we find that the selection of public employees in terms of human capital worsens in comparison to that of their private sector counterparts in areas with higher levels of our corruption indicators. This effect is mainly observed among managers and highly qualified professionals. Moreover, corruption indicators are associated with the misallocation of human resources and, in particular, with an increase in the rate of under-qualification among public sector employees compared with the private sector. These results are robust to various indicators of corruption and to several robustness checks, including IV estimation that uses historical factors as an exogenous source of variation for current corruption.

JEL classification: D73, J45.

Keywords: corruption, selection, mismatch, schooling, ability, public employment.

Contents

* Bank of Italy, Structural Economic Analysis Directorate, Economics and Law Division.

1. Introduction[1]

Corruption is widely believed to entail large economic and social costs. The economic literature has so far explored several channels through which corruption may affect economic outcomes. Some authors highlight its effects in terms of distortion of private decisions, such as investments (Shleifer and Vishny, 1993; Mauro, 1995) and human capital accumulation (Mo, 2001). Others focus on the activities of the public sector, documenting relationships between corruption and inefficiencies in the composition of government expenditure (Mauro, 1998), lower productivity of public investments (Del Monte and Papagni, 2001) and higher shares of goods and services procured by the public administration on non-competitive markets (Hessami, 2014).

In this paper we analyze the impact of corruption (as measured by local-level statistical indicators based on the number of reported crimes, on citizens' trust in local public institutions, on perception of administrations' integrity and on the quality of public expenditure) on personnel selection and allocation in the public sector. More specifically, we address two issues: first, we examine whether corruption affects the *selection into the public sector* of individuals with different levels of (observable) human capital; second, we examine the relationship between corruption and the *allocation within the public sector* of differently educated individuals to jobs with different skill content. Poorer recruitment and misallocation of human resources within public agencies might have significant and long-lasting consequences on the quality of the administration's economic decisions and on the effectiveness of the services provided by the public sector. Nevertheless the impact of corruption through these channels was surprisingly uninvestigated.

The empirical analysis is based on two complementary data sources containing information on Italian public and private employees and exploits several measures of corruption. We examine whether areas characterized by higher values of our corruption indicators show peculiar patterns of skill-based selection into and allocation within the public sector. Although we use cross-sectional variation, our empirical strategy mirrors a difference-in-differences approach where the "treatment" is represented by the intensity of corruption at the local level and exposure to the treatment is determined by individual

[1] We thank Audinga Baltrunaite, Federico Cingano, Silvia Giacomelli, Giuliana Palumbo, Paolo Sestito and participants at the conference on "Corruption, Tax Evasion and Institutions" (Riga, 2017), at the 29th SIEP conference (Catania, 2017) and at Bank of Italy seminars for useful comments. The views expressed in this paper should be referred only to the authors and not to the Institution with which they are affiliated.

characteristics of the employees (e.g. whether they are employed in the public or in the private sector). Time-invariant heterogeneity that might be correlated to both corruption and human capital endowments is captured by the inclusion of fixed effects at the local level. Moreover, to address reverse causality – the possibility that corruption itself be the consequence of poor selection and allocation of human resources by the public administration – we instrument corruption with past dependence upon public spending and past domination spells, i.e. with factors likely to be correlated with corruption but predating the hiring of current public employees.

We find that public employees are, on average, more educated and obtained higher grades at school than their professional counterparts in the private sector. However, in areas with higher values of our corruption indicators the relationship between educational attainments and the likelihood of joining the public sector is substantially weaker. The negative impact of corruption is concentrated among those with higher skill content jobs, such as managers and highly skilled professionals. As for the allocation process, we find that a higher level of the corruption indicators is associated with an increase, relative to the private sector, in the likelihood of mismatch between individual educational attainments and the skill content of the job one is assigned to. This mismatch comes mostly in the form of under-education – individuals being assigned to jobs that are, on average, undertaken by more qualified personnel – rather than over-education. We also show that mismatch is not merely a "mechanical" consequence of poorer selection processes, nor of inflation in the number of managerial positions. Finally, we show that, beyond worse selection and allocation processes, corruption also leads to a relatively lower effort by public employees, as measured by hours worked and absenteeism.

The literature has already partially dealt with the relationship between corruption and occupational choices. Murphy et al. (1991) and Acemoglu and Verdier (1998) argue that corruption magnifies rewards to rent-seeking activities, thus subtracting valuable human resources to entrepreneurship and distorting the allocation of talent across sectors. Concerning selection into the public sector, experimental evidence suggests that more corrupt environments encourage entry by the dishonest into the public sector: Banerjee et al. (2015) and Hanna and Wang (2017) find negative self-selection into the Indian public administration, while Barfort et al. (2016) find positive self-selection into the Danish public sector.

Our paper innovates upon the existing literature along several directions. First, the economic impact of corruption has typically been investigated using cross-country evidence (at a single point in time). However, the cross-sectional relationship might be severely biased as corruption and the other variables of

interest are likely to have common correlates that cannot all be credibly controlled for: stated differently, less corrupt societies appear to perform well in almost any dimension, and the risk of bias due to an omitted variable (e.g. of institutional or cultural nature) is large. To address this issue, some papers introduce country-fixed effects by exploiting panel data. However, the reliability of those estimates clearly depends on the longitudinal (within-country) variation of these factors that, in the case of a persistent and structural phenomenon like corruption, is admittedly low. Moreover, panel data alone do not fully address endogeneity concerns, as a variation in corruption and in the outcome variable might reflect common (country-specific) shocks. To tackle these difficulties, we exploit a different identification strategy that hinges on the differential impact of corruption among individuals living in the same area, while controlling through area fixed effects for any other potential omitted variable correlated with corruption.

Second, the measurement of corruption itself may be problematic either from a cross-sectional or longitudinal point of view. Indeed, one may question the capacity of international surveys to capture the intensity of corruption equally well in all countries, due to differences in culture and social norms or to other perception biases. Similarly, official data on reported crimes might not be comparable across countries due to differences in laws or in the availability of harmonized crime statistics. The extent of these measurement issues can also vary over time. However, our analysis is based on various measures of corruption within a single country, thus exploiting (sub-national) territorial variability while using homogenous and comparable indicators.

Third, previous studies on the relationship between corruption and workforce sorting have used experimental evidence and focused on whether workers' personal propensity to dishonesty makes them more likely to self-select into the public sector. On the contrary, we rely on hard data and drive the attention on the impact of environmental levels of corruption on sorting based on human capital, measured by individual educational attainments and grades obtained at school. Personal attitudes towards unlawful behaviors are undoubtedly of the foremost importance in determining the quality and the impartiality of public services. However, poor human capital endowments might also hinder the effectiveness of economic decisions by public agencies on a number of relevant dimensions, such as the level and the composition of public expenditure, the effectiveness of public investments and the quality of public services provided to households and firms.

Fourth, we focus on corruption's impact on both selection and allocation processes, while previous studies have mainly directed their attention towards workforce sorting only. However, human resource misallocation is also relevant:

on the one hand, the same group of individuals can produce substantially different results if they are badly matched to jobs requiring different educational qualifications; on the other hand, bad allocation processes and misaligned career rewards might discourage the most skilled individuals from applying for a public job in the first place.

Finally, though we cannot observe individual performance, we are able to examine the impact of corruption on proxies of effort exerted by public employees. We find that corruption is associated to lower labor supply (in terms of hours worked) and higher absence rate, consistent with worse personnel selection and allocation processes. As a whole our findings point to a lower quality and a reduced efficiency of the public sector.

The rest of the paper is organized as follows. Section 2 describes the data sources and the main variables of our analysis, including the construction of corruption indicators. Section 3 presents our empirical strategy and clarifies which effects of corruption we are able to identify. Section 4 presents our main findings and some robustness checks. Section 5 concludes.

2. Data and variables

2.1 Individual information on occupation and schooling

Individual data on employment characteristics and observed measures of human capital are drawn from two sources. The main one is the Italian Labour Force Survey (LFS). The survey is carried out by the National Institute of Statistics (Istat) on a weekly basis and its main aim is to provide accurate and official statistics concerning the employed and unemployed population in Italy. We pool the LFS waves from 2004 to 2010 and we restrict the analysis to non-manual employees (i.e. ISCO major groups 1 to 5).[2] LFS does not provide a clean distinction between the public and the private sector and, therefore, we identify as public employees all those employed in the following three NACE 2-digits groups: public administration, education and health. We also know the professional qualification of each employee, as measured by the ISCO occupational classification at 3 digits and their education level (in particular, the years of schooling corresponding to their highest educational attainment). Beyond the overall effect, we also provide

[2] The elaboration on Istat data for this work have been carried out at the Istat Elementary Data Analysis Laboratory (ADELE) in accordance with the legislation on statistical confidentiality and personal data protection. Reported results and their interpretation are to be considered sole responsibility of the authors and do not by any means represent official statistics or involve Istat in any other way. All analyses reported hereunder do not make use of sample weights.

evidence on the subgroup of managers and professionals (ISCO major groups 1 and 2), i.e. those employees who are at the top of the occupational hierarchy and who are responsible for controlling or managing an organization or staff teams. This focus is motivated by the fact that managers can single-handedly shape the activity of the public agency. We also observe labor supply and, among socio-demographic characteristics, age, gender and, most importantly for our goal, the local labor market (henceforth LLM) in which workers reside.[3] This geographic attribute is used to capture local economic and social conditions that might impact on the likelihood of joining the public sector and on the quality of the match between individual education and job skill content.

The selection process is also investigated through the use of a second data source, the Survey on Household Income and Wealth (SHIW). The survey is carried out by the Bank of Italy and contains information on the socio-economic conditions of a representative sample of the Italian population.[4] We pool the (bi-annual) SHIW waves from 2000 to 2014 and we restrict the analysis to household heads who are non-manual employees, as done with the LFS. As above, we also provide evidence on the subsample of managers and professionals. The size of the SHIW sample is much smaller than that of the LFS and details on occupation are definitely poorer. However, unlike the LFS, the SHIW allows a clean distinction between public and private sector. More importantly, the SHIW can be used to complement the LFS analysis with a further dimension of individual human capital: the final grade relative to the individual's highest educational attainment. Among socio-demographic characteristics, we include – as before – age, gender and the LLM where the individual resides.

Descriptive statistics for the LFS and SHIW samples are reported in Table 1. Consistently with evidence from previous studies (see for instance Giorgiantonio et al., 2016, and Rizzica, 2016), in both samples public sector employees are, on average, older, include a larger share of women and possess relatively richer endowments of human capital, both in terms of education attainments and grades obtained at school. Moreover, the extent of average mismatches (both under-education and lower-education) is similar in the private and the public sector. Finally, public employees work on average less than private employees and are slightly more likely to be absent for non-exogenous reasons (see Section 4.5 for details on how the absence rate is defined) in the week prior to the survey.

[3] LLMs are geographic units composed of contiguous municipalities and delimited on the basis of daily commuting patterns; therefore, a LLM represents the area in which most individuals both reside and work.

[4] See Brandolini and Cannari (1994) for more details on the survey.

2.2 Measures of corruption

Measuring corruption is admittedly a challenging task: as all illegal activities, corruption is mostly unobservable and, therefore, difficult to quantify. There are different possible definitions of corruption and different approaches to its measurement: so far, four basic approaches have been used to measure corruption at some aggregate level.

The first approach is based on *subjective* and *direct* assessments or perceptions of the extent of corruption, drawn from ad hoc surveys among citizens or "expert" respondents. Indicators of this type include, for example, Transparency International's Corruption Perceptions Index and Global Corruption Barometer, as well as the European Quality of Government Index (see Charron et al., 2014). The second approach relies on *subjective* but *indirect* indicators of corruption. For example, distrust towards (local or national) governments might at least partially reflect their perception as corrupt entities. The third approach relies on *objective* though *indirect* measures of corruption. For example, "missing expenditure" (Olken, 2009) – i.e. the difference between public expenditure in certain infrastructures and the corresponding realized outcome – can be thought as an observable consequence of corruption. The fourth approach relies on *objective* and *direct* measures of corruption such as direct observations, reported crimes or similar evidence arising from government audits.[5]

Each of these approaches has advantages and drawbacks. Subjective and perception-based indicators (either direct or indirect) have been widely used, as they are available for a large set of countries and allow to exploit cross-country variation in corruption to examine the latter's relationship with other economic outcomes.[6] However, the effectiveness of these indicators has been questioned. First, there are significant differences in cultural traits, social norms and laws across countries, so that citizens of one polity may find certain practices more acceptable than citizens of another, thus leading to different reported perceptions of the extent of corruption. Second, the reliability of survey information has also been questioned, as respondents might not report direct experiences but be influenced by what is publicized in the media (Rizzica and Tonello, 2015). The

[5] Olken and Barron (2009) designed a study in which surveyors accompanied Indonesian truck drivers on their trips in order to collect direct observations on illegal payments to police, soldiers, and weigh station attendants. Ferraz and Finan (2011) and Brollo et al. (2013) used data on a program of random audits on local governments, with detailed reports on corruption charges. For Italy, Del Monte and Papagni (2001, 2007) and Barone and Mocetti (2014) used official statistics on reported crimes against the public administration.

[6] See, among the others, Mauro (1995), Knack and Keefer (1995), La Porta et al. (1999), Fisman and Gatti (2002) and Fisman and Miguel (2007).

third approach is also intriguing, but missing expenditure – like any other variable measured as a "residual" – is not necessarily attributable to corruption. For example, the effectiveness of public spending in infrastructures might also reflect the efficiency of the local construction industry, unobserved characteristics of the territory or other random elements, thus confounding the interpretation of the computed indicator. Finally, the fourth approach, beyond poor cross-country comparability due to differences in laws and in the organization of the judicial system, might suffer from reporting bias. If crime episodes are collected by police forces or courts, variations in their number might reflect not only the intensity of the criminal activity, but also the efficiency of such institutions and/or their interest in prosecuting that particular type of offence.

In this paper we adopt two measures of corruption. The first is based on crimes reported by police forces to the judicial authority, extracted from the SDI database.[7] Data at our disposal are collected at the municipality level and cover the period from 2004 to 2011. In particular, we restrict the analysis to crimes intimately linked to corruptive practices: corruption proper, graft and malfeasance.[8] These unlawful behaviors all result into additional payoffs accruing to the public employee at the detriment of one or more private agents: the role of such agents may range from being an active part in the enactment of the criminal deed (as in bribery) to being the victims of the public servant's prevarication (as in graft). These raw figures on crimes are normalized with respect to total employment at the local level (a proxy for the level of economic transactions). This measure is computed at the local labor market (LLM) level and is averaged over the period of observation.[9] To address potential reporting bias, we partial out the effect of the local judicial efficiency on crime rates. Namely, we run a regression where we control for the judicial efficiency (as measured by the lengths of penal

[7] SDI (*Sistema Di Indagine*) is managed by the Ministry of Interior and collects data on crimes reported by the three main Italian police forces (*Arma dei Carabinieri*, *Polizia di Stato* and *Guardia di Finanza*).

[8] Crimes perpetrated by public officials are regulated by the Italian criminal law (*Codice Penale*, articles 314-323, 479-481 and 493): acknowledging oversimplification, *corruption* ('*corruzione*' in Italian) proper takes place when the public official accepts a bribe from a private counterparty in exchange for the enactment of or the abstention from certain behaviors; *graft* ('*concussione*') refers to the situation in which the payment is imposed by the civil servant to the private party; here *malfeasance* ('*abuso d'ufficio*') generically defines behaviors enacted by the public employee aiming at earning unlawful benefits: resource embezzlement ('*peculato*') and document forgery ('*falsità ideologica*'), when perpetrated by public officials or by other providers of public services, may be seen as special cases of malfeasance.

[9] We do not exploit within-LLM variation since corruption is a persistent phenomenon and does not show sufficient longitudinal variation.

proceedings in local courts) and we take the residuals. The latter yield a measure of corruption incidence net of local judicial efficiency (C^1 henceforth).[10]

The second measure is a synthetic indicator that combines information drawn from different approaches. Namely, we collect four different variables, each echoing one of the four measurement methods mentioned above (though, for reasons of data availability, they are measured at different geographical levels). The first variable is a subjective assessment of the level of corruption (CPI). Data are drawn from a large European survey (EQI) aimed at measuring the quality of governance within the European Union and they are available at the regional level.[11] The second variable echoes the subjective and indirect approach to the measurement of corruption. We exploit a survey managed by Istat (the so-called "Multiscopo") asking a large set of questions to citizens to various aspects of life, including trust towards local government and other institutions ($TRUST$). Based on a rich literature on the detrimental effect of perceived corruption on the trust expressed by people in local institutions (e.g. Uslaner, 2004; Clausen et al., 2011), we take distrust towards local government as an indicator of corruption. These figures are available at the regional level with a further distinction between small municipalities, intermediate municipalities and larger metropolitan areas. The third variable belongs to the group of objective and indirect measures of corruption. Golden and Picci (2005) compute a measure of corruption for Italy based on the difference between the value of the public infrastructure and cumulated public expenditure in public works (GP). These figures are available at the regional level. Our last variable is reported crime adjusted for judicial efficiency, i.e. the aforementioned C^1. We then rely on a principal component analysis to extract information from these four variables. The first principal component explains about 64 percent of the total variance of the underlying variables and it is positively associated, as expected, with each one of the input variables (Table 2). We call this synthetic indicator C^2.

C^1 and C^2 both have some strong and weak points. On the one hand, C^2 might better capture a multidimensional and unobserved phenomenon such as corruption; moreover, the large fraction of variance explained by the first component suggests that the four indicators largely overlap, which is supportive of the measure's rich informational content. On the other hand, C^1 is easier to interpret in economic terms and less subject to arbitrary choices. Moreover, C^1 is

[10] According to our findings, a variation of one standard deviation of the length of penal proceedings is associated to a 0.14 standard deviations increase in the reported crime rate, thus suggesting that the latter largely reflects the intensity of the criminal activity at the local level and is only marginally affected by judicial efficiency (as captured by our proxy).

[11] More information on the data can be found in Charron et al. (2014).

available at a finer partition of the territory, while C^2 partly reflects indicators that mostly vary at the regional level. For these reasons, C^1 is our preferred measure of corruption, though we provide evidence using both indicators throughout the paper.[12]

Summary statistics of the two indicators are reported in Table 3. In order to guarantee comparability between different indicators of corruption, both C^1 and C^2 are standardized. The two variables display considerable variability across LLMs. A graphical representation of the territorial differences in corruption intensity is reported in Figure 1: both indicators show that corruption is more widespread in Southern Italy, with the North-South divide being more visually evident when C^2 is used; however, in both cases there is also significant variability within each macro-area.

2.3 Descriptive evidence

Corruption and human capital endowments are positively correlated at the LLM level, as shown in Figure 2. This apparently surprising fact is mainly due to other covariates being correlated to both variables. For example, corruption is positively related to the size of the public sector (Figure 3a), either because large public agencies offer better chances to corruptors or because corruption may hinder the development of more market-oriented activities. Sector composition, however, also affects the incentives to invest in human capital: as it has been widely documented, the public sector tends to attract the most educated workers (Cowley and Smith, 2014; Rizzica, 2016). Moreover, corruption is more widespread in less economically developed LLMs, as measured by the value added per capita, and by poorer labor market opportunities. The latter, however, might also affect human capital investments reducing, ceteris paribus, the opportunity cost of studying. Indeed, when we control for the above-mentioned variables, the correlation between corruption and education disappears. This also suggests that, when attempting to identify a clean effect of corruption on other socio-economic outcomes, we face the challenging task of having to avoid spurious correlation driven by unobserved omitted variables.

Having established that the share of employees in the public sector is larger in LLMs where the intensity of corruption is higher, we found that the share of managers among public employees in those areas is also larger (31% versus 27%,

[12] Notice that our main results are qualitatively confirmed even if we use raw figures for reported crimes and/or each component of the principal component analysis separately. Results are available from the authors upon request.

see Figure 3a). In terms of human capital, as measured by the years of schooling, the (positive) gap between the public sector and the private sectors is narrower in more corrupt LLMs, and this is especially evident for managers, for whom average schooling advantage falls from 2.1 to 1.6 years (Figure 3b). Moreover, the relationship between under-education in the private and public sector changes when one moves from less to more corrupt areas (Figure 3c). When corruption is low, public-sector employees are *less* likely to be under-educated than private-sector employees by 2.4 percentage points (1.8 points for managers). On the contrary, where corruption is high, public-sector employees are *more* likely to be under-educated than private-sector employees by 1.1 percentage points (2.7 points for managers).

3. Empirical strategy

3.1 Selection of workers into the public sector

The first phenomenon we wish to study is the potential distortionary effect of corruption on the relevance of educational attainments, as well as other measures of individual ability, as predictors of the likelihood of an individual's belonging to the public sector. To this end, we estimate the following linear probability model:

$$Y_i = \alpha + \beta S_i + \delta\left(S_i \cdot C_{LLM(i)}\right) + \gamma' X_i + \rho_{LLM(i),p(i)} + \varepsilon_i \qquad (1)$$

where Y_i is a binary indicator of the occupational status of individual i, taking on the value of 1 if i is a public employee and the value of 0 if i is employed in the private sector; S_i is a measure of i's skills endowment, e.g. the completed years of schooling; $C_{LLM(i)}$ is one of the two measures of the incidence of corruption in the LLM in which individual i resides; X_i is a vector of individual controls such as gender and age: these are included as the likelihood of joining the public sector may be affected by gender- or cohort-specific factors; finally, the term $\rho_{LLM(i),p(i)}$ is a group indicator, obtained by combining i's LLM and professional area, capturing unobserved factors at that level.[13] Thus, our coefficient of interest δ captures how the impact of schooling on the likelihood of joining a certain professional class $p(i)$ in the public sector (rather than the same professional class in the private sector) varies across LLMs characterized by different corruption intensity. In most specifications, we compare the public sector with the manufacturing sector, rather

[13] In RFL data we can distinguish, within the sample of non-manual employees, among three professional areas: managers and professional, technicians, and clerical workers. In SHIW data we only distinguish between managers and clerical workers.

than with the entire private sector. The former, being hardly dependent on public spending and more exposed to international competition, tends to be more-market oriented and, therefore, is assumed to be substantially unaffected by corruption.[14] We might expect $\delta < 0$, indicating that corruption reduces the likelihood to join the public sector.

3.2 Allocation of workers within the public sector

Besides affecting, through self-selection and screening, the composition of the available public workforce, corruption may have an impact on how efficiently these human resources are assigned to different jobs and tasks. In particular, we imagine that to each job there corresponds a level of skills or human capital, i.e. the level of an individual which is "just right" for that job. We subsequently test whether corruption shifts the allocation of human resources away from the right matching and, if that happens, whether this prevalently takes the form of under- or over-education, i.e. of employees having a much lower or higher, respectively, skill level than that required on average by the jobs they are assigned to. In order to quantify this effect, we estimate the following linear probability model:

$$M_i = \alpha + \beta\left(Y_i \cdot C_{LLM(i)}\right) + \gamma' X_i + \rho_{LLM(i)} + \varphi_{s(i)} + \varepsilon_i \qquad (2)$$

where the dependent variable M_i is a binary indicator for the presence of some form of skills mismatch (under-education or over-education) for individual i. Specifically, an individual is considered to be under-educated if her schooling level falls below the 25th percentile of the distribution of schooling within her profession (defined in terms of the ISCO classification at 3 digits) and, conversely, over-educated if her schooling level exceeds the 75th percentile of that distribution. As before, Y_i denotes whether i is employed in the public rather than in the manufacturing sector. LLM-fixed effects ($\rho_{LLM(i)}$) and sector-fixed effects ($\varphi_{s(i)}$) capture local or industry-specific variables that might be correlated with mismatch.

Our coefficient of interest is β, which captures how the impact of working in the public sector on the likelihood to be mismatched varies across LLMs characterized by different corruption intensity. We might expect $\beta > 0$, as

[14] Indeed, corruption typically involves converging interests or – at least – some kind of interaction between the public officials and the private firms whose activity is affected by public decisions (e.g. electricity, water, waste disposal, construction sectors, social activities, etc.). However, in the robustness section we relax this assumption and we allow the employee to choose also between the public sector and the overall private sector.

corruption is supposed to increase mismatch in the public sector relative to the manufacturing sector.

3.3 Identification assumptions

When we examine the impact of corruption on economic outcomes exploiting cross-sectional variation, we should take account of two potential identification threats.

First, unobserved heterogeneity at the local level (e.g. social norms, level of economic development, etc.) might be related to corruption as well as to the accumulation of human capital. These omitted variables are likely to bias the OLS estimates. However, we include LLM-fixed effects aimed at capturing any potential variables at the local level. Indeed, our identification strategy exploits the differential effect of corruption between individuals living in the same LLM (e.g. between those employed in the public or in the private sector). This strategy mimics a difference-in-differences approach where the treatment is represented by the intensity of corruption at the local level and the individual characteristics of the employees determine the exposure to the treatment.

Second, we might suspect the presence of reverse causality, as one may argue that skill-biased recruitment and human resources management processes in the public sector could affect the intensity of corruption. To address this problem, we exploit variation in corruption intensity at the local level that is attributable to factors associated to corruption *but* predating the hiring of the current public employees. In particular, we use two types of pre-determined indicators as instruments. First, we exploit variation in corruption that is attributable to economic rents at the local level. More specifically, we use data from the Italian 1971 Census to compute the dependence of the private sector from public demand.[15] The idea is that where the latter is higher, the economic rents associated to the discretionary power of the public officials as well as the incentive of the entrepreneurs to influence public spending are also higher. This, in turn, may have increased the likelihood of corruptive practices being established. Second, we exploit variation in corruption that is attributable to historical dominations by the following nations or families: Anjou, Austria, Bourbons,

[15] Dependence on the demand of the public sector at the local level is computed in two steps. First, using the input-output matrix, we compute the dependence on the public demand for each sector of economic activity. Second, we translate these figures at the local level using the past sector composition of the local economy (i.e. the distribution of employees across sectors at the local level as recorded by the 1971 Census).

Normans, Papal States, Savoy, Spain, Swabians and the Republic of Venice (with the independent states being the residual category).[16] This analysis is related to a large literature that investigates how history (and historical institutions) may still influence existing institutions and current social behaviors (e.g. Acemoglu and Robinson, 2012).

4. Results

4.1 The impact of corruption on personnel selection

Table 4 reports the results of the estimation of model (1) for our two main measures of corruption, C^1 and C^2. The sample, drawn from the LFS, include all the employees of the public and manufacturing sectors engaged in non-manual activities. Individual human capital is measured by years of schooling.

Higher educational attainments are, as expected, positively associated with the likelihood of having joined the public sector. One additional year of schooling increases the probability of being a public employee by around 1.6 percentage points; the impact is higher among managers and professionals (2.5 percentage points). More interestingly, corruption reduces the role of education as a predictor of being a public employee. According to our results, moving from a LLM at the 10th percentile of C^1 to one at the 90th percentile (i.e. from a low-corruption to a high-corruption LLM) the impact of one additional years of schooling decreases from 2.1 to 1.0 percentage points; the detrimental effect of corruption is larger for managerial and professional occupations, where the same exercise would lead to a decrease of the impact of education from 3.2 to 1.5 percentage points. The last two columns of Table 4 replicates the analysis using C^2 as an approximation of corruption intensity at the local level: results are qualitatively similar.

In Tables 5 and 6 we rely on the SHIW data rather than on the LFS. Results should be interpreted with some caution given the relatively small number of observations and the large number of fixed-effects that we include in the specification in order to control for the relevant unobserved heterogeneity. However, SHIW data allow us to use a second measure of ability, i.e. an index representing the grade obtained by individuals at their highest achieved educational level, which is available only for those with at least secondary education.

In Table 5 we consider years of schooling as the only ability measure and the full sample of (non-manual) employees. These results generally confirms previous

[16] Figures are drawn from Di Liberto and Sideri (2015).

ones, though the impact of education on the probability of joining the public sector is, on average, slightly weaker. Estimates for our parameter of interest, albeit only weakly significant, testify the presence of a detrimental effect of corruption, again concentrated among managers.

In Table 6 we restrict the analysis to individuals with at least a secondary education diploma and we focus the attention on ability as measured by school grades.[17] According to our findings, having obtained one additional grade-point, in a scale ranging from 0 (the lowest grade) to 10 (the highest grade), has a negative effect on the overall probability of joining the public sector (with respect to the manufacturing sector). However, the impact is positive (though not statistically significant) when we focus on managers and other professionals. Again the impact of grades is differentiated across LLMs characterized by a different intensity of corruption, which negatively affects the propensity of more talented students to join the public sector. According to our estimates, one additional grade-point increases the likelihood of joining the public sector in a managerial position by 8 percentage points in low-corruption LLMs and decreases it by 6 percentage points in high-corruption LLMs. Results are again qualitatively similar if we use C^2 instead of C^1 to measure corruption.

4.2 The impact of corruption on the personnel allocation across jobs

In this section we inspect the impact of corruption on the effectiveness of the allocation process of human resources. The latter is examined comparing individual abilities and the skill content of jobs workers are assigned to. A mismatch may happen both in the direction of under-education (an individual is assigned to a task which is on average undertaken by more educated workers) or over-education (an individual is assigned to a task which is on average undertaken by less educated workers).

As we have described before, under- and over-education are by and large as frequent in the public sector as they are elsewhere. The aim of our empirical strategy is, again, to examine differential patterns between low- and high-corruption areas. Table 7 shows the results of the estimation of model (2). The coefficient associated to the interaction term between the public sector dummy and the measure of corruption is positive, suggesting that corruption increases the correlation between being in the public sector and the likelihood to be under-

[17] Grades are highly correlated with educational attainments, as those who obtain higher grades at secondary level are also those who are more likely to get tertiary education. Therefore, to avoid collinearity, we do not consider the two ability measures jointly interacted with corruption.

educated. These results hold for all employees and for the subset of those who stay at the top of the occupational hierarchy. On the other hand, we do not find any detectable effect in terms of over education; this might also be due to an inflation of professions with a higher (formally required) skill content in more corrupt LLMs, thus making over-education less likely by definition.

Skills mismatch might be, at least partially, a mechanical consequence of the negative selection patterns observed in the previous subsection. If corruption makes public employment relatively less attractive for the most educated, public agencies in corrupt areas will hire relatively less educated personnel. Assuming that the tasks assigned to each agency do not vary with the level of corruption, under-education will arise as the obvious outcome of having to fill the same job positions with less educated personnel. But under-education could also result from biased management practices, that may be more likely to occur where corruption is more intense. As an attempt to disentangle these two factors, in Table 8 we estimate a model identical to (2) but for two additional controls: the average skill content of professions present in each sector-LLM cell (measured as product of the nation-wide average of schooling in each profession and the share of professions in the cell) as well as the average education level in the same sector-LLM cell (measured with the average schooling of the employed in the cell).[18] These should respectively account for different educational endowments (and thus for the effects of selection) as well as for possible inflation in the number of high-level positions managed by public agencies. We indeed find, as expected, that these additional controls partly explain the levels of under- and over-education; for example, under-education is more likely where the average schooling of employees is lower and where the average schooling required by the available job positions is higher. Nevertheless, we still find evidence of corruption-related variations in the likelihood of under-education.

4.3 Robustness

This section contains some robustness checks, motivated by various considerations.

First, we examine whether our results hold when we modify the control group or use different sample selection rules. So far we have used the manufacturing sector as control group as it is hardly dependent on public spending and, therefore, arguably unaffected by corruption in the public sector. In the first

[18] This is the LLM-by-sector average of the average education level within professions at the ISCO 3-digit level of disaggregation.

two columns of Table 9, however, we replicate our baseline results on selection, and under- and over-education using C^1 as our measure of corruption and extending the control group from the manufacturing to the whole private sector.[19] Our main results are fully confirmed though the estimated effects are slightly smaller, thus implicitly suggesting that misallocation due to corruption is somewhat extended also to the private industries that interact more with the public sector.[20] Moreover, having shown that corruption is more widespread in the South of Italy, we examine to what extent our results are driven by the traditional North-South divide and whether they still hold when we compare more homogenous regions. The last two columns of Table 9 replicate our baseline results restricting the analysis to the LLMs located in the Centre-North, obviously at the cost of losing a significant number of observations and territorial variability. The estimates of the coefficients associated with the interaction term in the selection equation are fairly similar to those of our baseline specification. As far as misallocation is concerned, corruption continues to be significantly associated to under-education.

Second, our results might also be driven by other omitted variables correlated with corruption and implying differential effects similar to those produced by corruption. More precisely, this concern is not related to potential omitted variables driving the sorting between public and private sectors: those are already controlled for by the introduction of fixed effects at the LLM level. The concern relates to variables having a differential schooling-biased effect similar to that observed for corruption. To address this point, we enrich the specification with other local controls aimed at capturing relevant economic dimensions that are both correlated with corruption and potentially liable to affect individuals occupational choices. In the first column of Table 10 we include the (logarithm of the) value added per employee interacted with schooling as a determinant of selection into the public sector. The underlying idea is that better, on average,

[19] All results of this subsection are qualitatively similar if we use C^2 instead of C^1. They are not reported for the sake of brevity.

[20] One can also argue that a sharp comparison between public and private sector may fail to take into account that the latter is also potentially affected by corruption and possibly differently so depending on the industry. Indeed, corruption typically involves converging interests or – at least – some kind of interaction between the public officials and the private firms whose activity is affected by public decisions. In unreported evidence we replicate the analysis using a continuous indicator of dependence from the public sector in lieu of the discrete indicator. More specifically, we map economic activities into the unit interval, capturing the dependence and/or the proximity between each economic sector of activity and the public sector, using the input-output matrix. The smallest values of this continuous measure correspond to sectors that do not interact with the public sector (e.g. the manufacturing sector); in contrast, larger values correspond to industries whose demand partly depends on public spending and/or that operate on regulated markets (e.g. electricity, water, waste disposal, construction, etc.). The results (available upon request) are qualitatively similar.

economic prospects at the local level (and any other variable correlated with economic development) might affect the education-based sorting between public and private sector. In the second column of Table 10 we include population density at the LLM level: this might affect both corruption and selection patterns, since the scope of public administration can differ between urban and rural areas. Finally, in the last column of Table 10, we include the average unemployment rate (over the years 2004-2010) at the LLM level: unemployment and corruption may be related through a number of channels and unemployment might affect the composition of the workforce willing to join the public sector. Our main findings are basically unchanged in all cases.

Finally, we examine whether our patterns on the skill-biased impact of corruption on selection processes vary across different sections of the public sector. In Table 11 we replicate our baseline result distinguishing between public administration, education and health. We find that the association between schooling and the likelihood of joining the public sector remains weaker in high-corruption areas for the three sections. Moreover, in all cases the negative impact of corruption is larger for jobs at the top of the occupational ladder.

4.4 IV estimates

One last concern is related to reverse causality. Corruption might itself be the result of poorly selected public employees, while we are interested in the link *from* corruption *to* personnel selection and allocation. To address this issue we rely on an instrumental variable strategy. Our instruments are characterized by the common characteristic of being pre-dated with respect to the hiring of current public employees.

The first instrument is past local dependence from public-sector demand. The underlying idea, implicitly supported by our previous findings, is that corruption episodes are more likely to occur where the role of public spending for the private sector is more prominent. Unreported evidence documents that past economic dependence of the private sector on public demand is positively correlated with corruption intensity at the LLM level. The second set of instruments considers the impact of past dominations. Further unreported evidence shows broad consistency with other results on the cultural and institutional legacy of past foreign dominations.[21]

[21] Among past foreign dominations, corruption is positively correlated with the Norman domination and negatively correlated, albeit to a lesser extent, with other spells of foreign domination, except for the Angevine and Swabian ones.

IV estimates are reported in Table 12. Past economic dependence on public spending appears to be a strong determinant of corruption and the first stage F-statistic of the excluded instrument for the whole sample is well above the traditional threshold (first two columns). On the contrary the predictive power of past dominations, in our empirically setting, is somewhat weaker and the F-statistic is, in some cases, slightly below 10 (last two columns). The second stage coefficients using either set of instruments, are qualitatively similar to those of our baseline specifications, which reassures us on the identification of a link from corruption to personnel selection and allocation in the public sector.

4.5 The impact of corruption on labor supply and effort

Unfortunately we do not possess data on individual performance or on the output produced by public employees. Therefore, we cannot evaluate whether the worsening of personnel selection and allocation processes due to corruption is also associated to lower quality of the public services being provided to the local community. However, through the labor force survey we can – at least partially – observe individual inputs, as measured by number of hours worked and a measure of absenteeism. As for the latter, we measure it by an indicator that equals 1 when the employee is on sick leave or absent for study and family reasons, as well as other causes which we deem to be more easily manipulated by the shirking worker (compare to more "exogenous" absence such as non-business days, compulsory maternity leaves, vacations, feast days, etc.).

In Table 13 we estimate an equation similar to that reported in equation (2) with (the logarithm of) number of hours worked and absence rate as dependent variables. When considering labor supply, we find that the coefficient associated to the interaction term between the public sector dummy and the measure of corruption is negative, suggesting that in areas with more corruption the number of hours worked by public employees relative to those in the manufacturing sector decreases. The coefficient for the subsample of managers and high-level professionals is twice in size as that for all non-manual workers. When considering absenteeism as a measure of individual effort, we find that the difference in the absence rate between the manufacturing and the public sector is indistinguishable for the entire sample but becomes statistically significant, albeit weakly so, when considering only employees at the top of the occupational ladder.

These results indicate that, besides worsening selection and allocation processes, corruption also leads to a relatively lower effort of public employees. We argue that these public employees' characteristics and behavior can (at least in

part) explain the strong correlation existing between corruption and the quality of the administration's economic decisions and the effectiveness of the public services, as documented in earlier studies and as confirmed also by descriptive evidence reported in Figure 4.

5. Conclusions

Our analysis highlights the distortionary effect of corruption (as measured by local-level statistical indicators based on the number of reported crimes, on citizens' trust in local public institutions, on perception of administrations' integrity and on the quality of public expenditure) on the patterns of selection and allocation of public sector employees. Because of the nature of the tasks assigned to and areas of activity spanned by public agencies, public employees are more educated with respect to their counterparts in the private sector. This gap is, however, thinner where corruption indicators are higher, and the education bias induced by corruption is particularly strong for professions at the top of the occupational hierarchy. Similar evidence is found if we consider further dimensions of human capital such as grades obtained at school. Besides affecting selection, corruption contributes to deviating the education-based matching between workers and jobs: where corruption indicators are higher, public employees are relatively more likely to be assigned to tasks which are, on average, undertaken by more qualified personnel.

The comparative analysis of our results thus suggests that higher levels of corruption are associated with a poorer capacity of the public sector to select and allocate workers. Hence – if one believes that the workforce's human capital is conducive of better decision making – where corruption is high, the public administration will tend to adopt socially inefficient decisions and to remunerate individual less in terms of schooling ability than of other (unobserved) ability traits such as soft skills, relational capital or craftiness.

The eradication of corruption or, at least, the dampening of its implications have long been a major objective of governmental effort. Actions taken by governmental authorities usually rest on ex-post, repressive measures, which are sometimes accompanied by ex-ante, preventive provisions. The latter often take the form of a requirement for individual agencies to implement "in-house" anti-corruptive programs under governmental supervision. In light of the evidence presented in this paper, one may suspect that the administrations' ability to exert anti-corruptive self-monitoring might be hindered by corruption itself. Indeed, existing levels of crime in the environment may have contributed to the selection

of a workforce which will, in general, be more likely to be misallocated as well as less prone to take up action against corruption if called to do so. The risk is that self-regulation aimed at overcoming corruption may work well only where corruption is already rare and fare poorly where it is more intense. Hence our results suggest caution against over-estimating the additional benefits of ex-ante, decentralized provisions.

References

Acemoglu, D. and J.A. Robinson (2012), *Why nations fail: the origins of power, prosperity, and poverty*, New York: Random House.

Acemoglu, D. and T. Verdier (1998), Property rights, corruption and the allocation of talent: a general equilibrium approach, *Economic Journal*, vol. 108, pp. 1381-1403.

Banerjee, R., T. Baul and T. Rosenblat (2015), On self selection of the corrupt into the public sector, *Economics Letters*, vol. 127, pp. 43-46.

Barfort, S., N. Harmon, F. Hjorth and A.L. Olsen (2016), Sustaining honesty in public service: the role of selection, working paper.

Barone, G. and S. Mocetti (2014), Natural disasters, growth and institutions: a tale of two earthquakes, *Journal of Urban Economics*, vol. 84, pp. 52-66.

Brandolini, A. and L. Cannari (1994), Methodological appendix: the Bank of Italy Survey of household income and wealth, in A. Ando, L. Guiso and I. Visco (eds.), *Saving and the accumulation of wealth. Essays on Italian households and government saving behavior*, Cambridge: Cambridge University Press.

Brollo, F., T. Nannicini, R. Perotti and G. Tabellini (2013), The political resource curse, *American Economic Review*, vol. 103, pp. 1759‑1796.

Camussi, S. and A.L. Mancini (2016), Individual trust: does quality of public services matter? Bank of Italy, Working Papers no. 1069.

Charron, N., V. Lapuente and L. Dijkstra (2014), Regional governance matters: quality of government within European Union member states, *Regional Studies*, vol. 48, pp. 68-90.

Clausen, B., A. Kraay and Z. Nyiri (2011), Corruption and confidence in public institutions: evidence from a global survey, *World Bank Economic Review*, vol. 25, pp. 212-249.

Cowley, E. and S. Smith (2014), Motivation and mission in the public sector: evidence from the World Values Survey, *Theory and Decision*, vol. 76, pp. 241-263.

Del Monte, A. and E. Papagni (2001), Public expenditure, corruption, and economic growth: the case of Italy, *European Journal of Political Economy*, vol. 17, pp. 1-16.

Del Monte, A. and E. Papagni (2007), The determinants of corruption in Italy: regional panel data analysis, *European Journal of Political Economy*, vol. 23, pp. 379-396.

Di Liberto, A. and M. Sideri (2015), Past dominations, current institutions and the Italian regional economic performance, *European Journal of Political Economy*, vol. 38, pp. 12-41.

Ferraz, C. and F. Finan (2011), Electoral accountability and corruption: evidence from the audits of local governments, *American Economic Review*, vol. 101, pp. 1274‑1311.

Fisman, R. and R. Gatti (2002), Decentralization and corruption: evidence across countries, *Journal of Public Economics*, vol. 83, pp. 325–345.

Fisman, R. and E. Miguel (2007), Corruption, norms, and legal enforcement: evidence from diplomatic parking tickets, *Journal of Political Economy*, vol. 115, pp. 1020–1048.

Giorgiantonio, C., T. Orlando, G. Palumbo and L. Rizzica (2016), Incentives and selection in public employment, Bank of Italy, Occasional Papers no. 342.

Golden, M.A. and L. Picci (2005), Proposal for a new measure of corruption, illustrated with Italian data, *Economics & Politics*, vol. 17, pp. 37-75.

Hanna, R. and S.Y. Wang (2017), Dishonesty and selection into public service: evidence from India, *American Economic Journal: Economic Policy*, vol. 9, pp. 262-290.

Hessami, Z. (2014), Political corruption, public procurement, and budget composition: theory and evidence from OECD countries, *European Journal of Political Economy*, vol. 34, pp. 372–389.

Knack, S. and P. Keefer (1995), Institutions and economic performance: cross-country tests using alternative institutional measures, *Economics and Politics*, vol. 7, pp. 207–227.

La Porta, R., F. Lopez-de Silanes, A. Shleifer and R. Vishny (1999), The quality of government, *Journal of Law, Economics, and Organization*, vol. 15, pp. 222–279.

Mauro, P. (1995), Corruption and growth, *Quarterly Journal of Economics*, vol. 110, pp. 681-712.

Mauro, P. (1998), Corruption and the composition of government expenditure, *Journal of Public Economics*, vol. 69, pp. 263–279.

Mo, P.H. (2001), Corruption and economic growth, *Journal of Comparative Economics*, vol. 29, pp. 66-79.

Murphy, K.M., A. Shleifer and R.W. Vishny (1991), The allocation of talent: implications for growth, *Quarterly Journal of Economics*, vol. 106, pp. 503-530.

Olken, B.A. (2009), Corruption perceptions vs. corruption reality, *Journal of Public Economics*, vol. 93, pp. 950–964.

Olken, B.A. and P. Barron (2009), The simple economics of extortion: evidence from trucking in Aceh, *Journal of Political Economy*, vol. 117, pp. 417‐452.

Rizzica, L. (2016), Why go public? A study of the individual determinants of public sector employment choice, Bank of Italy occasional paper n. 343.

Rizzica, L. and M. Tonello (2015), Exposure to media and corruption perceptions, Bank of Italy working paper n. 1043.

Shleifer, A. and R.W. Vishny (1993), Corruption, *Quarterly Journal of Economics*, vol. 108, pp. 599-617.

Uslaner, E.M. (2004), Trust and corruption, in J.G. Lambsdorf, M. Taube and M. Schramm (eds.), *Corruption and the new institutional economics*, London: Routledge.

Tables

Table 1. Descriptive statistics

	Full sample		*Public sector employees*	
	Mean	St. dev.	Mean	St. dev.
	LFS data			
Female	0.561	0.496	0.656	0.475
Young (<35)	0.293	0.455	0.149	0.356
Years of schooling	12.53	3.337	13.54	3.467
Under-education	0.127	0.333	0.124	0.330
Over-education	0.090	0.286	0.103	0.304
Hours worked per week	34.859	10.348	31.883	10.013
Absence rate per week	0.015	0.121	0.019	0.136
# observations	*753,048*		*301,120*	
	SHIW data			
Female	0.365	0.482	0.382	0.486
Young (<35)	0.110	0.313	0.073	0.260
Years of schooling	13.09	3.256	13.43	3.481
Grades obtained at school	0.824	0.136	0.837	0.138
# observations	*11,511*		*5,905*	

Years of schooling are those corresponding to the highest educational attainment. Grades are the final grades (normalized with respect to the maximum obtainable grade) obtained at the highest education attainment (they are available only for individuals with at least a diploma). Under-education (over-education) is equal to 1 if the employee has a number of years of schooling below the 25th percentile (above the 75th percentile) of the years of schooling distribution within his/her profession (based on the 3-digit classification). The statistics on hours worked in the last week do not include individuals that worked 0 hours. The absence indicator is 1 for those who have been absent from work for reasons including: sick leave, working hours flexibility, study leave, absence for family reasons and for undeclared causes.
Sources: authors' elaborations on data drawn from LFS and SHIW.

Table 2. Corruption: principal component analysis

	1st component	2nd component	3rd component	4th component
Eigenvalue	2.573	0.883	0.330	0.214
Proportion	0.643	0.221	0.082	0.054
Cumulative	0. 643	0.864	0.946	1.000
	C^1	Trust	GP	CPI
Coefficient 1st component	0,365	0,482	0,382	0,486

Results of the principal component analysis.
Sources: authors' elaborations on ISTAT, Ministry of Interior, Golden and Picci (2015) and EQI data.

Table 3. Descriptive statistics

	Mean	S.D.	10th	25th	50th	75th	90th
Crime rate: C^1	0.000	1.000	-0.570	-0.442	-0.254	0.141	0.765
Principal component: C^2	0.000	1.000	-1.299	-0.739	0.133	0.856	1.225

Corruption indicators are standardized at the LLM level.
Sources: authors' elaborations on ISTAT, Ministry of Interior, Golden and Picci (2015) and EQI data.

Table 4. Selection in the public sector: the impact of schooling (LFS)

Dependent variable:	Employed in the public sector			
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Years of schooling	0.016***	0.025***	0.015***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)
Years of schooling × C^1	-0.008***	-0.013***		
	(0.001)	(0.002)		
Years of schooling × C^2			-0.007***	-0.009***
			(0.001)	(0.001)
LLM × professional area FEs	YES	YES	YES	YES
R-squared	0.269	0.218	0.270	0.220
# observations	*397,060*	*99,663*	*397,060*	*99,663*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variable is equal to 1 for public sector employees and to 0 for manufacturing sector employees. Years of schooling are those corresponding to the highest educational attainment. Corruption is measured at the LLM level and we consider two measures: C^1 – i.e. reported crimes net of judicial efficiency – and C^2 – i.e. the principal component of CPI, $TRUST$, GP and C^1. Other controls include fixed effects for gender and age cohort.

Table 5. Selection in the public sector: the impact of schooling (SHIW)

Dependent variable:	Employed in the public sector			
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Years of schooling	0.005***	0.006***	0.005***	0.006***
	(0.002)	(0.002)	(0.001)	(0.001)
Years of schooling × C^1	-0.003	-0.004*		
	(0.003)	(0.002)		
Years of schooling × C^2			-0.003**	-0.003**
			(0.002)	(0.001)
LLM × professional area FEs	YES	YES	YES	YES
R-squared	0.203	0.185	0.204	0.186
# observations	*4,939*	*2,419*	*4,939*	*2,419*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the SHIW. The dependent variable is equal to 1 for public sector employees and to 0 for industrial sector employees. Years of schooling are those corresponding to the highest educational attainment. Corruption is measured at the LLM level and we consider two measures: C^1 – i.e. reported crimes net of judicial efficiency – and C^2 – i.e. the principal component of CPI, $TRUST$, GP and C^1. Other controls include fixed effects for gender and age cohort.

Table 6. Selection in the public sector: the impact of grades (SHIW)

Dependent variable:	Employed in the public sector			
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Grades at school	-0.010**	0.018	-0.010**	0.015
	(0.046)	(0.040)	(0.045)	(0.039)
Grades at school × C^1	0.037	-0.110*		
	(0.052)	(0.059)		
Grades at school × C^2			-0.006	-0.077***
			(0.028)	(0.024)
LLM × professional area FEs	YES	YES	YES	YES
R-squared	0.207	0.185	0.206	0.187
# observations	*4,926*	*2,414*	*4,926*	*2,414*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the SHIW. The dependent variable is equal to 1 for public sector employees and to 0 for industrial sector employees. Grades are the final grades (normalized with respect to the maximum obtainable grade) obtained at the highest education attainment (they are available only for individuals with at least a diploma). Corruption is measured at the LLM level and we consider two measures: C^1 – i.e. reported crimes net of judicial efficiency – and C^2 – i.e. the principal component of CPI, $TRUST$, GP and C^1. Other controls include years of schooling and fixed effects for gender and age cohort.

Table 7. Under- and over-education in the public sector

Dependent variable:	Under-education		Over-education	
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Public sector × C^1	0.041***	0.041***	0.002	0.001
	(0.007)	(0.013)	(0.005)	(0.008)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
R-squared	0.045	0.059	0.043	0.038
Public sector × C^2	0.018***	0.015**	0.001	-0.004
	(0.003)	(0.006)	(0.003)	(0.004)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
R-squared	0.045	0.059	0.043	0.038
# observations	*397,064*	*99,663*	*397,064*	*99,663*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variable under-education (over-education) is equal to 1 if the employee has a number of years of schooling below the 25th percentile (above the 75th percentile) of the years of schooling distribution of the jobs he/she is assigned to (ISCO occupational at 3 digits). Years of schooling are those corresponding to the highest education attainment. Corruption is measured at the LLM level and we consider two measures: C^1 – i.e. reported crimes net of judicial efficiency – and C^2 – i.e. the principal component of CPI, $TRUST$, GP and C^1. Other controls include fixed effects for gender and age cohort.

Table 8. Under- and over-education (education and skill content corrections)

Dependent variable:	Under-education		Over-education	
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Public sector × C^1	0.026***	0.025*	0.011**	0.007
	(0.006)	(0.013)	(0.005)	(0.008)
Average skill content	0.083***	0.068***	-0.054***	-0.027***
	(0.003)	(0.007)	(0.003)	(0.004)
Average educational level	-0.076***	-0.069***	0.059***	0.026***
	(0.002)	(0.005)	(0.002)	(0.004)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
R-squared	0.054	0.064	0.050	0.040
# observations	*397,064*	*99,663*	*397,064*	*99,663*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variable under-education (over-education) is equal to 1 if the employee has a number of years of schooling below the 25th percentile (above the 75th percentile) of the years of schooling distribution of the jobs he/she is assigned to (ISCO occupational at 3 digits). Years of schooling are those corresponding to the highest education attainment. Average skill content is the LLM-by-sector is measured as the product of the nation-wide average of schooling in each profession and the share of each professions in the sector-LLM cell; average educational level is the average schooling of the employed in the sector-LLM cell. Corruption is measured at the LLM level with C^1, i.e. reported crimes net of judicial efficiency. Other controls include fixed effects for gender and age cohort.

Table 9. Robustness: different control groups

Dependent variable:	Employed in the public sector			
Control group:	All private sector		Only Centre-North	
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Years of schooling	0.022***	0.045***	0.018***	0.030***
	(0.001)	(0.001)	(0.001)	(0.002)
Years of schooling × C^1	-0.002**	-0.009***	-0.012***	-0.017***
	(0.001)	(0.002)	(0.004)	(0.006)
LLM × professional area FEs	YES	YES	YES	YES
R-squared	0.255	0.280	0.253	0.229
# observations	*753,043*	*135,127*	*263,176*	*58,995*
Dependent variable:	Under-education			
Public sector × C^1	0.009**	0.021***	0.057***	0.078***
	(0.004)	(0.007)	(0.014)	(0.027)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
R-squared	0.058	0.060	0.050	0.058
Dependent variable:	Over-education			
Public sector × C^1	0.000	-0.000	0.009	0.031
	(0.003)	(0.003)	(0.011)	(0.019)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
R-squared	0.048	0.039	0.047	0.040
# observations	*753,048*	*135,127*	*263,180*	*58,995*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. As control groups, in the first two columns all employees in the private sector are included while in the last two columns only employees located in the Centre-North of Italy are included. The dependent variables are the following: employed in the public sector is equal to 1 for public sector employees and to 0 for private sector employees; under-education (over-education) is equal to 1 if the employee has a number of years of schooling below the 25th percentile (above the 75th percentile) of the years of schooling distribution of the jobs he/she is assigned to (ISCO occupational at 3 digits). Years of schooling are those corresponding to the highest education attainment. Corruption is measured at the LLM level with C^1, i.e. reported crimes net of judicial efficiency. Other controls include fixed effects for gender and age cohort.

Table 10. Robustness: adding further controls

Dependent variable:	Employed in the public sector		
Professional area:	All		
Years of schooling	0.016***	0.016***	0.016***
	(0.001)	(0.001)	(0.001)
Years of schooling × C^1	-0.007***	-0.008***	-0.003***
	(0.001)	(0.001)	(0.001)
Years of schooling × VA	0.002***		
	(0.001)		
Years of schooling × Density		0.000	
		(0.001)	
Years of schooling × Unemployment			-0.006***
			(0.001)
LLM × professional area FEs	YES	YES	YES
R-squared	0.269	0.269	0.270
# observations	*397,060*	*397,060*	*397,060*
Professional area:	Managers/ professionals		
Years of schooling	0.025***	0.025***	0.025***
	(0.001)	(0.001)	(0.001)
Years of schooling × C^1	-0.012***	-0.013***	-0.006***
	(0.002)	(0.002)	(0.001)
Years of schooling × VA	0.005***		
	(0.001)		
Years of schooling × Density		0.002	
		(0.003)	
Years of schooling × Unemployment			-0.009***
			(0.001)
LLM × professional area FEs	YES	YES	YES
R-squared	0.220	0.219	0.223
# observations	*99,663*	*99,663*	*99,663*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variable is equal to 1 for public sector employees and to 0 for manufacturing sector employees. Years of schooling are those corresponding to the highest educational attainment. Corruption is measured at the LLM level with C^1, i.e. reported crimes net of judicial efficiency. We also include controls that might affect the public-private sector sorting between individuals with different educational level: the (logarithm of the) value added per employee at the LLM level (VA), the LLM population density (Density) and the LLM unemployment rate (Unemployment), all of which are standardized. Other controls include fixed effects for gender and age cohort.

Table 11. Robustness: different sections of the public sector

Dependent variable:	Employed in the public sector		
Professional area:	All		
Section of the public sector:	Public administration	Education	Health
Years of schooling	0.022***	0.028***	0.012***
	(0.001)	(0.001)	(0.002)
Years of schooling × C^1	-0.009***	-0.008***	-0.001
	(0.001)	(0.002)	(0.002)
LLM × professional area FEs	YES	YES	YES
R-squared	0.359	0.509	0.310
# observations	*184,113*	*207,016*	*197,760*
Professional area:	Managers/ professionals		
Section of the public sector:	Public administration	Education	Health
Years of schooling	0.022***	0.035***	0.055***
	(0.002)	(0.002)	(0.002)
Years of schooling × C^1	-0.010***	-0.019***	-0.006**
	(0.003)	(0.002)	(0.003)
LLM × professional area FEs	YES	YES	YES
R-squared	0.355	0.318	0.390
# observations	*28,610*	*65,055*	*30,850*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variable is equal to 1 for public sector employees and to 0 for manufacturing sector employees. Years of schooling are those corresponding to the highest educational attainment. Corruption is measured at the LLM level with C^1, i.e. reported crimes net of judicial efficiency. Other controls include fixed effects for gender and age cohort.

Table 12. Robustness: IV estimates

Dependent variable:	Employed in the public sector			
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Years of schooling	0.016***	0.027***	0.016***	0.026***
	(0.001)	(0.002)	(0.001)	(0.002)
Years of schooling × C^1	-0.041***	-0.071***	-0.022***	-0.035***
	(0.006)	(0.012)	(0.003)	(0.006)
LLM × professional area FEs	YES	YES	YES	YES
F-stat of excluded instruments	119.2	35.1	22.8	7.0
R-squared	0.257	0.152	0.267	0.209
# observations	*397,060*	*99,663*	*397,060*	*99,663*
Dependent variable:	Under-education			
Public sector × C^1	0.104***	0.040	0.088***	0.072***
	(0.024)	(0.039)	(0.014)	(0.026)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
F-stat of excluded instruments	36.8	34.9	6.9	6.6
R-squared	0.044	0.059	0.044	0.059
Dependent variable:	Over-education			
Public sector × C^1	0.009	-0.015	0.005	-0.022
	(0.017)	(0.028)	(0.010)	(0.016)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
F-stat of excluded instruments	36.8	34.9	6.9	6.6
R-squared	0.043	0.038	0.043	0.038
Instrumental variable:	Past public dependence		Past dominations	
# observations	*397,064*	*99,663*	*397,064*	*99,663*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variables are the following: employed in the public sector is equal to 1 for public sector employees and to 0 for manufacturing sector employees; under-education (over-education) is equal to 1 if the employee has a number of years of schooling below the 25th percentile (above the 75th percentile) of the years of schooling distribution of the jobs he/she is assigned to (ISCO occupational at 3 digits). Years of schooling are those corresponding to the highest education attainment of the individual. Corruption is measured at the LLM level and we consider reported crimes net of judicial efficiency (C^1) instrumented with past public sector dependence (first two columns) and with length of the different past dominations (last two columns). Other controls include fixed effects for gender and age cohort.

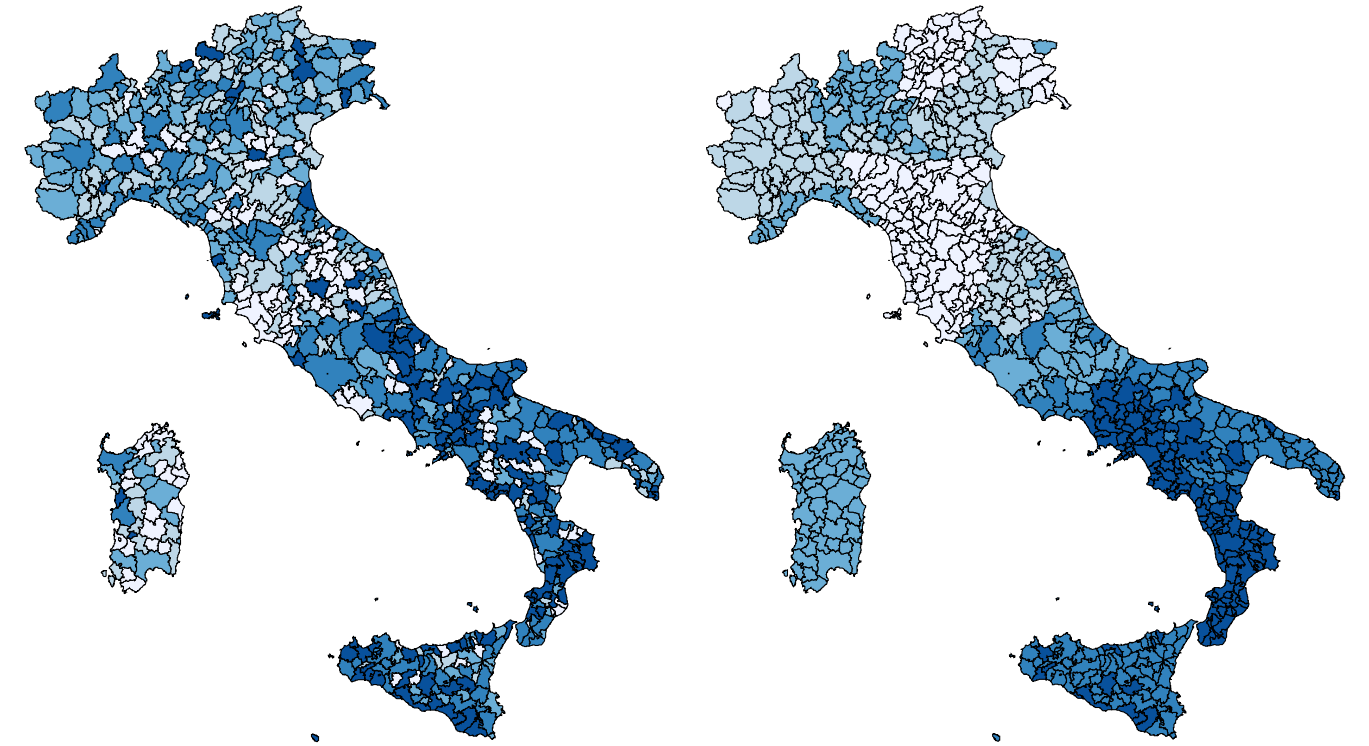
Table 13. Labor supply and effort

Dependent variable:	Hours worked		Absenteeism	
Professional area:	All	Managers/ professionals	All	Managers/ professionals
Public sector × C^1	-0.016***	-0.032***	-0.001	0.003*
	(0.004)	(0.010)	(0.001)	(0.002)
LLM FEs	YES	YES	YES	YES
Sector of activity FEs	YES	YES	YES	YES
R-squared	0.397	0.427	0.005	0.010
# observations	*351,609*	*86,949*	*397,064*	*99,663*

Standard errors are clustered at the LLM level (* p<0.1, ** p<0.05, *** p<0.01). The sample includes non-manual employees, drawn from the LFS. The dependent variables are (the logarithm of) hours worked (first two columns) and an indicator of absenteeism (last two columns). Corruption is measured at the LLM level with C^1, i.e. reported crimes net of judicial efficiency. Other controls include fixed effects for gender and age cohort and, when the dependent variable is hours worked, an indicator for whether the individual works part-time.

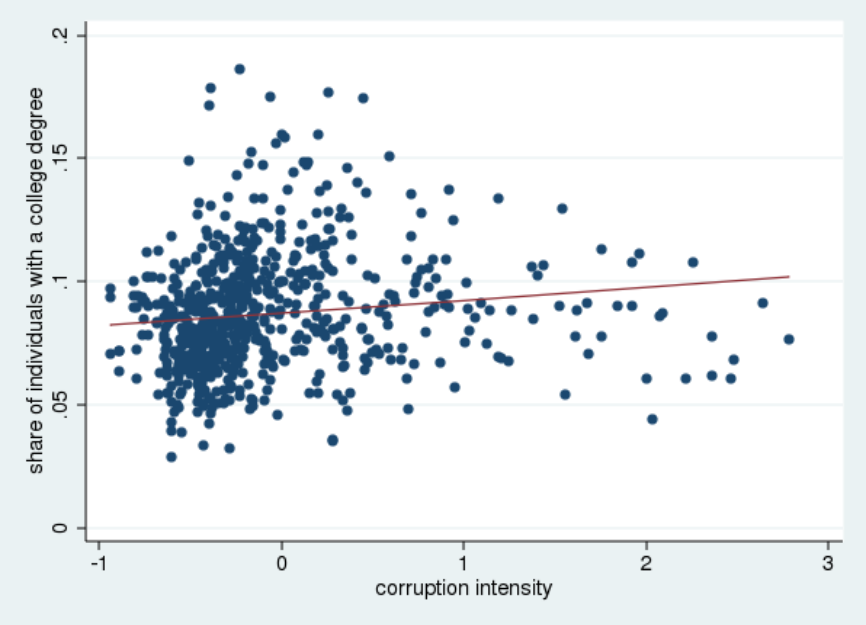
Figures

Figure 1. Map of corruption



Sources: authors' elaborations on ISTAT, Ministry of Interior, Golden and Picci (2015) and EQI data.

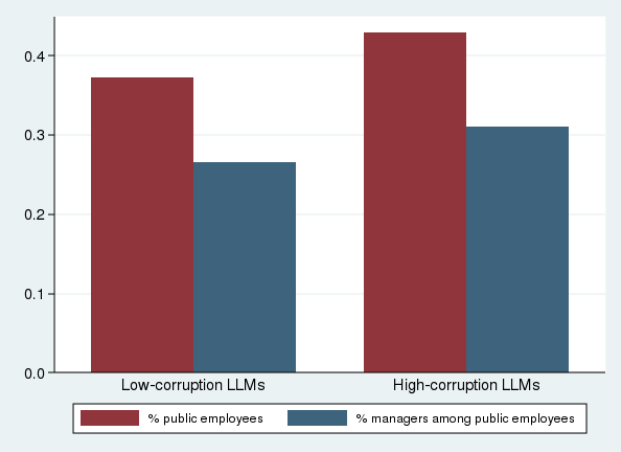
Figure 2. Corruption and education across LLMs



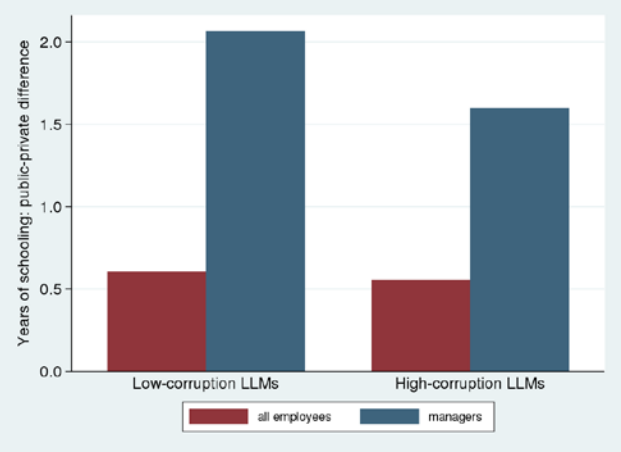
Corruption intensity is measured with reported crimes net of judicial efficiency; the share of population with a college degree is drawn from Census 2001.
Sources: authors' elaborations on ISTAT and Ministry of Interior data.

Figure 3. Corruption and public employment

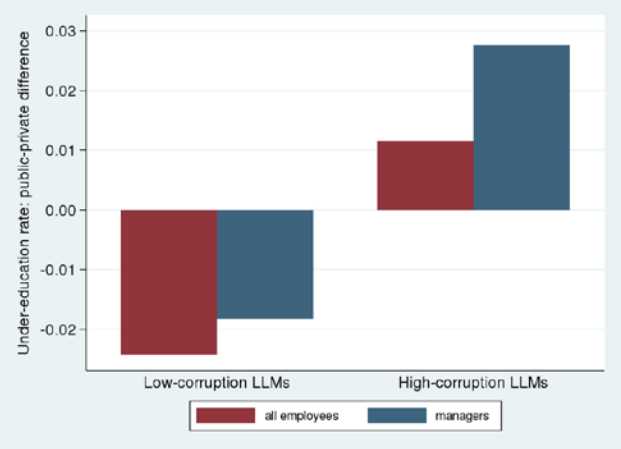
(a) share of public employees and managers



(b) public-private differences in schooling

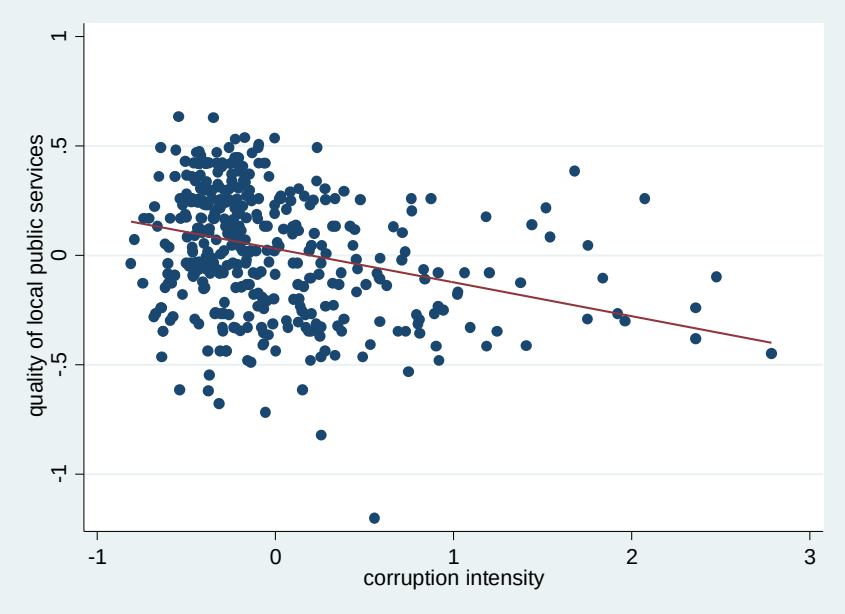


(c) public-private differences in under-education



Sources: authors' elaborations on ISTAT and Ministry of Interior data.

Figure 4. Corruption and quality of local public services across LLMs



Corruption intensity is measured with reported crimes net of judicial efficiency; the quality of local public services is drawn from Camussi and Mancini (2016).
Sources: authors' elaborations on ISTAT and Ministry of Interior data.