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Article

The Role of Monetary Incentives: Bonus and/or Stimulus

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Abstract: In this paper, the role of the monetary incentives in the employee performance is investigated in the context of Public Administration (PA). In particular, the distribution of monetary incentives among the employees based on the position held, is compared with a merit approach which tends to recognize and reward individual contributions. Starting from a questionnaire, the informal network, which ignores the vertical relation among supervisor and employees, is created and a Centrality Index, based on the employee connections, has been defined and used to proxy the performance of employees. The main goals of the paper are to understand if the two mechanisms of monetary incentive distribution affect the employee performance, to analyze the variables that influence the employee performance, and therefore to identify the role of monetary incentives. The linear regression methodology has been chosen as a tool of analysis. Results show that the distribution of monetary incentives according to merit criteria rewards the employee performance and has positive effects on the employee performance in the short term.

Keywords: public administration; monetary incentives; organization; network

1. Introduction

In the last 30 years, many reforms of the public sector have been guided by the New Public Management (NPM) theory. NPM is a theory on how the public sector is to be governed, developed by political scientists working in the field of public administration in the UK and Australia in the early 1990s (Hood 1991; Hood and Jackson 1991). This theory contains insights from game theory and from the disciplines of law and economics. In the decade after entering the literature, NPM acquired a wider range of meanings.

One of the main key ideas of the NPM is that public sector organizations need to introduce performance management based on targets, monitoring and incentives (Cainarca et al. 2019; Hood 1995). In other words, in the Public Administration (PA), a performance improvement requires a transition from a “bureaucratic culture” to a results-oriented one that emphasizes outcomes rather than inputs or processes. Reform initiatives, concerning the performance appraisal and reward systems, could foster technical (use of output controls and explicit standards performance) as well as cultural (managerial accountability and responsibility for action) changes in the public sector (Grueing 2001; Hood 1991).

Since the early 1990s, many transformation attempts with the adoption of new managerial instruments, which are often borrowed from the private sector, have been made, but the transferability of tools generally used in the private sector to the bureaucracy of the PA is not always possible. Focusing on incentives and, in particular, on monetary incentives, the balance reached by operating on their architecture has been enriched with all those conceptual tools that research into Human Resource Management (HRM) has developed over time. The ability to identify the consequences of the incentives scheme design to be adopted is highly dependent on how services are defined

and measured [Levitats and Vigoda-Gadot \(2019\)](#). In the literature, particular attention is devoted to the application of extrinsic incentive mechanisms, but without reaching conclusive results [Perry et al. \(2009\)](#). According to [Perry et al. \(2009\)](#), Performance-Related Pay (PRP) has failed to produce the expected changes. It is worth remembering that a variety of contextual factors moderates the effectiveness of PRP, such as organizational context, scheme design, performance indicators, form of the incentive [Spano and Monfardini \(2018\)](#) and the application of PRP to public services often encounters some resistances due to the non-market logic of government organizations ([Atkinson et al. 2014](#); [Bellé 2015](#); [Frey et al. 2013](#); [Weibel et al. 2009](#)).

Moreover, the problems of PA are the constraints that reduce the possibility to make change if they are not imposed by law.

In Italy, next to the initiatives already implemented (for example, training), an attempt to initiate a virtuous circle able to trigger behaviors (for example, improving the efforts) more efficient can be seen in the introduction of the “Decreto Legislativo 27 ottobre 2009, n. 150”, “Attuazione della legge 4 marzo 2009, n. 15, in materia di ottimizzazione della produttività del lavoro pubblico e di efficienza e trasparenza delle pubbliche amministrazioni. (09G0164)”. According to this law the monetary incentives are distributed ranking the employees according to merit criteria.

It is worth noting that the promotion tournaments in public organization hierarchies might be more efficient than pay-for-performance systems ([Weibel et al. 2009](#); [Whitford 2006](#)). The main goal of the paper is to study the actual and potential impact of economic incentives on individual performance in Public Administration (PA). In particular, the paper investigates if the introduction of a meritocratic-based system of monetary incentives which tends to recognize and reward individual contribution in the PA really rewards the employee performance and if it is a stimulus for better employee performance in the future period of evaluation. In other words, the main research questions are to test whether the introduction of a competitive system, structured as a “closed-ranks tournament”, encourages employees (non-managers) to improve their performance and whether it induces virtuous behavior in employees. The results show that a well-suited design scheme of economic incentives like the meritocratic-based system has positive effects on individual performance, rewarding the employee performance and creating a stimulus in the short term. To address such investigation, thanks to the availability of empirical data collected by two questionnaires, the paper presents an empirical analysis. Many models can be used to perform this analysis for example the data envelopment analysis (DEA) or linear and nonlinear regressions ([Blalock 2017a](#); [Gordon 2015](#)). DEA is a nonparametric method in operations research and economics used to empirically measure productive efficiency of decision-making units (DMUs) [Mariano et al. \(2015\)](#). In this paper, the linear regression methodology has been chosen. It is worth noting that linear models, their variants and extensions, are among the most useful and widely used statistical tools for social research ([Blalock 2017b](#); [Fox 1997](#)). The paper is organized as follows: Section 2 presents a literary review defining the research scope and the research hypotheses, Section 3 the empirical data, Section 4 the model, Section 5 shows the results of the empirical analysis. Finally, Section 6 provides the discussion and conclusions of the study.

2. Literary Review and Research Hypothesis

In the literature, many scholars underline the difficulty to define how to increase and evaluate the performance of employees ([Boland and Fowler 2000](#); [Brignall and Modell 2000](#); [Johnsen 2019](#); [Shields et al. 2015](#); [Umans et al. 2018](#)) in general, and in particular in the Public Administration (PA) ([Behn 1995](#); [Burgess et al. 2017](#); [Kearney 2018](#); [Koliba et al. 2017](#)). Many theory have been developed and the most important are the Public Service Motivation (PSM), the Organizational Citizenship Behavior (OCB) and the ones based on the Ability and Motivation model and the Ability, Motivation and Opportunity (AMO) model. According to the Public Service Motivation (PSM) the most important aspect for the employee performance is the intrinsic motivation, whereas for the OCB the employee performance cannot be evaluated considering only the job description. Organizational Citizenship Behavior (OCB) represents a concept that describes a person’s voluntary commitment that is not part of her/his contractual

tasks (Alkahtani 2015; Mostafa et al. 2015; Organ 1988; Perry 1996; Perry and Vandenabeele 2015; Perry and Wise 1990; Rainey 2009; Ritz et al. 2016; Sawitri et al. 2016; Smith et al. 1983). According to the Ability and Motivation model, a person's "capacity to work" and "will to work" jointly determine her/his level of performance (Mace et al. 1935; Viteles 1953; Yating and Yang 2017). The main theories formalize "capacity to work" as ability and the "will to work" as motivation (Maier 1955; Marin-Garcia and Tomas 2016). Thus, employees perform better, if they possess the necessary knowledge and skills, they do the job because they want to and are adequately motivated. There could be an individual who is motivated, but without the requisite ability to perform and there may be an individual with knowledge and skills but little motivation. To improve the effective evaluation of the contribution of employees, this model has been enriched adding a new component: the opportunity to perform. The resulting model has been called Ability, Motivation and Opportunity (AMO) model (Appelbaum 2000; Paauwe 2009). According to this logic, HR system, designed to maximize employee performance, is viewed as a composition of three dimensions intended to enhance employee skills, motivation, and opportunity to contribute, respectively (Appelbaum 2000; Boxall and Purcell 2008; Delery and Shaw 2001; Katz et al. 1985; Lepak et al. 2006). Thus, employees perform better, if they can do the job because they possess the necessary knowledge and skills (Abilities, A), they do the job because they want to and are adequately motivated (Motivation, M) and their work environment provides the necessary support and avenues for expression (Opportunity to participate, O) (Brayfield and Crockett 1955). Focusing on the motivation component, it is worth noting that it is already known that the employee performance is modified using economic motivation (Banno and Sgobbi 2010). The use of monetary or other financial incentives in the classic performance paradigm is based primarily on the theoretical propositions of reinforcement theory (Durant et al. 2006), of expectancy theory (Pearce and Perry 1983) and performance-related pay theory. Reinforcement theory focuses on the relationship between the target behavior (e.g., performance) and a motivational tool (e.g., pay for performance) (Skinner 1969). It is premised on the principles and techniques of organizational behavior modification (Luthans 1973; Skinner 1969; Stajkovic and Luthans 1997). Expectancy theory is predicated on a belief that individuals exert effort if they expect it will result in an outcome that they value (Van Eerde and Thierry 1996). In the case of performance-related pay, employees work harder if they value monetary rewards and believe that those awards will result from their increased efforts (Lah and Perry 2008; Salzman 2000). PRP, contrary to a mechanism that pay a bonus based on seniority, represents a tool that is capable of boosting work motivation, increasing the performance of employees (Chang 2011). It is worth remembering that the performance-related pay is not invention of NPM, but is connected to principles of Weberian bureaucracy, see (Dahlström and Lapuente 2017) for further details. Finally, it is worth remarking that numerous studies in the literature argue that the effectiveness of monetary incentives is linked to the particular conditions of the organization and in particular that usually, individual economic incentives are not so effective in traditional public sector settings (Durant et al. 2006). The evidence offered by the literature in this context is very variegated (Perry et al. 2009); only in some contexts, for example medical and education, is its effect positive (Andersen 2007; Davidson et al. 1992; Dowling and Richardson 1997; Shaw et al. 2003). It is worth noting that this is true in corporate contexts as well (Mao and Weathers 2019).

The aspect that makes hard to interpret the relationship between incentive and performance is linked to the identification of the contribution of individual employees. If this is easier in private firms, where the results of operations are clear, it is more difficult in the public sector, where profit is not the primary goal. If it is not possible to locate certain criteria and uniform evaluation for employees, the evaluation schemes should be designed to capture the different levels of competence and predisposition of individuals to exert a greater effort in the workplace.

There are several ways to detect the performance of employees (Bradler et al. 2016; Lăzăroiu et al. 2015). The most common measure considers the subjective evaluations that take account of individual organizational behavior or the objective, directly considering the feedback of one or more superior or all of the colleagues who have contact with the individual employee. To overcome the limits of a subjective measure, an objective evaluation of the importance and relevance that a single employee has,

compared to their colleagues is possible by using the network analysis and in particular the connections among the employees. In fact, the intra-organizational relationships reflect the recognition given to a single employee from her/his colleagues for her/his skills and her/his opportunities to participate in working life (Bonacich 1987; Freeman 1977).

2.1. Network Centrality and Performance

Generally speaking, centrality indicates the influence of an individual within a network regarding other individuals within that network Brass and Burkhardt (1992). Thus, using the network analysis approach, the centrality in the advice network is considered to be proxy of individual performance Boissevain and Mitchell (2018). The exchange of task advice and information is likely to be positively related to job performance. Individuals share information, advice and assistance, in connection with their work. Centrality in the advice network means the involvement of each individual in the exchange of assistance with other colleagues and availability to put effort into problem solving. A central individual can accumulate knowledge about many problems over the years, and as others become dependent on a central individual for some important advices, she/he gains power and authority Baldwin et al. (1997); Cook et al. (1983). Although there are many definitions of centrality, the most common are the Degree, the Closeness, Betweenness and the Bonacich centrality Aalbers and Dolfsma (2015). The degree centrality is defined as counting the number of in- and out-/or outgoing ties from one's position within the network. This is an intuitive measure: more contacts means more actors one can draw on. Since contacts may not be reciprocal, it makes sense to distinguish in-degree from out-degree. This is the simplest way to measure the importance of a node in a network Lü et al. (2016).

Recently, some scholars argued that the location of a node is more significant than the number of its linked neighbors, and they suggested that coreness is a better indicator of a node's influence on spreading dynamics than degree. The coreness of a node is measured by k-core decomposition, and a larger coreness value indicates that the node is more centrally located in the network Kitsak et al. (2010). The closeness centrality, instead, assesses the "distance" of a person to all other persons in a network. Closeness centrality is an intuitive measure of how well (quick) one can actively spread information oneself or become aware of information, rumors and epidemics spread by others through the network (defined as the total number of steps of the actor to all the other reactors). The betweenness centrality assesses the extent to which one is positioned on the shortest path between any pair of any two of one's colleagues in the network. Betweenness centrality is an intuitive measure of how one plays a role as go-between, broker, or structural hole. In addition to Degree, Betweenness and Closeness Centrality, Bonacich centrality is an intuitive measure of the status that someone has since it takes into account the number of onward ties someone an agent is connected with has. One's centrality score is based on one's neighbors' centrality. A higher centrality of this variety indicates strong control over one's direct contacts, and the contacts of these contacts.

Centrality is also used in studying innovation in an organization (Ibarra and Andrews 1993).

2.2. Monetary Incentives Mechanisms in PA

So far, the monetary incentives in the public sector, were distributed equally among the business units, and then divided among the single employees according to a hierarchical logic, i.e., with a fraction proportional to the tenure, predetermined according to the role in the organization. An attempt to introduce a merit logic in the distribution of monetary incentives in the PA is represented by the Italian Legislative Decree no.150/2009. Italian Legislative Decree no.150/2009 states that public administrations, must promote merit and performance improvement using selective reward systems. Employees who achieve the best performance should be rewarded through the selective allocation of economic and career incentives. The introduction by decree of a closed-ranks tournament system could be an efficient way of labor compensation when measuring the performance of individual employees is more difficult than organizing them through ranking. However, little research has been developed

about the use of rank-order tournaments in the public sector. According to this theory, wage differences are based not on marginal productivity but instead upon relative differences between the individuals [Lazear and Rosen \(1981\)](#). Furthermore, this system could overcome the problem of budget constraint, since the ability of employees to increase their bonus (earning it at the expense of someone else) is not limited. Rank-order tournaments represent a system of nonlinear bonus given because each additional unit of performance does not necessarily translate into an additional unit of reward [Whitford \(2006\)](#). The intention of those who apply this incentivizing system is to produce positive results continuously, discouraging people from taking opportunistic attitudes. Managers who create the tournament rules seek to discourage risk-aversion, affirmation of which would lead instead to a crystallization of the system. This would cause a double negative effect: the less efficient employees will not be stimulated to improve, considering the required results out of reach, while the most deserving ones will consider a performance just enough to be rewarded, beating their colleagues of the lower classes. After the first year, the distribution of bonuses will form an incentive for the performance of the following year.

2.3. Research Hypothesis

Based on the above discussion, the two research hypotheses of this investigation claim that:

Hypothesis 1. *The monetary incentives, distributed according a merit approach which tends to recognize and reward individual contribution rewards the employee performance.*

Hypothesis 2. *The monetary incentives distributed according a merit approach which tends to recognize and reward individual contribution are a positive stimulus to improve the employee performance of the next period of evaluation.*

In the first hypothesis the mechanism of monetary incentives' distribution base on merit is studied, whereas in the second the effect of this mechanism is investigated.

3. The Data

The PA considered in this investigation is an Italian chamber of commerce. The chambers of commerce are public bodies focused on the needs of local businesses; their primary mission is to work as a key component of the local economy, in particular they perform functions of general interest for all kinds of companies and entrepreneurs and focus on the development of local economies. They are autonomous bodies, as each of them has its own statute, management and policies, and they are also financially independent. The reform of the chambers of commerce is found in Law no. 580 of December 29th, 1993, as amended by Legislative Decree no. 219 of November 25th, 2016. The main functions are summarized in [Table 1](#)

Table 1. Main functions of Italian chambers of commerce.

Functions	Description
Administrative services	keeping and updating the Business Register, the Register of Protests, the Register of Assessors and Experts, the Patent and Trademark Register
Promotional services	providing information and financial support to the local business community
Information for economic analysis	providing lists of businesses for market analysis, studies and analyses based on local economic data
Market regulation	increasing market transparency by promoting the spread of fair, well-known rules and correct trading practices, to build up mutual trust between consumers and entrepreneurs

The period of investigation is from year 2010 to year 2013. This period has been chosen because in Italy in 2009 the D.L.150/09 has been introduced and the mechanism of distribution of monetary incentives in PAs changes.

Two surveys were conducted in February 2011 and January 2013. The method of semi-structured interviews has been used. 131 employees in February 2011 and 126 in January 2013 belonging to a local PA were interviewed. The employees, organized in five Organizational Area and 16 units, participated in one-hour face-to-face interviews composed by 57 questions with answer that ranges between 1 to 7 according the Likert scale (Albaum 1997).

Table 2 summarizes the organization and activity of each area.

Table 2. Area and business units description. The data refers to year 2013.

Area Number	Area and Sectors	Employees	% Women	Average Age
1	Support services, staff e personnel	23	74%	47
	Presidency and studies	2	100%	58
	General Secretariat	2	100%	45
	Tourism and external relations	3	100%	52
	Administrative and documentation support services	6	67%	44
	Staff and organization	10	60%	47
2	Internal services	23	48%	49
	Statistical	2	100%	48
	Accounting and budget	7	57%	50
	Inspectorate	14	29%	51
3	Personal data services	37	68%	52
	Companies Register	24	67%	53
	Environment and special ratings	8	63%	52
	Chiavari	5	80%	49
4	Promotional activities	21	81%	49
	Productive Activities	5	80%	54
	Economic development	4	75%	47
	Logistics	4	50%	47
	Internationalization	8	100%	49
5	Area regulation of the market	17	53%	51
	Market regulation services	10	70%	49
	Metric and inspection services	4	0%	51
	Innovation	3	67%	55

The questionnaires were administered directly by the research team to the employees to minimize misunderstandings, highlighting their anonymity, the use of data for research and the agreement with the trade unions. The effective number of questionnaires collected in 2011 is 126 because four employees were absent and one was appointed as temporary secretary; in 2013, the number is 121. It is worth noting that the total number of employees decreases because of some retrieves and the financial crisis. The questionnaire was composed by the following main parts:

- personal data of the interviewees (age, gender),
- the occupied position (tenure, organizational area),
- the skills (problem solving, team working, determination, customer oriented, self-organizing),
- intra-organization relationships.

Table 3 summarized the questionnaire's structure.

The resulting database provides information on the personal data (the position occupied, the knowledge and skills and the background of the interviewee), on the organizational model (the relations inter and intra-organization) and the technology used.

Table 3. Questionnaire.

Questionnaire's Sections	Description	Questions about
A	Personal Data	Employees personal data such as age, qualification
B	Position held in the organization	The duties covered by the worker, in terms of characteristics, sector of belonging, type of professional classification
C	Organizational model	How processes are managed and organized, autonomy, supervision, clarity of information
D	Inter-and intra-organization relations	The relationships between internal and external subjects
E	Technologies	How the technologies are used and their impact on the performance of the job)
F	Knowledge and skills	Workers' knowledge and skills
G	Training	Training within the organization
H	Internal environment	Aspects concerning the organizational climate and the working environment. In particular, questions on satisfaction with respect the evaluation for relationships, culture and organizational commitment

Moreover, the human resources department provided all the data on optional treatments and the information on salary levels of employees for the years 2010, 2011 and 2012. In particular, this information concerned:

- the part of the bonus (expressed in euro) granted to employees of the organization uniformly.
- the quote of incentives (expressed in euro) which has been allocated based on the assessments of the department managers, according to the criteria of merit.
- the salary level, divided into 12 levels, 8 of which are reserved for employees with non-executive work position.

It is worth remembering that usually in PA the monetary incentives are distributed equally among all the employees with the same tenure and position held. The distribution of monetary incentives according to a merit approach has been used only recently. In particular, in 2011 the PA investigated decided to distribute the 47% of monetary incentives according the position held and the remaining 53% according the merit approach, whereas in 2013 the percentage are 33% and 67% respectively. It is worth noting that the percentage of the merit approach increases because the PA considered to implement a gradual change of the monetary distribution. The PA decided to implement this change because in 2011 the law L.D.150/09 has been introduced. Moreover, it is important to underline that the monetary incentives are distributed with the same rules in all areas of the organization.

For the sake of simplicity in the following the part of incentives distributed equally among the employees is called historical incentives (Inc_h), whereas the part distributed according to merit criteria is called experimental incentives (Inc_e).

4. The Linear Regression Model and the Variables

As already stated in Section 2, the performance is approximated as a function of the network centrality, modeled considering the relations among the employees, and in particular the informal network (Bonacich 1987; Freeman 1977). The informal network has been built ignoring the vertical relation among supervisor and employees, and has been created by a questionnaire asking with whom and how many times it is necessary to interact to perform the assigned task. In particular, employees were asked to declare up to 10 members of the organization they need to relate more directly and more

frequently with, to improve or facilitate the conduct of their activities. The Likert scale used ranged from 1 (contacts infrequent, some once a month) to 7 (several times a day). Through the collected information it was possible to build an adjacency, squared and not symmetrical matrix. Only the relationships between employees belonging to the same level have been considered, to detect only those which can be defined “horizontal”. Figure 1 shows the built network. Each node in the network represents an employee and the arrows represent the interactions between two employees. It is worth noting that to represent the frequency of the employee interaction each arrow as a weight.

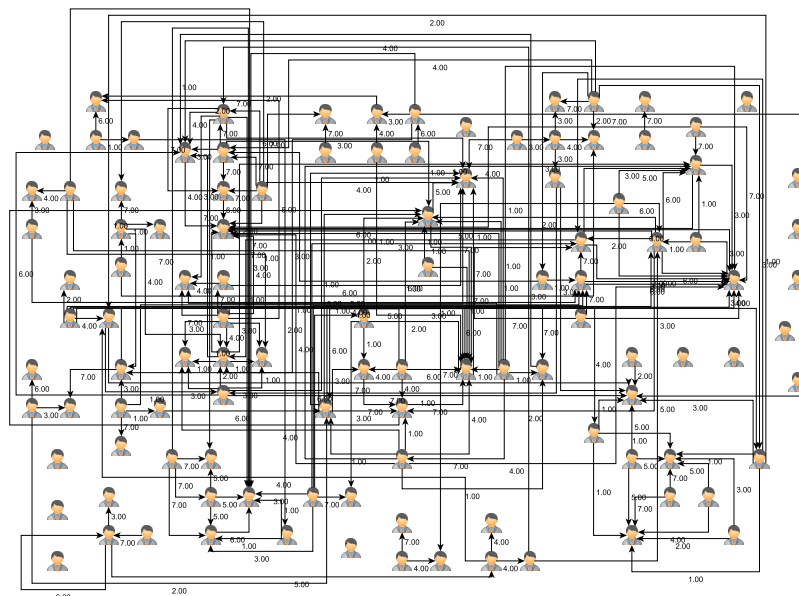


Figure 1. Network of employees.

Starting from the network built, the centrality index (CI) has been defined. As stated in Section 2 the simplest way to measure the importance of a node is to determine its degree, i.e., to count the number of its linked neighbors. The centrality index of employee i , CI_i , represents the relations between employee i and the other employees and, in particular, indicates how employee i is involved in the activities of the other employees. In formulas,

$$CI_i = \frac{TAC_i}{c_{max}} \tag{1}$$

where TAC_i is the task advice centrality of employee i and c_{max} is the maximum number of input connections. The task advice centrality for each node is the sum of all incoming branches (input node degree) multiplied by their weight and it represents the centrality of the individual in the social consulting network. In formulas the task advice centrality of employee i (TAC_i) is

$$TAC_i = \sum_j c_{j,i} g_{j,i} \tag{2}$$

where $c_{j,i}$ are the incoming branches of employee i and $g_{j,i}$ are the respective weights. The intra-organizational relationship reflects the recognition given to a single employee by his colleagues for both her/his skills and her/his opportunity to participate in working life. In particular, it indicates how a node is necessary to perform the employee activities. Thus, it is a proxy of the employee performance. It is worth noting that as stated in Section 2 the centrality in the advice network is a proxy of individual performance [Boissevain and Mitchell \(2018\)](#).

The “task advice centrality”, represents the relations between employee *i* and the other employees and, in particular, indicates how employee *i* is involved in the activities of the other employees. The task advice centrality for each employee represents the centrality of the individual in the social consulting network. The intra-organizational relationship reflects the recognition given to a single employee by her/his colleagues for both her/his skills and her/his opportunity to participate in working life. In particular, it indicates how an employee is necessary to perform the employee activities. Thus, it is a proxy of the employee performance.

Thus, the performance of employee *i*, is evaluated as:

$$P_i = CI_i \tag{3}$$

where CI_i is the centrality index.

The other main variables considered in the analysis are the level of salary, the tenure and the type of contract. In this paper, the variables Problem solving, Team working, Self-organizing, Technical knowledge, Customer oriented, considered in Cainarca et al. (2019), have not been included because they do not help in explaining the dependent variables. In fact, the results of the regressions do not change with the inclusion of these variables (see the Appendix of the paper). To verify that the considered variables are independent, the correlation matrix has been evaluated. Table 4 summarizes the values for data collected in February 2011.

Table 4. Pearson Correlations between the independent variables of the linear regression models described in Equations (4) and (5) for data collected in January 2011. * The correlation is significant at the 0.05 level (two-tailed).

Correlations				
	SalLev	Con	Ten	P
SalLev	1	−0.071	−0.022	0.076
Con	−0.071	1	−0.043	0.091
Ten	−0.022	−0.043	1	0.229 *
P	0.076	0.091	0.229 *	1

Table 4 shows that the correlations’ values are small and then the linear regression with these variables can be performed.

The linear regression for the two cases of historical and experimental incentives is:

$$Inc_{h,i} = \beta_0 + \beta_1 SalLev_i + \beta_2 Con_i + \beta_3 Ten_i + \beta_4 P_i + \beta_5 \chi_i + \epsilon_i \tag{4}$$

$$Inc_{e,i} = \beta_0 + \beta_1 SalLev_i + \beta_2 Con_i + \beta_3 Ten_i + \beta_4 P_i + \beta_5 \chi_i + \epsilon_i \tag{5}$$

In the regression analysis the incentives $Inc_{h,i}$ and $Inc_{e,i}$ are the dependent variable, whereas, the Level of salary, the Type of contract, the Tenure and the Performance are the independent variables. Table 5 summarizes all the variables used in the regression.

To verify the hypothesis H2 defined in Section 2, the independent variable is the performance P of year 2013 and the dependent variables are the level of salary, the type of contract, the tenure and the experimental and historical incentives of year 2011. Table 6 summarizes the variables used for this regression.

Table 5. Variables of the linear regression models described in Equations (4) and (5).

Variable	Description
Dependent variables	
<i>Inc_h</i>	historical monetary incentive received by each employee
<i>Inc_e</i>	experimental monetary incentive received by each employee
Independent variables	
SalLev	level of salary
Con	type of contract
Ten	tenure
P	performance
Control variables	
Age	Age
Gender	gender
FPT	female part-time
Area	area

Table 6. Variables of the linear regression model described in Equation (6).

Variable	Description
Dependent variables	
P	performance
Independent variables	
<i>Inc_h</i>	historical monetary incentive received by each employee year 2011
<i>Inc_e</i>	experimental monetary incentive received by each employee year 2011
SalLev	level of salary
Ten	tenure
Control variables	
Age	Age
Gender	gender
FPT	female part-time
Area	area

Table 7 shows the correlation between the independent variables of the linear regression model described in Equation (6) for data collected in January 2013.

Table 7. Pearson correlations between the independent variables of the linear regression model described in Equation (6) for data collected in January 2013. ** The correlation is significant at the 0.01 level (two-tailed). * The correlation is significant at the 0.05 level (two-tailed).

Correlations					
	SalLev	Con	en	Inch	Ince
SalLev	1	−0.071	−0.023	0.246 *	0.368 **
Con	−0.071	1	−0.047	0.789 **	0.334 **
Ten	−0.023	−0.047	1	−0.021	0.021
Inch	0.246 *	0.789 **	−0.021	1	0.605 **
Ince	0.368 **	0.334 **	0.021	0.605 **	1

As there are significant correlations between some independent variables, the multicollinearity analysis has been performed. Table 8 shows the Variance Inflation Factor (VIF) and its reciprocal, that is called Tolerance, of the independent variables of the linear regression model described in Equation (6).

VIF quantifies the extent of correlation between one predictor and the other predictors in a model James et al. (2013).

Table 8. Variance Inflation Factor (VIF) and Tolerance of the independent variables of the linear regression model described in Equation (6).

	Collinearity Statistics	
	VIF	Tolerance
Level of salary	1.934	0.517
Type of contract	3.730	0.268
Tenure	2.138	0.468
Historical incentive 2011	4.958	0.202
Experimental incentive 2011	1.892	0.528
Age	2.361	0.424
Gender	1.330	0.752
Area 1	1.708	0.586
Area 2	2.010	0.498
Area 3	2.143	0.467
Area 4	1.864	0.537

All the VIF values are such that the linear regression described in Equation (6) can be performed. See James et al. (2013) for details. The linear regression is:

$$P_i = \beta_0 + \beta_1SalLev_i + \beta_2Con_i + \beta_3Ten_i + \beta_4Inc_{h,i} + \beta_5Inc_{e,i} + \beta_5\chi_i + \epsilon_i \tag{6}$$

In the regression analysis the performance P_i is the dependent variable, whereas, the Level of salary, the Type of contract, the Tenure and the historical and experimental incentives are the independent variables.

5. Results of the Linear Regression Analysis

To investigate H1 the regressions described in Equations (4) and (5) have been performed and results are shown in Tables 9.

Table 9. Results of linear regressions described in Equations (4) and (5). ** Significant at the 5%. *** Significant at the 1%.

	Historical Incentive 2011			Experimental Incentive 2011		
	Beta	Err. Std.	Sign.	Beta	Err. Std.	Sign.
Constant		0.54.168			0.789.366	**
Level of salary	0.364	0.5.392	***	0.414	0.78.761	***
Type of contract	0.756	0.32.797	***	0.327	0.34.903	***
Tenure	0.044	2.805		0.041	0.9.750	
Performance 0.011	0.013	1.080		0.328	7.602	***
Age	-0.039	3.946		-0.111	0.7.777	
Gender	-0.099	0.7.352		0.057	0.62.962	
Area 1	-0.060	0.7.128		-0.210	0.02.186	**
Area 2	-0.183	0.8.150	**	-0.259	0.09.381	**
Area 3	-0.080	0.7.020		-0.146	0.31.025	
Area 4	-0.093	0.1.050		-0.085	0.29.800	
R ² adjusted	0.707			0.377		
ANOVA Test F	0.5.838	***		7.246	***	

In the case of linear regression described in Equation (4) (historical incentives), the value of R^2 adjusted (adjusted r-squared) is 0.707, confirming that the choice of the dependent variables are sufficient for the explanation of Inc_h . The ANOVA test is equal to 25.838 confirming that the model fits the data considered. Looking at the regressors' coefficients, the greatest weights are the type of contract and the salary level. In the case of the type contract, the value of beta is 0.756, that indicates that the historical incentive is directly proportional to the percentage of working time. In these terms, the greater the share of part-time contract, the lower the amount of incentives received is, regardless of any assessment of individual performance. For the historical incentives, the remuneration is strictly linked to the level of contract. In this case, the historical incentives are assigned according to parameters not linked to the individual performance, because instead of the performance the discriminant variables are the type of contract and the salary level. These variables are linked to the organization plan.

In the case of linear regression described in Equation (5) (experimental incentives) the value of R^2 adjusted (adjusted r-squared) is 0.377. It can be considered a good result because this work attempts to predict human behavior. The ANOVA test is equal to 7.246 confirming that the model fits the data considered. The tenure and type of contract variables are important also in this case whereas the tenure is not. These results confirm that part of the experimental incentives is distributed among the employees considering the position held. It is worth noting that the value of β of the performance in the experimental case is equal to 0.328 showing that the monetary incentives are linked to the performance. Thus, the regression demonstrates that employees that have a better performance are better rewarding with the monetary incentives. These results verify the hypothesis H1. Moreover, it is worth noting that the monetary incentives are a reward for the year in which they are distributed. In order to investigate if they become a stimulus for the next year, the regression defined in Equation (6) has been studied. The results are shown in Table 10.

Table 10. Results of linear regressions described in Equation (6). ** Significant at the 5%. *** Significant at the 1%.

	Performance 2013		
	Beta	Err. Std.	Sign.
Constant		16.394	
Level of salary	0.059	1.894	
Type of contract	0.091	14.152	
Tenure	0.116	0.172	
Historical incentive 2011	−0.379	0.007	**
Experimental incentive 2011	0.405	0.001	***
Age	−0.005	0.248	
Gender	0.053	2.387	
Area 1	0.099	3.692	
Area 2	−0.178	3.777	
Area 3	−0.430	2.973	***
Area 4	−0.265	3.746	**
R square adjusted	0.225		
ANOVA Test F	3.690		***

Looking at the regressors' coefficients, the greatest weights are the incentives. The value of beta of the experimental incentives is 0.405, that indicates that the experimental incentive is directly proportional to the employee performance, whereas the value of beta of the historical incentives is −0.379 showing that the historical incentive is inversely proportional to the employees performance. These results confirm that if the monetary incentives are distributed according to a merit criterion, they work as stimulus to improve the employee performance. Instead the historical incentives work in the opposite direction, in fact the employees know that the monetary incentives are distributed based on tenure and level of salary and not on the basis of parameters linked to individual performance.

The value of R^2 adjusted (adjusted r-squared) is 0.225 and the ANOVA test is equal to 3.690 confirming that the model fits the data considered.

Finally, comparing the results of the investigation published in [Cainarca et al. \(2019\)](#) with the ones obtained here, we also address the reverse causality issue because if the monetary incentives induce a virtuous employee behavior, it means that the monetary incentives are distributed according the employee performance, which means that the monetary incentives represent a bonus for the employee performance.

6. Discussion and Conclusions

This study is one of the first attempts, to study the distribution of monetary incentives in the public sector after the introduction of a merit-based incentive system that follows a “rank-order tournament” logic. The management has disclosed transparently what the objectives of the incentive system are, trying as much as possible to ensure fairness in the evaluation criteria.

The relation between the employee monetary incentives and employee performance has been investigated using a regression model. The employee performance has been approximated with the centrality index. The theoretical and empirical aspect employed for the design of the employee performance and of the mechanism of monetary incentives distribution have been presented and discussed.

The results have shown that the monetary incentives distributed with a merit logic depends on the employee performance and they are a stimulus for the next period of evaluation. It is worth noting that using an ordinal, and not cardinal system, to compare the performance of individual employees, they do not have to compete only with themselves, but their performance will be evaluated in relation to the ones of others and the result of the comparison will be known only at the end. This study observed the results of the interaction between monetary incentives and employee performance for two cycle of application. The use of the meritocratic system in the first period of evaluation increases employee responsiveness to incitation from managers, as suggested by Homans and other supporters of the theory of social exchange [Homans \(1974\)](#). The use of the meritocratic system in the second period of evaluation show that the bonus is a stimulus for the next period of evaluation. Furthermore, results have confirmed that the monetary incentives distributed with a merit logic influence positively the employee performance in the short term.

It is worth noting that the change in the PA can be possible only by laws, but it is important to investigate the effects of laws to give information to the politicians. The main limitation of the study is the dataset. In fact, in this paper only one local PA has been considered. Another limitation is the methodology used. Even if linear regression analysis is the most common method used ([Blalock 2017b](#); [Fox 1997](#)), other methods like nonlinear regressions and the data envelopment analysis can be used as robustness check. To overcome these limitations, in the next future, other local PA will be included in the analysis and other methodologies such as nonlinear regression, data envelopment analysis and machine learning techniques, if the number of observations will be sufficient, will be adopted. The final step will be to develop an agent-based model where the agents represent the employees to provide a tool very suitable to make classical what-if analysis. In particular, it will be a sort of computational laboratory where to perform experiments and find the more convenient policy to distribute the monetary incentives and to improve the employee performance. Finally, it is worth remembering that the agent-based model will be a useful tool not only for Public Administration but also for private companies.

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Appendix A

Tables A1 and A2 show that including the “life skills” variables defined in Cainarca et al. (2019), the results discussed in Section 5 and 6 are confirmed.

Table A1. Results of linear regressions described in Equations (4) and (5) considering all the interactive variables described in Cainarca et al. (2019). * Significant at the 10%. *** Significant at the 1%.

	Historical Incentive 2011			Experimental Incentive 2011		
	Beta	Err. Std.	Sign.	Beta	Err. Std.	Sign.
Constant		0.007	***		0.006	***
Level of salary	0.322	0.000	***	0.315	0.002	***
Type of contract	0.926	0.000	***	0.571	0.001	***
Tenure	−0.045	0.446		−0.109	0.357	
Performance 0.011	0.034	0.441		0.404	0.000	***
Age	−0.059	0.319		−0.019	0.875	
Problem solving	−0.092	0.073	*	−0.082	0.422	
Self-organizing	0.056	0.255		0.130	0.186	
Technical knowledge	0.014	0.758		0.039	0.669	
Customer oriented	0.066	0.211		0.023	0.828	
Women part-time	0.021	0.803		0.265	0.116	
Area 1	−0.041	0.422		−0.028	0.783	
Area 2	−0.37	0.492		−0.093	0.398	
Area 3	0.041	0.496		−0.081	0.499	
Area 4	−0.029	0.595		0.043	0.694	
R ² adjusted	0.841			0.354		
ANOVA Test F	0.9.125	0.000	***	4.943	0.000	***

Table A2. Results of linear regressions described in Equation (6) considering all the life skill variables described in Cainarca et al. (2019). ** Significant at the 5%. *** Significant at the 1%.

	Performance 2013		
	Beta	Err. Std.	Sign.
Constant		0.646	
Level of salary	0.163	0.185	
Type of contract	0.132	0.668	
Tenure	0.138	0.296	
Historical incentive 2011	−0.393	0.155	
Experimental incentive 2011	0.332	0.004	***
Age	−0.038	0.774	
Problem solving	−0.029	0.799	
Team working	0.246	0.019	***
Self-organizing	0.016	0.887	
Technical knowledge	−0.097	0.341	
Customer oriented	−0.146	0.194	
Women part-time	−0.020	0.915	
Area 1	0.026	0.817	
Area 2	−0.169	0.164	
Area 3	−0.382	0.005	***
Area 4	−0.281	0.020	**
R square adjusted	0.239		
ANOVA Test F	3.001	0.001	***

Moreover, it is possible to observe the Area 3 and 4 with respect to the gender. The interactive variables have been defined multiplying the original independent variables. Table A3 shows the results. It is worth noting that in area 3 are the women to have a negative relation to the performance whereas in area 4 are the men.

Table A3. Results of linear regressions described in Equation (6) considering some interactive variables.
 ** Significant at the 5%. *** Significant at the 1%.

	Performance 2013		
	Beta	Err. Std.	Sign.
Constant		15.816	
Level of salary	0.050	1.839	
Tenure	0.114	0.169	
Historical incentive 2011	−0.313	0.006	**
Experimental incentive 2011	0.423	0.001	***
Age	−0.019	0.245	
Area 1	0.110	3.620	
Area 2	−0.154	3.676	
Women part-time	0.007	3.432	
Women Area 3	−0.437	3.190	***
Men Area 3	−0.176	3.953	
Women Area 4	−0.161	4.630	
Men Area 4	−0.239	4.618	**
R square adjusted	0.232		
ANOVA Test F	3.569	0.001	***

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