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**Awards at work**

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# AWARDS AT WORK\*

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## Abstract

Awards—widespread in the corporate sector and elsewhere—are motivators that derive their value from non-pecuniary concerns such as status and self-image. Quasi-experimental panel data from the call center of a large international bank allow us to estimate the causal impact on effort when receiving an award. The performance of winners proves to be significantly higher than that of comparable nonrecipients after the award has been presented. This increase in work effort is sizeable and robust. We investigate the various theories that could explain the change in behavior. We find that image concerns most likely drive the effect.

**JEL classifications:** C23, J33, M52

**Keywords:** Awards, Motivation, Non-monetary Compensation, Insider Econometrics.

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“If an organization is going to function well,  
it should not rely solely on monetary compensation schemes.”  
Akerlof and Kranton (2005)

## 1 Introduction

Awards are increasingly popular in the corporate sector where managers consider innovative human resource practices, such as awards, to be essential for firm competitiveness (Ichniowski and Shaw 2003). In his book *1001 Ways to Reward Employees*, Nelson (2005) provides ample evidence of the number and variety of awards in companies. The prevalence and popularity of awards in the corporate sector suggest that awards fulfill important functions in principal-agent relationships.<sup>1</sup> However, what exactly are awards and in what respects do they differ from other kinds of incentives studied in the economic literature? In award schemes, an agent is given a symbolic reward for good performance in combination with positive performance feedback and social recognition from superiors and peers. While there is no universally accepted definition of an award, the essential elements of those kinds of awards that we are interested in consist of (1) the publicity of the winners, (2) a set of deliberately vague evaluation criteria, (3) the unenforceability of awards, and (4) their tournament character. Although awards contain features of other motivators, such as performance bonuses, pure feedback, gifts, praise, and tournament prizes, they can be clearly distinguished from these other motivators. To date there is no clear empirical evidence on the effect of awards on performance.<sup>2</sup>

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<sup>1</sup>There is a major discrepancy between the practitioner literature and the academic literature with respect to recognition programs like awards. On the one hand, the practitioner literature frequently advocates recognition programs to improve safety (Pardy 1999), reduce turnover (Davidson 1999; Wallsten 1998), increase job satisfaction (Davidson 1999), improve performance and productivity (Schneier 1989), and reduce absenteeism (Boyle 1995). Furthermore, numerous books and manuals have been written detailing how to structure recognition programs (Townsend and Gebhardt 1997; Glasscock and Gram 1999; Ventrice 2003; Podmoroff 2005). On the other hand, there is a paucity of academic research targeted at recognition programs. This disparity is probably driven by the lack of a clear definition about what constitutes a corporate award system from an academic point of view. When practitioners discuss recognition programs, they refer to a variety of interventions that represent incentive instruments designed to reward at a low cost. From an academic point of view, this represents an ambiguous concept with little theoretical basis, which is why academic research has focused on studying money, praise, and feedback in isolation. Despite these concerns, we consider the study of awards worthwhile given their prevalence in the corporate sector where they are used as instruments to induce effort in addition to monetary compensation schemes.

<sup>2</sup>Previously, when economists studied incentives in organizations, the focus was on incentives in the form of monetary payments in exchange for performance in specific, measurable dimensions. This is illustrated by the large literature on incentive pay to align the interests of principal and agent starting with the pioneering works by Alchian and Demsetz (1972) and Jensen and Meckling (1976). Potential problems with performance pay have been acknowledged and analyzed. One example is the discussion of multi-tasking problems (Holmstrom and Milgrom 1991). Starting with Lazear and Rosen (1981) the analysis of work incentives in the form of tournaments has been a popular field of study. Another popular thread of the literature that is important for studying awards is the literature on signaling (Spence 1973, 1974). Prendergast (1999) provides an overview of the economic literature on the provision of incentives in firms. This study complements the traditional economic analysis with respect to non-material incentives, ex-post effects of rewards, rewards for vague performances such as volunteering, and spill-over effects of rewards for good performance in one job dimension to performance in another.

This paper identifies the effect of receiving an award on subsequent employee performance in the call center of a large international bank. Our data set is unique in that the awards studied are exogenous to the performance that we look at. Specifically, the awards are directed towards valuable activities such as substituting for colleagues or making improvement suggestions, which are uncorrelated with recorded performance in core call center activities such as the number of calls answered. We test and corroborate the exogeneity of the awards and conclude that they are indeed handed out randomly with respect to core performance. Hence, this feature of the award system can be used as an exogenous source of variation and the set-up presents a quasi-experiment.

Our analysis yields four main findings. First, we find that award winners substantially increase their subsequent performance relative to both nonrecipients and their own previous performance.<sup>3</sup> This result is robust to alternative specifications that check the validity of the identifying assumption and a variety of robustness checks. Thereby, we show that awards are valuable motivators that can serve as additional incentive instruments in principal-agent relationships. Second, we document the motivating power of non-pecuniary rewards.<sup>4</sup> While economists have a good understanding why and how financial rewards affect performance, we are still at the beginning of understanding the motivating power of non-pecuniary rewards. As of now, there is very little evidence on such non-financial rewards and this paper addresses this research gap. Third, we report a positive spill-over effect from the rewarded on a job dimension that does not qualify for an award: The receipt of an award for social activities like volunteering or making improvement suggestions causes a statistically significant and sizeable increase in core call center performance. Fourth, the data allow us to test and distinguish between different hypotheses that could theoretically explain the performance increase. The analysis suggests that the effect is driven by those individuals who previously performed poorly. This implies that image concerns and the desire to live up to the honor rather than reciprocity or a change in employee identity are driving the effect. This is in line with the literature on self-image concerns (Bénabou and Tirole 2002, image motivation (Ariely et al. 2009) and peer effects (Mas and Moretti 2009; Bandiera et al. 2009).

Transitory, ex-post effects of material rewards have been documented in the gift-exchange

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<sup>3</sup>Malmendier and Tate (2008) also show how the receipt of a title, like “CEO of the Year,” affects subsequent performance. However, their paper is concerned with extra-organizational awards that are exogenous to the principal-agent relationship of interest. These kinds of awards differ in essential ways from intra-organizational awards. They are presented by a person or institution that is not the principal of the agent whose performance is affected, for a different set of reasons, and they come with a different set of benefits for the recipient. Therefore, their findings cannot be generalized to intra-organizational awards.

<sup>4</sup>Of course, there are some material benefits associated with the awards studied like the symbolic bonus associated with winning and the potential signaling value of the award. However, we provide evidence that the value of the bonus is too small to explain the entire increase in performance and that the signaling value of this particular award is negligible.

literature (see, e.g., Fehr and Gächter 2000 and Gneezy and List 2006). This study complements previous research in this field with its focus on non-material rewards. Our finding of the positive spill-over effect of an award for social activities on core performance adds to the literature on motivation crowding out and multi-tasking that mainly focuses on negative spill-overs. This study adds to the empirical principal-agent studies for which it has been lamented that they only focus on very simple tasks (Prendergast 1999) and analyzes performance in a complex work environment—a task that is characterized by many different job dimensions including quality. Additionally, the significant behavioral effect of these social incentives also fits well into the current discussion on the disparity between the impact of monetary incentives in the lab and in the field.<sup>5</sup>

While the form that the non-material reward takes might be specific to this setting, the essence of the results is of general interest. The fact that awards affect subsequent performance in a job dimension that does not qualify for it indicates that social incentives might, more generally, substitute for or complement monetary incentive schemes in solving agency problems. Awards may be of particular value in situations prone to multi-tasking or motivation crowding. This has important implications for how workers respond to the provision of non-material work incentives and sheds light on how compensation schemes can be enriched with non-material components like awards.

We are aware of only a few other papers that explicitly study awards.<sup>6</sup> Hansen and Weisbrod (1972) and Frey (2005) address awards as incentives in general. Markham et al. (2002) show in a quasi-experimental setting that the introduction of a public recognition program to reduce absenteeism decreases the latter by 52 percent. Moldovanu et al. (2007) study the optimal design of status categories in organizations, assuming that agents care about their relative positions. Gavrilă et al. (2005) describe the optimal solution for the management of awards over time, considering that their incentive effect depends on the number of awards that are presented. Besley and Ghatak (2008) analyze a principal-agent setting with status incentives, such as job titles or awards. The decisive feature of these rewards is that they have zero marginal costs, so it is incentive compatible for the principal to award them even if the payoff is not verifiable. Neckermann and Frey (2008) and Neckermann and Kosfeld (2009) show that awards act as incentives, significantly influencing performance before they are presented.

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<sup>5</sup>While lab studies find a large behavioral effect of wage increases, effort reacts relatively little in the field. Some authors (see, e.g., Dur 2008) argue that this divergence is caused by the fact that employers in the field typically use motivators other than wages, for example, recognition, to signal kind intentions. Therefore, employees do not reciprocate to wage increases in the field to the extent they do in the lab, where money is the only means of signaling kind intentions.

<sup>6</sup>Of course, there are related literatures in organizational psychology and management (Stajkovic and Luthans (2003) provide an overview of the organizational behavior literature). However, there is a general paucity of empirical evidence, specifically on measured rather than stated behavior.

Section II presents the data and the estimation technique. In Section III, the empirical findings are discussed and Section IV concludes.

## **2 Data**

The data set comprises information on awards as well as the employee performance of the 155 call center agents of a credit card service company of a large international bank and covers the period from January 2004 to October 2007. The call center is responsible for handling customer complaints and questions and consists of six workgroups, each with one manager.

### **2.1 The Performance Measure**

The company records daily performance for a number of different performance dimensions, starting in the second month of employment. On a monthly and yearly basis, these measures are transformed into rankings and aggregated into a single performance index. In particular, for each dimension, the percentage deviation between individual performance and the average monthly performance of all the call center agents is calculated and changed into a rating between 5 (very good) and 1 (unsatisfactory), according to a matrix set up by the department head. As an example, an agent that performs 120 percent of the average performance in a dimension receives a rating of 5 in that dimension, and an agent whose performance is 80 percent or lower receives a rating of 1. On a monthly basis, employees are informed about their rating and about how it compares to the average performance in the call center. The company uses the performance measure for decisions about layoffs and promotions.

The relative nature of the performance measurement is an advantage for our study because it ensures that all time-varying factors that affect the absolute performance of all call center agents are excluded.<sup>7</sup> Specifically, the measurement is not affected by an increase in the number or difficulty of calls or by improvements in the technical infrastructure. Both of these factors render absolute performance incomparable over time. In line with exerted effort, the relative rating further ensures that a certain number of calls answered translates into a higher rating in slow rather than in busy months. We use the same index as the company to ensure that our

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<sup>7</sup>Theoretically, relative performance measures may have the downside that a change in ratings may not always reflect corresponding changes in effort; hence, ratings may not be comparable across months. This is the case when a variation in the average absolute performance causes a given effort to translate into different ratings in different months. In our setting, however, absolute performance does not exhibit a systematic trend and typically changes only very little between two months in all dimensions. Moreover, the nature of the task renders it highly unlikely that employee fluctuation causes changes in ability distributions dramatic enough to have a sizeable impact on absolute performance. Therefore, any change in absolute performance that we observe likely reflects changes in working conditions that should be filtered out.

performance measure corresponds to the company's assessment. Because the company alters the exact calculation of its performance index from time to time by adding and removing different performance dimensions from it, a core performance measure was constructed in collaboration with the call center manager. Our performance index comprises the following six dimensions that have been part of the company's index in all of the periods covered:<sup>8</sup>

1. Calls Taken Per Hour: Average number of phone calls handled per hour.
2. Call Handling Time: Average length of phone call.
3. After Call Worktime: Average amount of time needed to process the request after the call has been ended.
4. Transfer Rate: The average ratio between calls handled by the employee and the number of phone calls that were transferred to colleagues or other service units.
5. Lates: Number of days on which the employee showed up late for work.
6. Quality: Quality of client handling is assessed both externally and internally.<sup>9</sup>

Of these dimensions, only the dimension *Lates* is not evaluated relatively, but according to an absolute scale (no absence corresponds to a rating of 4, one absence to a rating of 3, and more than one absence to a rating of 1). The resulting six ratings are then combined to a single overall rating, which provides an overall assessment of performance. It captures all the relevant trade-offs the company faces, ensuring that employees do not improve their rating, for instance, by answering more calls at the expense of a higher transfer rate. Therefore, the performance cannot be captured by analyzing the performance in individual performance dimensions. Rather, the index must be used. It is constructed according to the same weighting scheme used by the company.<sup>10</sup> Specifically, *Quality* enters with a weight of 50 percent and the five other dimensions

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<sup>8</sup>The company's changes in the index do not reflect systematic and sustained improvements of performance evaluation, which would have suggested that we should use the changing index too. Rather all dimensions that are not captured in our core rating were added and removed at various instances. Examples are the two dimensions *Training*, which measures an employee's performance in in-house training courses, and *Write off Policy*, which measures the degree to which employees follow company guidelines on goodwill issues. Both dimensions were in the company's index only in 2006.

<sup>9</sup>The external and the internal component of the rating each account for 50 percent of the quality rating. Internal quality is assessed by a manager by periodically monitoring the conversations of each agent. The assessment follows a clear set of rules and guidelines that leave virtually no room for subjectivity. Evaluation criteria are, for example, whether the agent correctly introduces herself and asks the right set of questions in the prescribed order. The external quality rating is generated by an outside company that conducts surveys with the company's customers.

<sup>10</sup>The addition and deletion of performance dimensions in the company's indices in different years were accompanied by changes in the weights of the individual dimensions. However, the relative weights of the six core performance dimensions remained basically identical throughout the entire time period covered.

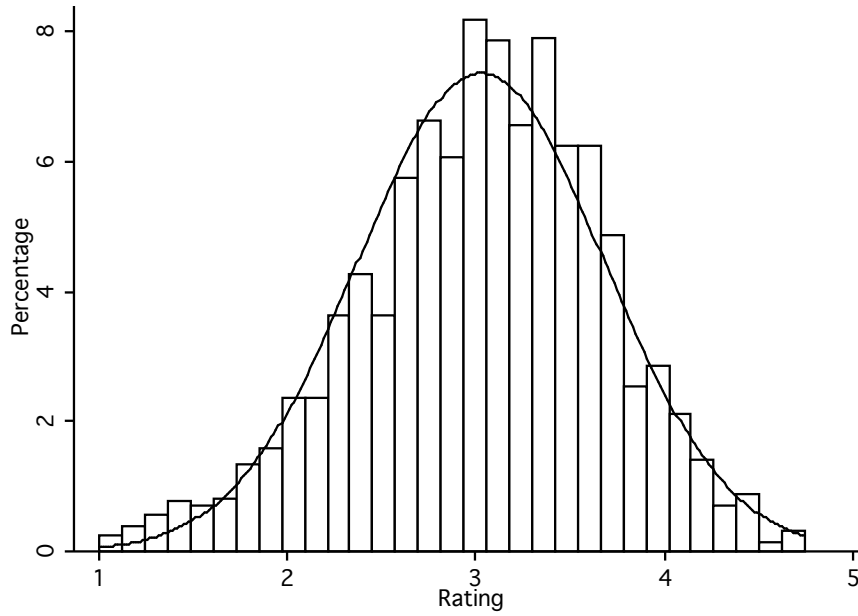


Figure 1: Distribution of Performance Ratings Against a Normal Distribution

with 10 percent each. The weighting scheme suggests that the company places equal emphasis on technical measures, such as the number and durations of calls, and content measures, which capture the actual interaction between employee and customer. The management confirmed that our core index captured overall performance well and that no important performance dimension was neglected. Figure 1 exhibits the distribution of performance ratings.

The performance ratings are approximately normally distributed with an average of 3.02 and a standard deviation of 0.66 and do not exhibit a time trend. The mean and variation corroborate the objective, quantitative nature of our performance data, as subjectively determined evaluation data typically cluster around high values (on the leniency bias see, e.g., Murphy and Cleveland 1995; Yariv 2006) and may cause endogeneity problems because managers might assess award-receiving individuals more favorably. The resulting index represents a weighted average of quantitative performance measures. Thus, we can treat the rating as cardinal because it takes on many different values and does not have the quality of an ordinal grading scheme.

## 2.2 The Awards

The company has a variety of awards. These are called the *Thank You Reward*, the *Gold Reward*, the *Platinum Reward*, the *President Reward*, *Employee of the Month*, and *Employee of the Year*. The requirements for qualifying for these awards increase from *Thank You Reward* to *Employee of the Year*. While a *Thank You Reward*, an email notification of the recipient and a letter sent to the employee's home address, allows a spontaneous exchange of thanks among colleagues,



the *President Reward* remunerates activities that have benefited the company as a whole; these require approval by the CEO and come with a personal congratulation by the department head. The winners of *Employee of the Month* and *Employee of the Year* are selected by a reward committee and the CEO from among the winners of the *Platinum* and *President Rewards*. For all awards, there is a close connection between effort and likelihood of nomination, so that individuals can actively pursue winning an award. The award program of the company has been in place since 2001. Therefore, we cannot estimate how the presence of the award system per se changes performance because there is no control group without awards. Rather, this ex-ante incentive effect of awards is part of the baseline motivation of each employee and constant throughout the period of our study.<sup>11</sup>

While our data set contains information on the winners of all awards other than the *Thank you Reward*, only the *Gold Reward* lends itself to a statistical examination because there are too few observations of call center agents winning the other, more prestigious awards. The *Gold Reward* remunerates exceptional efforts that benefit the entire work group. Examples of behaviors that qualify for a *Gold Reward* are volunteering as a substitute during vacation times, initiating and implementing team events, making improvement suggestions, and helping others with good advice. The company encourages employees to engage in these activities because they are important for its efficient functioning. Nominations can be made by colleagues as well as supervisors.<sup>12</sup> An award is presented by the call center manager in front of the worker's colleagues in the middle of the following month. Award winners, as well as their colleagues, only learn about the award at that ceremony. There is no additional announcement of the award winners; however, the management tries to present the award when many colleagues are on hand. The award is accompanied by a certificate for the wall, which serves as a reminder and ensures that agents not present when the award is bestowed learn about it. Further, it comes with a symbolic bonus of around \$ 150, which equals about 3 percent of monthly income. Importantly, awards are not presented for the performance used as the dependent variable in our analysis. In fact, core performance is uncorrelated with the activities that lead to an award. Awards are therefore exogenous, and their causal effect on core performance can be identified by comparing the performance of winners and nonrecipients subsequent to winning. If awards depended on performance, they would always be—at least, in part—a reflection of good performance, and

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<sup>11</sup>This incentive effect potentially changes with winning an award. One might argue that the motivation to win decreases once an award has been won. However, such a potential change in baseline motivation renders the detection of a positive change in performance caused by the receipt of an award more difficult.

<sup>12</sup>About half of the nominations come from group supervisors and the other half from colleagues. The reasons provided for the nominations do not differ systematically between those by supervisors and colleagues. The Human Resources Department communicates the criteria for nominations well, so almost all nominations result in an award. Interviews with group managers and employees further suggest that employees deserving an award are not ignored, especially as so many individuals can nominate.

a careful creation of control groups would be necessary to identify the causal effect.

The data set covers 46 months from January 2004 to October 2007. Each month, the employees had the opportunity to win *Gold Rewards* (*Gold Reward January 2004* to *Gold Reward October 2007*). Overall, 158 *Gold Rewards* were presented to the 155 call center agents. As expected, the distribution is skewed to the right. Two agents received a total of eight *Gold Rewards*, whereas 76 got none.<sup>13</sup> These numbers suggest that the award is sufficiently scarce for it to be valuable to its recipients, and the sample is well balanced between winners and nonrecipients because about half of the agents never received an award. On average, 3.4 awards are presented per month with a minimum of zero and a maximum of 11.

## 2.3 Further Data Information

The call center agents are paid a fixed monthly wage of CHF 4,500 (about \$4,500). The exact sum the individual receives depends on her level of experience, knowledge of languages, and length of employment at the call center. The *Gold Reward* complements the company's salary scheme because it incentivizes activities such as substituting for colleagues or organizing team events that are not remunerated as part of the fixed wage. The management asserted that receiving a *Gold Reward* had no effect on future promotion decisions and award winners did not receive special attention, training, or other advantages, for which we cannot control. Hence, although in-house training may increase productivity, it is not correlated with winning awards and therefore does not cause systematic biases of the awards' impact on performance.

# 3 Awards and Performance

## 3.1 Empirical Specification

*Gold Rewards* are directed towards behaviors such as supporting colleagues and organizing team events that are not captured in the core performance rating. Hence, we make the identifying assumption that the probability of winning an award is decoupled from an agent's core performance and that the development of the performance of nonrecipients presents a valid counterfactual for that of winners had they not won the award. The validity of this identifying assumption will be tested as part of the analysis below. We estimate period-specific effects both before and after a *Gold Reward* is won. The relative nature of our performance measure implies that the performance rating is equal to three on average. Hence, we identify the effect via the change in performance of the award-winning employees. We will show that the performance

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<sup>13</sup>Figure A.1 in the Appendix shows the entire frequency distribution of the number of *Gold Rewards* per employee.

of winners does not deviate significantly from the average prior to winning the award, but is significantly higher in the month subsequent to winning given individual specific fixed effects. Our effect is identified via the changes in the ratings of winners.

The following table presents an overview of the three dimensions used to identify and quantify the effect of a Gold Reward on employee performance:

Table 1: Dimensions of Identification Strategy

Dimension	Value	Use
Time relative to event	Before bestowal of <i>Gold Reward</i> vs. after bestowal of <i>Gold Reward</i>	Allows testing whether the performance of winners deviates from the average performance prior to winning.
Type of performance	Core Performance vs. behaviors that qualify for a <i>Gold Reward</i> <sup>a</sup>	Ensures exogeneity of event ( <i>Gold Reward</i> ) on our performance measure.
Treatment	Winner of <i>Gold Reward</i> vs. nonrecipient	Identification of the size of the effect of a <i>Gold Reward</i> on core performance.

<sup>a</sup> The *Gold Reward* recognizes exceptional efforts that are unrelated to core call center duties. Examples of behaviors that qualify for a *Gold Reward* are volunteering as a substitute during vacation times or implementing team events.

Under the identification strategy presented above, the causal effect of receiving an award on employee performance is estimated by fitting the following equation to the data:

$$Y_{it} = \alpha + \sum_{\tau=\underline{T}}^{\bar{T}} \pi_{\tau} W_{i\tau} + \mu_i + \beta X_{it} + \xi_{it}. \quad (1)$$

The dependent variable  $Y_{it}$  represents the performance rating of employee  $i$  in period  $t$ . Because  $Y_{it}$  is constructed as the weighted average of the ratings in the individual performance dimensions discussed above, it takes on many different values and can be treated as continuous. The index  $\tau$  denotes the time period relative to  $t$  and is measured in months.  $\tau$  runs from  $-6$  to  $+6$  and is normalized so that  $\tau = 0$  refers to the current month  $t$ ;  $\tau < 0$  refers to months prior to  $t$ ;  $\tau > 0$  refers to months after  $t$ . The range of  $\tau$  determines the size of the event window. The indicator variable  $\mu_i$  controls nonparametrically for employee fixed effects, such as level of education and gender.<sup>14</sup> Because the resulting panel is unbalanced, we use dummy variables rather than fixed effects as controls for individual-specific effects.  $X_{it}$  is a vector of time-varying

<sup>14</sup>In principle, one could also control for time- and award-specific effects. However, the relative nature of our performance measure already eliminates period-specific, exogenous shocks to performance. In addition, the *Gold Rewards* in the individual months that we cover are identical, so there is no reason to expect independent award-specific effects.

observable characteristics of the individual. In our case this is the length of employment in the call center and its squared term.  $\alpha$  represents a constant, and  $\xi_{it}$  is a stochastic error term. To calculate standard errors, we cluster on the workgroup level per year.<sup>15</sup> Alternative ways of adjusting standard errors are discussed below.

The key variables in this regression are the  $W_{i\tau}$  indicator variables.  $W_{i\tau}$  equals 1 for a person  $i$  who receives a *Gold Reward*  $\tau$  from  $t$ , and zero otherwise. As the *Gold Reward* is open to all employees in all periods,  $W_{i\tau}$  captures all the relevant information because each employee is either a winner or a nonrecipient in each month. The vector  $\pi_\tau$  are the parameters of interest in this equation and capture the period-specific effects on performance of winning a *Gold Reward*  $\tau$  months from the current time period  $t$  as compared to not winning an award, conditional on all covariates. By including an indicator variable for each period, the effect of being a winner is allowed to vary with  $\tau$ . For example, a coefficient  $\pi_{+2} = 0.5$  means that the performance of employees who won a *Gold Reward* two periods ago is 0.5 points higher than the one of nonrecipients. The time series of the coefficients  $\pi_\tau$  around the event ( $\tau = 0$ ) allows us to detect the causal effect of an award on performance. If the coefficients were significantly positive before the award was presented, there would be concerns about reverse causality. In case the performance of winners and nonrecipients is indistinguishable prior to an award for a large number of periods, we can be confident that our identifying assumption holds.

As all individuals are winners or nonrecipients with respect to multiple awards, every performance observation simultaneously helps to identify all 13 different  $\pi_\tau$  from  $\pi_{+6}$ , the performance of winners relative to nonrecipients six months prior to an award, to  $\pi_{-6}$ , the performance of winners relative to nonrecipients six months after an award.

## 3.2 Hypotheses

The effect of awards on subsequent performance is a priori theoretically ambiguous. On the one hand, core performance might be unaffected because the awards recognize activities that have nothing to do with it. For the same reason, increasing core performance does not increase the likelihood of winning the award again. Hence, the awards provide no direct incentives to increase core performance. Additionally, because awards are predominantly nonmonetary rewards there are no relevant income effects. On the other hand, performance might decrease,

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<sup>15</sup>We do not have obvious problems with grouped errors as the unit of observation corresponds with the unit of variation, i.e., the award. However, clustering on workgroups accounts for possible correlations of ratings within teams. As team composition varies between years due to employee fluctuation, workgroup-per-year clusters are used. This also increases the number of clusters, which improves inference due to the asymptotic properties of the clustering procedure (Kiefer 1980; White 1980).

for example, because award winners rest on their laurels.<sup>16</sup> Alternatively, performance might increase sustainably when the award intensifies identity in the form of workers’ self-images as job holders of the award-winning employees with the company (Akerlof and Kranton 2005). Performance also might increase for a short period subsequent to winning when award winners reciprocate the recognition (Dufwenberg and Kirchsteiger 2004 and Falk and Fischbacher 2006).<sup>17</sup> The following analysis will provide insights into which of these theories prevails here.

### 3.3 Descriptive Statistics

The data set comprises a total of 1202 individual-month observations.<sup>18</sup> In total we observe 147 individuals, 63 percent of the agents in the sample are female, and the agents remain in the sample for 12.84 months on average. On average about half of all the men and women in the sample receive a *Gold Reward*. Further descriptive statistics are presented in table A.1 in the appendix. In the regressions that ensure clean award windows, there are 39 persons with one award and two persons have with two awards.

### 3.4 The Performance of Winners and Nonrecipients

Figure 2 shows the the raw data, ie. the average, quarterly performance of winners and nonrecipients around the award.<sup>19</sup> The performance of winners has a higher standard error and moves around more because there are fewer observations for the winners as compared to nonrecipients. Naturally, the average, mean-corrected performance rating of the large number of nonrecipients centers around zero. The illustration suggests that the performance of winners and nonrecipients is indistinguishable prior to an award and that the performance of winners increases relative to nonrecipients in the period following the award.

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<sup>16</sup>Malmendier and Tate (2008) show that CEOs who win titles, like “CEO of the Year,” subsequently underperform both relative to their prior performance and relative to a matched sample of non-winning CEOs.

<sup>17</sup>The large literature on gift exchange has documented transitory increases in effort after the reward, typically in the form of money, was transferred to the recipient (Fehr and Gächter 2000 and Gneezy and List 2006 provide surveys on lab and field experimental evidence).

Theories on other social motivators like feedback (Suvorov and van de Ven 2006) or manager-employee relations (Dur 2008) also suggest a positive ex-post effect. However, these mechanisms should not be important in our setting. Theories that posit a positive cross-derivative between status and effort (e.g., Auriol and Renault 2008) would also predict an increase in performance after the receipt of an award. The sustainability of this increase would then depend on whether and for how long the award increases the relative standing of the recipient.

<sup>18</sup>The initial data set comprised some additional id-month observations that were lost because one or more performance dimensions were not recorded in a particular month due to vacation, sick leave, or failure of the manager to assess the dimension *Quality*. Further, some observations were dropped to ensure clean event windows. This means that those id-month observations are included where at most one of the winner dummies,  $W_{it}$ , equals one to eliminate confounding effects of other awards received in the event window.

<sup>19</sup>The performance is corrected for individual fixed effects to ensure the comparability with the results of the regressions presented below.

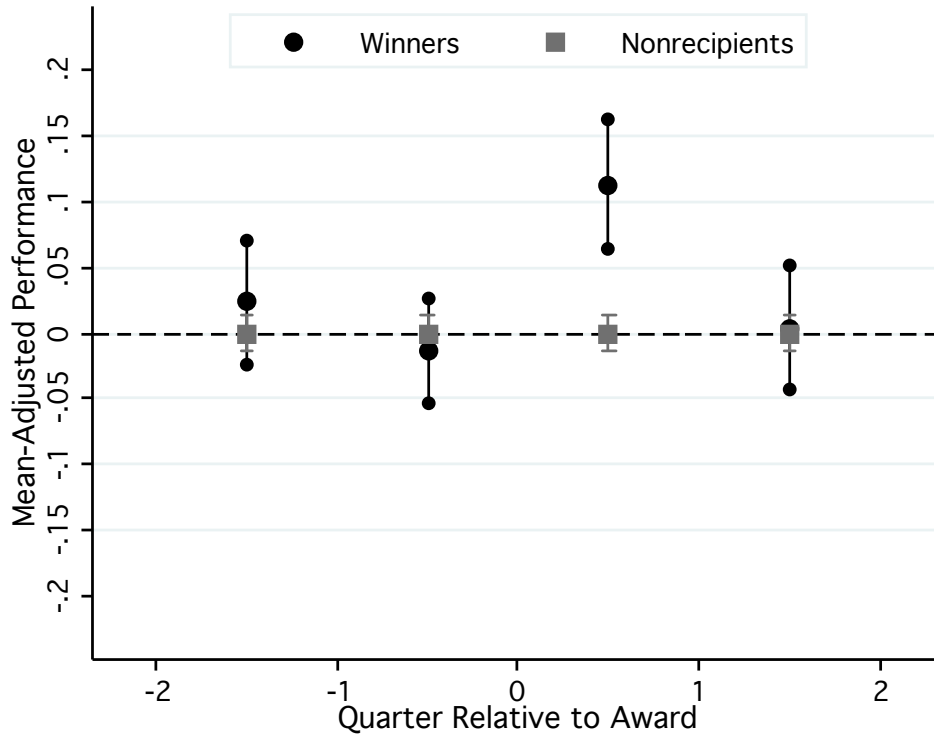


Figure 2: Quarterly Performance of Winners and Nonrecipients Prior to and After an Award (With Standard Error Bars)

This first impression is confirmed in a regression analysis that controls for individual fixed effects and length of employment and accounts for potential serial correlation. Table 2 presents the results when estimating equation (1) for two different subsets of employees. The first model includes all id-months observations with clean event windows. This means that those id-month observations are included where at most one of the winner dummies,  $W_{it}$ , equals one to eliminate confounding effects of other awards received in the event window. Model 2 only includes the id-month observations of those employees that receive at least one *Gold Reward* during their time of employment at the company. As the entire sample is now comprised only of individuals that have received *Gold Rewards* at different points in time, *Gold Reward* winners and the nonrecipients that form our control group are homogeneous in their underlying unobservable characteristics by definition. Model 3 uses the same sample as model 2 and tests the sensitivity of our results with respect to the weighting of the different performance dimensions in constructing the index. The dependent variable in this model is an index in which all performance dimensions were weighted equally.

According to model 1, the performance of winners is 0.24 or 7.4 percent higher than that of nonrecipients one month after the award. This is equivalent to an increase of performance by

Table 2: Impact of an Award on Performance (Six Months Before and After the Event)

	Model 1	Model 2	Model 3
$\pi_{-6}$	-0.055 (-0.54)	-0.069 (-0.67)	0.035 (0.42)
$\pi_{-5}$	0.123 (1.37)	0.117 (1.31)	0.152 (1.70)
$\pi_{-4}$	0.100 (1.40)	0.098 (1.47)	0.135 (1.64)
$\pi_{-3}$	0.076 (0.76)	0.080 (0.84)	0.083 (0.84)
$\pi_{-2}$	-0.013 (-0.13)	-0.008 (-0.09)	-0.035 (-0.50)
$\pi_{-1}$	-0.028 (-0.39)	-0.020 (-0.29)	-0.083 (-0.98)
$\pi_0$	-0.034 (-0.51)	-0.022 (-0.33)	-0.067 (-0.85)
$\pi_{+1}$	0.234** (2.73)	0.246** (2.96)	0.198** (2.18)
$\pi_{+2}$	0.015 (0.12)	0.035 (0.29)	-0.051 (-0.43)
$\pi_{+3}$	0.172 (1.03)	0.192 (1.19)	0.117 (0.80)
$\pi_{+4}$	-0.006 (-0.05)	0.017 (0.17)	0.000 (0.00)
$\pi_{+5}$	-0.050 (-0.85)	-0.022 (-0.40)	-0.022 (-0.39)
$\pi_{+6}$	0.005 (0.05)	0.033 (0.28)	-0.035 (-0.32)
<i>Tenure</i>	0.013 (1.76)	0.009 (0.95)	0.009 (0.84)
<i>Tenure</i> <sup>2</sup>	-0.000 (-0.98)	-0.000 (-0.81)	-0.000 (-0.69)
<i>Constant</i>	3.209*** (37.29)	3.228*** (34.91)	3.572*** (42.00)
Observations	1202	667	667
<i>R</i> <sup>2</sup>	0.576	0.563	0.648

*t* statistics in parentheses\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ 

0.36 standard deviations. This increase is substantial, especially when taking into account the large number of *Gold Reward* winners at the call center and that we use performance in a job dimension that is not incentivized with the award as the dependent variable. Two months after the award, the difference in performance becomes insignificant. The fixed effects of winners are,

on average, higher than that of agents who never receive an award.<sup>20</sup> Consistent with our homogeneity assumption, we find that, in each of the six months prior to an award, recipients and nonrecipients have very similar performance ratings when the different level effects are taken into account. Indeed, their mean-adjusted performance ratings are statistically indistinguishable for this relatively large number of periods. The long time series of insignificant coefficients prior to winning an award supports our identifying assumption that awards are exogenous to the performance in core call center duties.<sup>21</sup> As an additional robustness check, we regressed the likelihood of receiving an award on lagged performance levels and do not find a statistically significant relationship.

The results for model 2 closely resemble those of model 1. Hence, our result is robust with respect to the inclusion and exclusion of particular kinds of employees and the choice of the specific control group. The control variable *job tenure* does not have a robust statistically significant effect on performance.

One may be concerned that the particular construction of the index drives our result. We use the index rather than performance in the individual performance dimensions for two reasons: First, the use of individual performance dimensions is problematic, as one cannot interpret and increase or decrease in any individual performance as an improvement or a deterioration of performance because there are important trade-offs. For example, an agent can increase the *number of calls taken per hour* by increasing her transfer rate or being less diligent in the documentation of the process reflected in *after call worktime*. Second, the index that we use represents the performance measure used by the company. Hence, our performance measure reflects what the company considers to be an appropriate assessment of performance. To check the robustness of our result, we constructed a different index that weights all performance dimensions equally. The results are reported in model 3, which confirms that our results are not driven by the large

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<sup>20</sup>One could argue that differences in ability drive the positive correlation between award-relevant and core performances. Then, efforts in these two performance dimensions may be substitutes and the increase in performance after the award does not present a true additional performance increase but merely a reshift in effort allocation. To test this, we regress the likelihood of receiving an award (our proxy for effort in the award-relevant activities) on lagged performance for different levels of the individual fixed effect (our proxy for ability), separately. In case the argument were true, one should find a negative correlation between core performance and the likelihood of receiving an award for any given ability level. However, this is not the case. Past performance is not significantly related to the likelihood of receiving an award in any regression. Hence, awards are not conditional on core performance. One could further argue that awards are given to the productive types not because they actually engage in voluntary work behaviors, but because they collude with supervisors to gain additional compensation for their high performance. However, we can show that within the first five months at the company, employees who receive an award exhibit a higher core performance than those who never receive an award (Mann-Whitney test p-value: .07, one-sided). As employees at the beginning of their careers lack the necessary familiarity with their supervisors and the unwritten rules of the company, they actually earn their awards with voluntary work behaviors rather than politicking.

<sup>21</sup>There is also no indication for an Ashenfelter Dip here because the award is independent of the performance in core call center tasks (Ashenfelter, 1978).



weight of 50 percent of *Quality* in the index. The pattern of performance, both in terms of the size of coefficients as well as significance levels is similar to that in the other models presented. A closer look at performance in the individual performance dimensions shows that the overall result (i.e., the sizes of the coefficients and their significance levels) is reflected in the *Quality* dimension and, to a lesser extent, in the dimension *After Call Worktime* (see table B.1 in the appendix). Performance also increases in all other dimensions, but the effect size and the specific lags that exhibit significant coefficients differ between dimensions and are not strong enough to have a significant effect on the overall rating. However, these findings should be interpreted with care because only the aggregate rating is a useful measure of performance due to the trade-offs between the different dimensions.

RESULT 1. Awards significantly increase the performance of recipients subsequent to winning.

### 3.5 Development of Performance Over Time

In this section, we look at whether performance increase of winners relative to nonrecipients is driven by an increased performance of the winners or by a performance drop of the nonrecipients. Comparing the performance of winners between the month of the award and the subsequent month (i.e., periods  $\tau = 0$  and  $\tau = +1$ ), the t-test suggests that performance is significantly higher in the month after the award than in the month of the award. In contrast, the performance in the month prior to the award is not statistically different from that in the month of the award. The average increase in performance between the month prior to the award and the month after the award is 0.14 ( $\alpha = 0.05$ , p-value: .04, two-sided). There is no statistically significant difference in performance between any of these three months for nonrecipients (i.e., between the periods  $\tau = -1$ ,  $\tau = 0$ , and  $\tau = +1$ ). Given that each individual's performance rating is determined relatively by comparing her performance with the average, it is no surprise that the average, mean-corrected performance rating of the large number of nonrecipients centers around zero. This was even true when the absolute performance of these agents changed. Hence, the increase in the performance of the winners may be caused by a worse performance of the nonrecipients. Because there is large number of nonrecipients each month, this would be reflected in a deterioration of absolute performance. However, this is not the case. Absolute performance over the four years stays relatively stable. In particular, we do not detect a general time trend in absolute performance nor in any individual performance dimension (Table A.2 in the appendix provides an overview). Therefore the significant increase in the ratings of the winners represents higher winner effort.

RESULT 2. Receiving an award improves the performance of winners, whereas the performance of nonrecipients remains unaffected.

### 3.6 Why Do Winners Work Harder?

The observed increase in performance subsequent to winning an award could be attributed to induced feelings of organizational commitment. Akerlof and Kranton (2005), for instance, state that employees who identify with their company perform better and that employers can actively influence whether employees identify with the company. Specifically, initiation rites, such as award ceremonies, can be used to change self-perception.<sup>22</sup> Our evidence, however, suggests that a *Gold Reward* does not cause a sustainable change in preferences (i.e., employee identity) because the effect is limited to the month subsequent to winning. Psychological evidence also suggests that a positive event, which induces a good mood, increases subsequent voluntary behavior when this is in line with the positive cognitions evoked by the event (Isen and Simmonds 1978). While this mechanism could explain an increase in the behavior that lead to the award, it cannot explain an increase in core call center performance.

The Hawthorne effect (Mayo 1933; Roethlisberger and Dickson 1939; Levitt and List 2009 provide a recent critical assessment), on the other hand, cannot explain the documented impact of the award. It argues that any intervention, irrespective of its content, can increase performance due to the additional attention of the managers devoted to the workers as part of the intervention. In our study, however, both the treatment and the control group are subject to the award system, which has been in place for a number of years. Further, the data that we use were collected as part of normal business procedures prior to us contacting the organization. Hence, nothing out of the ordinary happened in the period that we cover. General effects related to the potential motivating power of managerial and peer attention are discussed below.

At the same time, receiving an award can also induce reciprocal actions (e.g., Fehr and Gächter 2000; Kube et al. 2008). The transitory effect that we find is in line with the evidence on gift exchange literature (e.g., Gneezy and List 2006). According to reciprocity theories typically used to explain these effects (e.g., Dufwenberg and Kirchsteiger 2004; Falk and Fischbacher 2006), winners increase their efforts to reciprocate to the monetary bonus or the value of the gift associated with winning the *Gold Reward*. However, it is highly unlikely that the entire effect we document is driven by reciprocity to the monetary value of the bonus or gift. First, the amount is small—only 3 percent of the average monthly salary of around CHF 4,500. Second, field studies have shown that the wage elasticity of workers' outputs ranges from roughly 0.15 to 0.44 (Fehr et al. 2008). Thus, the observed increase of 7.5 percent would require a wage increase between 15 to 50 percent. This corresponds to a bonus of between CHF 750 and 2,500,

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<sup>22</sup>According to Akerlof and Kranton (2005), cognitive dissonance (Festinger 1954) is the underlying psychological mechanism that drives this development of loyalty. Applying cognitive dissonance theory to awards implies that individuals, who have publicly accepted an award and thereby the rules and values of the organization, improve their views and valuation of the organization.

which is much higher than the actual amount of CHF 150. Any effect related to the agents reciprocating to the social recognition value of the award is in line with our argumentation that purely social rewards influence performance.

Another explanation for the observed increase in performance may be the increased exposure of the award winner in the month of his or her award. Recipients may feel a need to live up to the honor of having received an award for their voluntary work behaviors, and this may affect their core performances. This effect should be stronger for award winners whose core performance was below average prior to the award. The data allow us to test this hypothesis by separating the winners into two groups: those individuals who performed below average in  $\tau = 0$  and those who performed above average. Looking at how much performance increases between the month of the award and one month later, we find that, on average, the rating of low performers increases by 0.58 (+23 percent), whereas the performance of high performers decreases by 0.17 (−5 percent). The one-sample t-test indicates that both coefficients are highly significantly different from zero. This differential impact of winning an award supports the notion that the increase in performance is caused by winners wanting to live up to the award with respect to core performance (see Ariely et al. 2009; Bénabou and Tirole 2002 on self-image concerns and image motivation). At the same time, the differentiated effect renders it highly unlikely that reciprocity or organizational commitment causes the increase because this should apply to under- and over-performing winners in the same manner. However, the differentiated effect could also be caused by mean reversion. Individuals who achieve a very good performance rating likely were lucky that month. Their next draws are unlikely to meet or exceed prior realizations, causing their individual performance to revert to the population mean. Therefore, we use a longer time horizon to classify individuals as high- or low-performing. Specifically, we look at  $\tau = +2$ ,  $\tau = +1$ , and  $\tau = 0$ . Individuals that perform worse than average in two or three of those periods are classified as low performers. Low-performing winners increase their rating by 0.29 (+11 percent) (which is significantly greater than zero at the 1 percent level), while the rating of high-performing winners changes by 0.03 (+1 percent) (not significantly different from zero).<sup>23</sup> Therefore, while there is some mean reversion going on, the differential impact of awards on the rating of high- and low-performing agents is robust.

That the documented increase in core performance is mainly caused by the catching up of previously low-performing agents is illustrated in Figure 3. The figure shows that all performance ratings that were below 2.8 in the month prior to the award shift up and center around the average performance. This supports our finding that reciprocity does not drive the perfor-

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<sup>23</sup>The average rating of high performers in the month when they win an award is 3.52 (std. dev. 0.32), which suggests that the performance of high performers is not bounded from above, and they have the scope to increase their performance the same as low performers.

mance increase because if reciprocity was the mechanism all winners should increase their core performance subsequent to winning irrespective of whether they performed well or poorly prior to the award.

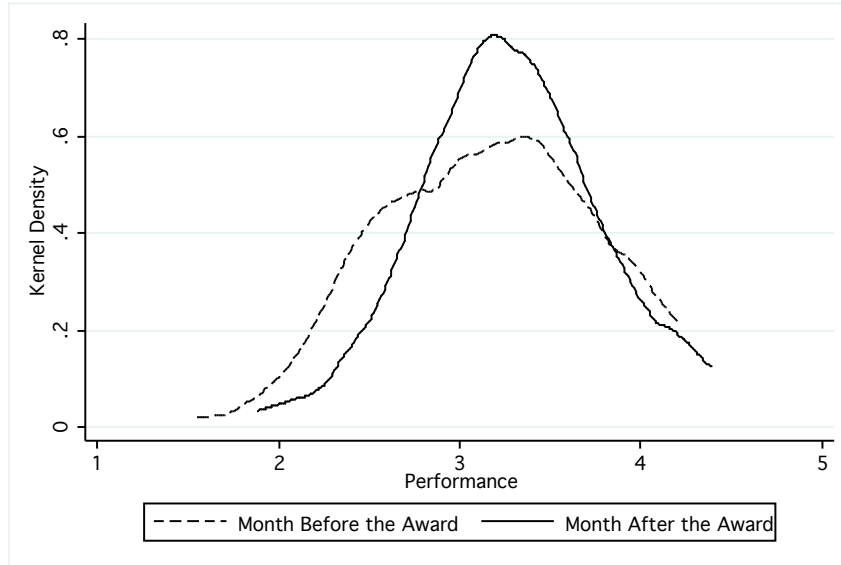


Figure 3: Kernel density of the winners' performance before and after the award

Arguments explaining the observed effect without resorting to social motives are unlikely to play a role here. The award system is well established, and the criteria are clear to all employees. Therefore, handing out the award should not change the relevant information of the agents on the type of behavior and the required effort level to win. Further, the small bonus of CHF 150 is unlikely to cause an income effect that could explain the result. Moreover, if there were any income effect, it would affect performance in the opposite direction and only strengthen the result that winning the award triggers employees to work harder. A *Gold Reward* has no impact on future promotion decisions, and employees know that. Furthermore, a *Gold Reward* has no value as a signal of ability and motivation. Managers and employees both confirmed that they would not mention a *Gold Reward* in their CV. Any motive related to the agent trying to win the award again also cannot explain the finding because any increase in core performance is by definition of the award criteria not linked to a higher chance of winning another *Gold Reward* because these reward activities are not captured in the core rating.

We can also rule out that the effect is caused by award winners focusing on those activities that lead to the award at the expense of core performance prior to winning. If the argument were true, the performance after the award would be the normal level of core performance, and winners and nonrecipients would not be homogeneous despite the similarity of their performance prior to the award. While such an effect could be imagined if one only looked at the three months prior to an award—the maximum time span that an activity eligible for winning lasts—the long

time series of insignificant performance differences prior to an award renders the conjecture invalid. In addition, the difference in performance after an award should then also be sustained for more than one month. The same holds for the argument that utility is concave in the number of awards won. Then, award-winning employees may substitute effort for award-eligible activities by effort in core performance dimensions because they do not care as much about winning another award. That employees are homogenous ex ante then simply reflects that prior to the award everyone tries to win an award. However, if this argument were true, one should observe an increase in absolute performance over time as more and more employees receive an award, which is not the case. At the same time, the argument is hard to reconcile with the short-lived nature of the effect.

Regarding the size of the effect, it is worth observing that the sizes of the documented effects only present a lower bound due to three reasons specific to this study. First, the *Gold Reward* is low in the hierarchy of awards at the company, and one would expect to find even larger effects for the other awards. Second, awards at the company are presented for beneficial behaviors that are not included in the company's core performance measure, which we use as the dependent variable. Thus, the estimated effect of awards on core performance presents only the spillover effect of the presumably larger effect on those behaviors that are rewarded. One standard objection to award systems is that they induce individuals to exert unproductive efforts to increase their chances of winning. Our result, however, provides evidence to the contrary, as we observe an increase in productive effort. Hence, even if there were some rent seeking going on, it does not come at the expense of productivity. Third, we only measure the impact of the award subsequent to being presented. However, the award system as such does have an incentive effect that, while it cannot be captured in this study, probably has a substantial impact on the performance of all employees as they work towards the award. In a field experiment, Neckermann and Kosfeld (2009) find that the introduction of an award system increases performance by about 10 percent.<sup>24</sup>

### 3.7 Robustness

The following section addresses a variety of issues concerning the reliability of our results. As is the case with most, if not all, event studies, our results exhibit serial correlation. However, this issue does not affect our results because we estimate robust standard errors. Specifically, we report the robust (Huber-White sandwich) estimates of variance that provide correct estimates for any type of correlation within the observations of each panel/group. Moreover, Bertrand et

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<sup>24</sup>Receiving an award may also have other beneficial side effects that cannot be measured as part of this study. For example, one might conjecture that awards have an additional positive affect on the retention rates of the award winners.

al. (2004) show that, if the intervention variable is not serially correlated, OLS standard errors are consistent, despite the positive serial correlation in the residuals. This holds in our study because the average correlation of the independent variable over time for each individual is close to zero. Serial correlation and heteroskedasticity are more extensively addressed, and additional tests are reported in Appendix C. As a further robustness check we used the two-way cluster approach (Cameron et al. 2006), which provides cluster-robust inference when there is non-nested, two-way clustering. The two dimensions that we checked were id and month because one could imagine errors to be clustered for all observations of one individual and within one month. However, our results are robust to this test as Table C.1 in the appendix shows.

We already established above that the direction of causality runs from award to performance by showing (1) that there is no significant difference between the performance of winners and nonrecipients prior to an award and (2) that the results of models 1 and 2 are basically identical. Nevertheless, we additionally tested whether current or lagged performance determines if a person receives a *Gold Reward*. As expected, there is no significant effect of these variables on the likelihood of receiving an award. Only the length of tenure has a significant impact, which provides an additional rationale for including it in the regressions presented above. Third, the results are robust with respect to the inclusion and exclusion of employees depending on the number of *Gold Rewards* received. The results do not change with a variation in the event window size (we tested event windows ranging from plus/minus 3 to 12 months). In addition, the inclusion of time fixed effects has no effect on the results because the relative rating already eliminates any impact of time-varying changes in the business environment.

## 4 Conclusion

In general, the use of incentives is indispensable in principal-agent relationships within organizations. Advances in behavioral economics have recently addressed and presented models of a wide set of human motivations such as the desire for status and positive self-image. However, awards as incentive instruments tapping a number of such motives have so far been neglected in economics despite their widespread use in the corporate sector and elsewhere.

In a quasi-experimental set-up, this study shows that receiving an award for uncontractible, voluntary work behaviors such as organizing team events or substituting for sick employees increases core performance—those efforts that are more immediately linked with business success by 7.5 percent when compared to nonrecipients. Hence, we show in the field that social incentives have a sizeable and robust positive effect on employee performance. Moreover, rewards influence behavior after they have been received, that is, beyond the incentive effect normally

considered as people work towards receiving the reward.<sup>25</sup> This clearly contradicts the notion that awards only influence behavior due to their effect on future monetary income and that awards only reflect high ability and performance, but do not cause it. Additionally, awards as social incentives have a positive spillover effect on dimensions of the job that they do not target. The richness of the data set allows us to distinguish between different hypotheses that could theoretically explain the effect. Examples include reciprocity and a change in employee identification with the company. We conclude that the effect is driven by the desire to live up to the honor.

One important implication of the study is that social incentives are valuable in incentivizing types of activities that are desirable for the company, but not contractible. The vague nature of awards, for instance, better corresponds to the vague nature of activities such as helping colleagues or sharing knowledge. Therefore, employees may perceive social incentives to be a more adequate reward for these kinds of activities than monetary bonuses that put a clear dollar value on the exerted effort. Thereby, awards are less likely to reduce intrinsic motivation.<sup>26</sup> At the same time, multitasking problems may less likely occur. Moreover, social rewards may have a positive impact on the work climate and the shared beliefs about appropriate kinds of behavior. There is much scope for future research to investigate these and other issues. One relevant question concerns the optimal number of awards and award categories. Additionally, a deeper understanding of all channels through which awards affect performance might improve our understanding of incentive provision in principal-agent relationships.

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<sup>25</sup>Hence, the documented ex-post performance enhancement adds to the presumably positive impact on the rewarded activity itself and the incentive effect of the award system per se.

<sup>26</sup>See, e.g., Frey 1997 and Bénabou and Tirole 2003 on the crowding out of motivation.

# Appendix

## A Descriptive statistics

Figure A.1: Distribution of *Gold Rewards* per Employee

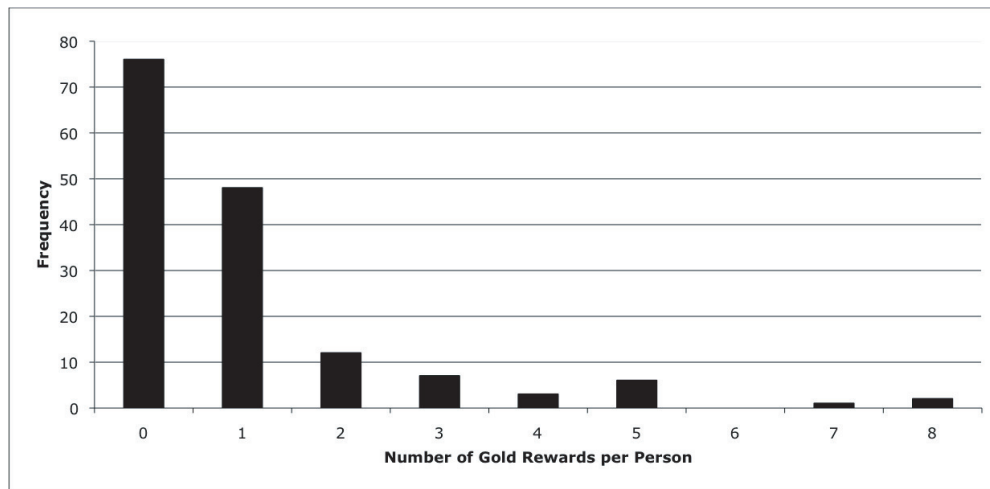


Table A.1: Descriptive Statistics

Number of observations							
Winners	431	36%					
Nonrecipients	771	64%					
Total	1202	100%					
By gender		Total	Winner		Nonrecipients		
Men	488	41%	273	63%	441	57%	
Women	714	59%	158	37%	330	43%	
Total	1202	100%	431	100%	771	100%	
Total awards in sample		43					
Months covered		46					
Average number of awards per year		11					
Average number of awards per month		1					
Awards per Month	0	1	2	3	4	5	6
Frequency	23	13	6	1	1	1	1



Table A.2: Development of average absolute performance over time

	2004	2005	2006	2007
Calls taken per hour	9.39	10.96	10.12	10.01
Call handling time	0:04:29	0:04:09	0:04:20	0:04:56
Quality	91.00%	83.93%	93.43%	94.77%
Transfer rate	7.63%	8.96%	8.25%	8.84%
After call worktime	26.58%	23.96%	26.42%	35.02%

## B Performance in the Individual Performance Dimensions

Table B.1: Effect of an award in the different performance dimensions

	Calls taken per hour	Call Duration	Quality	Late	Transfer Rate	After Call Worktime
$\pi_{-6}$	0.186* (2.01)	0.143 (1.06)	-0.222 (-1.26)	-0.011 (-0.06)	0.183 (1.22)	0.055 (0.22)
$\pi_{-5}$	0.178 (1.25)	0.312** (2.51)	0.059 (0.45)	0.019 (0.17)	0.046 (0.29)	0.376 (1.57)
$\pi_{-4}$	0.219 (1.40)	0.229 (1.47)	0.034 (0.29)	-0.078 (-0.55)	0.115 (0.49)	0.349* (1.77)
$\pi_{-3}$	0.152 (0.93)	0.061 (0.39)	0.068 (0.54)	-0.054 (-0.34)	0.145 (0.55)	0.118 (0.49)
$\pi_{-2}$	0.090 (0.58)	0.147 (0.90)	0.023 (0.13)	-0.307* (-1.92)	0.110 (0.38)	-0.281 (-1.67)
$\pi_{-1}$	-0.043 (-0.33)	-0.013 (-0.08)	0.061 (0.72)	-0.403* (-1.98)	-0.061 (-0.23)	-0.063 (-0.33)
$\pi_0$	0.012 (0.10)	-0.028 (-0.14)	0.030 (0.38)	-0.197 (-0.60)	-0.237 (-0.81)	-0.045 (-0.22)
$\pi_{+1}$	0.199 (1.51)	0.350 (1.47)	0.303** (2.52)	-0.038 (-0.17)	-0.133 (-0.69)	0.445* (1.79)
$\pi_{+2}$	0.070 (0.35)	-0.084 (-0.41)	0.139 (0.82)	-0.173 (-0.85)	-0.178 (-0.69)	-0.175 (-1.16)
$\pi_{+3}$	0.050 (0.20)	0.130 (0.59)	0.280 (1.34)	-0.145 (-0.52)	0.413 (1.34)	-0.129 (-0.44)
$\pi_{+4}$	-0.016 (-0.12)	-0.141 (-0.77)	0.017 (0.12)	-0.108 (-0.41)	0.369 (1.30)	-0.243 (-0.86)
$\pi_{+5}$	-0.106 (-0.89)	-0.129 (-0.63)	-0.049 (-0.40)	0.017 (0.06)	0.132 (0.35)	-0.163 (-0.74)
$\pi_{+6}$	-0.054 (-0.44)	-0.161 (-1.07)	0.104 (0.73)	0.202 (0.79)	0.062 (0.15)	-0.521** (-2.60)
<i>Tenure</i>	0.024 (1.68)	0.035 (1.77)	0.017** (2.48)	0.029*** (3.02)	0.008 (0.52)	-0.051** (-2.25)
<i>Tenure</i> <sup>2</sup>	-0.000 (-1.58)	-0.001 (-1.28)	-0.000 (-1.61)	0.000 (0.24)	-0.000 (-0.18)	0.001 (1.60)
<i>Constant</i>	2.754*** (21.12)	2.287*** (19.33)	2.691*** (21.16)	3.892*** (31.93)	4.929*** (29.19)	4.770*** (23.42)
Obs.	1202	1202	1202	1202	1202	1202
<i>R</i> <sup>2</sup>	0.665	0.660	0.476	0.437	0.546	0.655

Fixed-effect OLS regression, *t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## C Serial Correlation and Heteroskedasticity

### C.1 Further Discussion

With event studies two concerns are serial correlation and heteroskedasticity of the disturbances. These render the least squares estimator inefficient and even inconsistent if some regressors are lagged dependent variables. Standard test statistics, such as the first-order autocorrelation coefficient of the residual (coefficient 0.125, significant at 1 percent level), obtained from regressing performance on individual characteristics (*tenure* and *tenure*<sup>2</sup>) and individual fixed effects, as well as the DW-statistic for panel data, do indeed suggest that disturbances are positively correlated.<sup>27</sup> Serial correlation is also detected when using the Woolridge test for autocorrelation in panel data (Wooldridge 2002, pp. 282–283) (p-value: .05 for  $H_0$ : no first-order autocorrelation). We also ran the modified Wald test for group-wise heteroskedasticity on the fixed effect model and found a highly significant test statistic. Therefore, we reject the null hypothesis that the panels in our model have common disturbance variances and that those disturbances are not correlated with the regressors. Hence, adjustments need to be made. If the goal were to estimate a model with complete dynamics, we needed to re-specify the model because strong serial correlation is often an indication of omitting important explanatory variables or functional form misspecification. However, as this was not our goal, we had to find a way to carry out statistical inference in light of this positive correlation and potential heteroskedasticity (Li and Hsiao 1998).

Bertrand et al. (2004) discuss serial correlation as a frequent problem, typically caused by the use of a fairly long time series, the positive serial correlation in the dependent variable, and the high degree of persistence of the intervention variable. They used Monte Carlo simulations to investigate how several estimation techniques helped to solve this serial correlation problem. They found that allowing for an unrestricted covariance structure over time within groups, with or without making the assumption that the error terms in all states follow the same process, worked well when the number of groups (i.e., units to which the intervention is applied, here: individuals) was greater than 50. This condition is satisfied in our sample. In addition, we allow for an arbitrary variance-covariance matrix as we cluster on the team level. These variance estimates are robust in the sense of providing correct coverage rates to much more than panel-level heteroskedasticity. In particular, they are robust to any type of correlation within the observations of each panel/group. Moreover, Bertrand et al. (2004) show that, if the intervention variable is not serially correlated, OLS standard errors are consistent, despite the positive serial correlation in the residuals. This is true in this study where the average correlation of the award

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<sup>27</sup>Second- and third-order autocorrelation coefficients are small (0.028 and 0.004) and insignificant.

variable over time for each individual is  $-.05$  (correlation coefficients vary between  $-.31$  and  $.47$  with a mode and median of  $-.05$ ).

To further check the robustness of the reported standard errors, we applied OLS with panel-corrected standard errors (PCSE) assuming heteroskedastic and contemporaneously correlated disturbances across panels (a method initially suggested by Beck and Katz 1995). The estimates calculated with the Prais-Winsten FGLS (Prais and Winsten 1954), assuming an AR(1) process in the disturbances, do not differ in any meaningful way from the ones presented above. The same holds, when we apply the Driscoll and Kraay standard errors for fixed effect models (Driscoll and Kraay 1998). These standard errors are robust to general forms of cross-sectional (spatial) and temporal dependence when the time dimension becomes large. Because this non-parametric technique of estimating standard errors places no restrictions on the limiting behavior of the number of panels, the size of the cross-sectional dimension in finite samples does not constitute a constraint on feasibility—even if the number of panels is much larger than  $T$ . Hence, we are confident that the standard errors reported in the table are roughly accurate.

## C.2 Regressions With Two-Way Clustering

Table C.1: Models with One-Way (Team-Month Basis) and Two-Way (Id and Month) Clustering

	Model 1a one-way	Model 1b two-way	Model 2a one-way	Model 2b two-way
$\pi_{-6}$	-0.055 (-0.54)	-0.055 (-0.53)	-0.069 (-0.67)	-0.069 (-0.62)
$\pi_{-5}$	0.123 (1.37)	0.123 (0.87)	0.117 (1.31)	0.117 (0.77)
$\pi_{-4}$	0.100 (1.40)	0.100 (1.25)	0.098 (1.47)	0.098 (1.18)
$\pi_{-3}$	0.076 (0.76)	0.076 (0.72)	0.080 (0.84)	0.080 (0.72)
$\pi_{-2}$	-0.013 (-0.13)	-0.013 (-0.12)	-0.008 (-0.09)	-0.008 (-0.07)
$\pi_{-1}$	-0.028 (-0.39)	-0.028 (-0.31)	-0.020 (-0.29)	-0.020 (-0.21)
$\pi_0$	-0.034 (-0.51)	-0.034 (-0.37)	-0.022 (-0.33)	-0.022 (-0.22)
$\pi_{+1}$	0.234** (2.73)	0.234** (2.04)	0.246** (2.96)	0.246** (2.00)
$\pi_{+2}$	0.015 (0.12)	0.015 (0.12)	0.035 (0.29)	0.035 (0.25)
$\pi_{+3}$	0.172 (1.03)	0.172 (1.24)	0.192 (1.19)	0.192 (1.31)
$\pi_{+4}$	-0.005 (-0.05)	-0.005 (-0.06)	0.017 (0.17)	0.017 (0.16)
$\pi_{+5}$	-0.050 (-0.85)	-0.050 (-0.62)	-0.022 (-0.40)	-0.022 (-0.25)
$\pi_{+6}$	0.005 (0.05)	0.005 (0.05)	0.033 (0.28)	0.033 (0.29)
<i>Tenure</i>	0.013* (1.76)	0.013* (1.83)	0.009 (0.95)	0.009 (0.82)
<i>Tenure</i> <sup>2</sup>	-0.000 (-0.98)	-0.000 (-1.02)	-0.000 (-0.81)	-0.000 (-0.62)
<i>Constant</i>	3.209*** (37.29)	3.209*** (22.65)	3.228*** (34.91)	3.228*** (21.45)
Observations	1202		667	
<i>R</i> <sup>2</sup>	0.576		0.563	

*t* statistics in parentheses

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

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