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THE HETEROGENEOUS EFFECTS OF BONUS PAY ON PERFORMANCE OUTCOMES: EVIDENCE FROM PERSONNEL DATA

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February 28, 2014

Abstract

This study uses rich information on performance outcomes to estimate the effect of bonus pay on worker productivity. We use a policy discontinuity in the call centre of a multi-national telephone company in which management introduced monetary bonuses upon achieving pre-defined performance thresholds. The results show that the bonus is associated with an increase of a third of a standard deviation in the underlying performance outcome. This effect is mostly driven by low-ability agents whose performance improvement is about three times as large as for the average worker. Conversely, the treatment effect for high-ability agents is even negative. Furthermore, we find that other, non-incentivised performance outcomes are positively affected.

JEL-codes: J33, C23, M52

Keywords: Fixed pay, performance pay, incentives, productivity

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1 Introduction

Performance pay is used to link workers' wages to their performance to elicit optimal effort levels. There has been substantial research on measuring the effect of provision of performance bonuses on performance outcomes that depend on either absolute performance targets or workers' performance relative to their peers. Most studies use personnel data and exploit (quasi-) exogenous variations in the compensation schemes of single firms. Overall, studies find that pay for performance based on absolute performance thresholds yields higher worker performance (see, e.g., Dohmen and Falk, 2011, for a recent overview).¹

This paper exploits the introduction of performance bonuses in the call centre of a multi-national telephone company located in the Netherlands. The dataset contains information on different performance outcomes, one of which was used to incentivise call agents by introducing a bonus payment upon achieving a predefined performance level over a given time period. This outcome, which is available for each working week, is based on the service quality an agent provides to customers. This net promoter score is rated by the firm's customers (see, e.g., Keiningham *et al.*, 2007). In accordance with the related literature, we find that the workers, on average, react to the newly introduced performance pay by providing higher performance. This result is also in line with findings from other laboratory as well as field studies for other industries (Lazear, 2000; Shearer, 2004; Shi, 2010; Heywood *et al.*, 2011). Estimation results show that workers who are lower in the performance distribution before the introduction of the performance pay

¹Relevant studies examine the effect of relative incentives on performance (Bandiera *et al.*, 2005) and the effect of team incentives on productivity (Hamilton *et al.*, 2003; Muralidharan and Sundararaman, 2011; Bandiera *et al.*, 2012).

drive the performance improvement after the bonus is introduced, whereas the bonus does not affect the behaviour of workers who would have outperformed the performance target anyhow. These results are stable to tests for seasonality and time trends and other robustness tests.

This study contributes to the literature on the analysis of performance incentives on performance outcomes in several ways. First, this study contributes to the literature on the effects of introducing a performance-related bonus on performance outcomes. Previous research exploiting firm personnel data shows that performance-related pay can have substantial effects on individual performance. Lazear (2000) shows that the output of windshield installers increases by 44% after the introduction of piece-rate pay. Similarly, Shearer (2004) and Shi (2010) find that workers perform about 20% better under piece-rate pay in tree planting and tree thinning, respectively. Heywood *et al.*, (2011) find that a piece rate leads to an increase of 50% in peer-reviewed publishing among professors of a university in China. These studies focus on output measures, such as the number of pieces accomplished within a given time. It is more difficult, however, for firms to monitor the quality of workers' output. The call centre analysed in this study applies a monitoring system for service quality. Given the availability of this performance measure, the firm incentivised this measure to improve overall call quality.

Second, we analyse whether agents throughout the ability distribution react differently to the incentives set by management. For relative incentives, Azmat and Iriberri (2010) find that ability matters for the response to incentives. Owing to the design of the incentive scheme, our study finds that the incentives work best for those in the lower

tail of the ability distribution, while they decrease performance at the upper end of the distribution.

Third, this study analyses the effect on incentivised as well as non-incentivised performance measures. If workers' tasks consist of several dimensions of task performance, one of which is incentivised while the others are not, workers may simply aim at performing well on the performance outcome that is rewarded Holmstrom and Milgrom (1991). Only a few studies analyse the effect on alternative performance outcomes that are not subject to the incentive introduced (Asch, 1990; Al-Ubaydli *et al.*, 2008). Our study is able to analyse whether an increase in the incentivised service quality comes at the cost of a lower service quantity. However, we do not find such a trade-off, since service quantity is also affected positively.

The following section describes the firm whose performance pay is evaluated and how worker performance is measured. Furthermore, it discusses how the firm set wages before and since the introduction of performance pay. The main estimation results are given in Section 3. Section 4 shows that the results are robust to alternative hypotheses (e.g., placebo treatments). Section 5 summarises and concludes the study.

2 The firm and its incentive schemes

2.1 The firm

The call centre in which this incentive scheme was implemented is part of a multi-national telephone company located in the Netherlands.² The call centre is an in-house service centre that handles the inbound calls of current and prospective customers. Customers can contact the call centre to ask questions and report technical and administrative problems and complaints. An automated routing system connects customers to available agents.

The call centre is organised into different departments, some of which were subject to the introduction of performance bonuses based on individual performance.³ The estimation sample comprises these departments, where all agents have the same task and are evaluated based on the same performance measures. Handling inbound customer calls involves talking to customers as well as accessing and entering documentation in the customer database. Agents are not involved in any other task, such as written customer correspondence. Agents are assigned to team leaders whose main task is supervising the agents and monitoring their calls. Team leaders report to and are evaluated by the department managers.

²Data from the same firm are also used by De Grip *et al.* (2011), De Grip and Sauermann (2012), and Kriechel and Sauermann (2012). In contrast to these papers, our paper uses a more recent sample period that covers the introduction of performance bonuses. In addition, this study uses information on more departments than the cited papers.

³There are also workers who receive bonuses based on their department's average performance because individual performance is not properly measurable, for example, general management and back-office workers.

2.2 Explicit incentives in the firm

Though agent performance is precisely measurable along several dimensions for any given time interval, explicitly formulated performance incentives to increase performance were only introduced in April 2011.⁴ Before as well as after the introduction of the new incentive scheme, the incentive scheme consisted of two components, one bonus component and one pay rise component. The main difference of the new system is that agents are paid a wage premium if they outperform one of four predefined performance thresholds on one of the observable performance outcomes.

Before the introduction of the performance bonuses evaluated in this paper, the firm incentivised agents by an annual wage increase and an annual bonus. Agents were formally evaluated by their supervisor, i.e. their team leader, in April or May and would receive a grade from one (lowest) to five (highest).⁵ This grade was then used as a multiplier for the reference wage increase and the reference bonus level. If management set the reference wage increase at 4%, a grade 1 agent would receive no wage increase, grade 3 agents would receive 4%, and agents with the highest grade (five) would receive 6% (150% of the reference wage increase). The annual bonus was calculated in the same way and could be up to a maximum of 8%. There is no additional seniority-related wage increase employed at the call centre.

⁴According to management, the main reason for the non-utilisation of explicit incentives based on observable performance outcomes was the position of the workers' council.

⁵Additional data on the performance ratings show that 54% of agents received a three, 30% received a two and 14% a four, and only 2% received a one or five. Team leaders as well as department managers were asked to reach a bell-curve distribution of performance gradings in both their teams and departments, respectively.

Though the annual performance rating by the supervisor had considerable impact on agents' wage growth and annual bonuses, the rating was at the discretion of the team leader and not (directly) dependent on an agent's observable performance outcomes. The team leader was supposed to consider several measurable performance outcomes, such as average handling time and measures of customer satisfaction, as well as the agent's behaviour towards peers, team leaders, and managers in the previous year. In addition to the lack of well-defined evaluation criteria such as performance thresholds, there was no predefined weighting of the different measures.

The new incentive scheme introduced in April 2011 only affected the bonus component. While the annual performance rating was still used to determine an agent's annual wage growth, the firm abolished the annual performance bonus linked to annual performance ratings. Under the new incentive scheme, up to 12% of an agent's wage is now paid as a bonus, depending on whether the agent outperforms the thresholds defined by management. The idea behind the introduction of a bonus explicitly related to service quality is that the quality of services provided to customers has become a unique competitive advantage in the mobile communications market.

This bonus is based on a measure of service quality gathered from customer satisfaction surveys of randomly phoned back customers. There are $j = 1, \dots, 5$ bonus levels B_j , which correspond to bonuses of 0, 4.8, 8, 10, and 12% of the wage earned, respectively. Agent performance is calculated and evaluated quarterly (Figure 1). If an agent's average performance \bar{y} does not exceed the lowest threshold y_1 ($\bar{y} \leq y_1$), the agent receives no bonus ($B_1 = 0\%$). Agents who outperform the highest threshold ($y_{j-1} \leq \bar{y}$) receive the highest bonus, B_j . In accordance with the bonus payments, the performance thresholds

on which the bonuses are based are not equally distributed. The distance between the lowest threshold (threshold 1) and the second lowest threshold (threshold 2) on the service quality index is 0.05 units of service quality, defined on a scale of zero to one. However, the distance between thresholds 2 and 3 and that between thresholds 3 and 4 are only 0.025.⁶ Throughout the quarter, agents are given feedback about their individual performance about once a week.

Agents are shown to experience substantial learning effects (for other performance outcomes, see De Grip *et al.*, 2011). For this reason, management decided not to consider agents hired as temporary help or agents with less than six months' tenure for individual performance pay. Instead, these agents were paid a bonus depending on the average department performance.⁷

The calculated bonus pay is paid with the regular monthly wage 1.5 month after the end of each quarter. In the meantime, management revises the thresholds and communicates the new thresholds for the next quarter to team leaders and agents.

The main difference between the old and the new bonus payment is that the new incentive system is more precisely formulated in terms of specific service quality targets and is more transparent in terms of outcomes, which are clearly communicated before the bonus period. In addition, the evaluation periods are much shorter (three months) than

⁶Average performance differs by department. The target size is therefore adjusted accordingly. The absolute distance between the target thresholds is the same for each department.

⁷Furthermore, agents whose quarterly performance is based on fewer than 60 evaluations, the agent's department average performance is used to assess the individual agent's bonus level. In the estimation sample, about 45% of the agents did not have the minimum number of 60 evaluations during the evaluation period. Since agents are not able to affect whether customers participate in the survey, this should not bias the results.

that of the old incentive scheme (12 months), which increases worker awareness of the relation between their own performance and pay.

2.3 Performance outcomes

While it is often difficult to directly measure worker performance, call centres have several measures covering different performance dimensions. These performance data comprise measures of service quality as well as measures that describe the work speed of agent tasks ('quantity'). Both dimensions of performance, service quality and work speed, are important to the firm because they affect customer loyalty and the total costs of the calls (wages), respectively. The availability of different performance dimensions, one of which is incentivised under the new incentive scheme, allows one to estimate the effect on both incentivised and non-incentivised measures. All performance measures are available at the individual agent level before and after the introduction of performance pay for a large number of time periods.

While several studies use team manager evaluations to measure worker performance, this information is potentially biased because of its subjectivity, and the reasons for this bias may be unobservable to the researcher Flabbi and Ichino (2001). All performance outcomes used in this study, however, were automatically generated and thus less prone to potentially subjective evaluations, as in the case of performance evaluations by team leaders or managers.

Service quality provided by agents

The newly introduced bonus pay in this call centre is based on a measure generated from a customer satisfaction survey among a randomly chosen population of customers. Amongst other questions, customers were asked whether they would recommend the mobile operator to family and friends, based on the previous call. This question could be answered on a scale from zero ('very unlikely') to 10 ('very likely').⁸

From the answers to this question, the management calculated the net-promoter score (see, e.g., Keiningham *et al.*, 2007), which is assumed to be related to customer loyalty. Because the question explicitly asks for the customer's opinion based on this call, we use this as a measure of an agent's service quality. This measure is defined as the percentage point difference between the share of customers rating the agent as nine or 10 (high service quality) and those rating the agent as six or lower (low service quality):

$$NPS_{it} = y_{it}^q = \frac{N_{it,9-10} - N_{it,0-6}}{N_{it,0-10}} \quad (1)$$

where N is the number of evaluations and the subscript denotes the grade given by the customer for agent i in week t . For interpretation purposes, the customer satisfaction index used throughout this study is scaled between zero and one. All evaluations during the bonus period (i.e. the quarter) are used to calculate y_{it}^q and to assess the size of the bonus.

⁸The exact question was 'Based on this contact, how likely are you to recommend [the firm] to your family and your friends?' The survey contained further information on whether the customer had already approached the call centre with the same problem previously, whether the problem that was the reason for the call had been solved, and how much effort the agent put into the call to solve the problem.

Before interacting with an agent, customers are informed whether they were willing to participate in a customer satisfaction survey. Importantly, the agent did not know whether the customer agreed to participate in the survey or not. Neither agents nor managers can affect the selection of customers who rate agent performance and thus cannot influence this outcome measure by selection into the survey. Shortly after the end of the customer call, a random subset of customers was automatically called back. An interactive voice response system then guided the customers through the survey.

Because service quality is taken from the customer survey, the number of evaluations relative to the actual number of calls made is rather low. In the sample employed for this study, about 1.9% of calls were evaluated by the customer satisfaction survey. This has two implications for the use of service quality as a performance measure: First, available agent–week observations of service quality are often based on only a low number of actual evaluations and thus have considerably more variation than the average. For this reason, all estimations control for the number of customer evaluations (see Section 3.3). Second, only about 61% of agent–week observations have at least one evaluation which substantially reduces the sample size for estimations using service quality as an outcome variable.⁹

⁹A potential concern about using y_{it}^q as a performance outcome is that it may be potentially biased because of customer non-response. Agents providing low-quality (high-quality) service would then be characterised by service quality that is higher (lower) than their actual service quality because the sample of evaluated calls is less representative of their calls than for agents providing higher (lower) quality. While this may be a potential concern about the validity of service quality as a proxy for quality provided, there is no reason to assume that customer non-response changed with the introduction of performance pay.

Alternative performance outcomes

Apart from service quality y_{it}^q , which is used to calculate the bonus paid to agents, the call centre generates other performance outcomes that are not related to the new incentive scheme. These enable us to analyse the effect of incentives on performance outcomes that are not subject to the bonus pay calculation. This study uses performance outcomes that describe (1) work speed and (2) another service quality indicator that indicates whether the customer's problem was actually solved.

The performance outcome that describes work speed is based on the average length of calls to measure performance. Average handling time ah_{it} provides a clear and objective measure of quantitative performance that is available for each agent i and all calendar weeks t . It measures the average time an agent spends talking to a customer and logging the information on the call in the customer database.¹⁰ Shorter average handling times are associated with higher performance because short calls are less costly to the firm. We therefore define the measure of (quantitative) performance as $y_{it} = \frac{100}{ah_{it}}$. Shorter calls with a lower average handling time ah_{it} are thus interpreted as higher performance y_{it} .

The share of problems solved is used as a second performance outcome to approximate service quality. The information is taken from the same survey as the incentivised performance outcome service quality. Customers were asked whether their 'question was completely resolved to' by the call agent in the corresponding call (yes/no). This variable is defined as the number of solved problems over all evaluations of agent i in week t . Compared to performance outcome service quality, the share of problems solved indicates

¹⁰This performance outcome is used by several studies using call agent data: for example, Liu and Batt (2007), and De Grip and Sauermann (2012).

whether the agent was able to solve the problem for which the customer called the call centre.

3 The effects of incentives on performance

3.1 Estimation sample

The data used in this study provide weekly information on the performance outcomes of the same workers before and after the introduction of the bonus related to service quality. We use the performance information on all agents who worked at least one week during the three months before or after the introduction of the performance bonuses. The sample also includes agents who were working in these departments but who were not (yet) eligible for individual performance pay because, for example, they did not meet the tenure or employment criteria.

The total number of agents in the estimation sample is 428, with 15,584 observations. The agents were observed on a weekly basis from week 6/2010 until week 26/2011 (end of quarter 2/2011).¹¹ The sample thus consists of weekly data over more than four quarters before the introduction of performance pay and one quarter after. In the estimation sample, 41% of the agents are men; agents are, on average, 30 years old and have an average tenure of 2.1 years (Column (1) of Table 1). Across the estimation sample, 61% of all agent-week observations were working or had worked as temporary help agents who

¹¹Despite the fact that the same data are available for the time period after quarter 2/2011, they are not used in this paper. This is because management re-evaluates the performance thresholds for each bonus quarter, which introduces endogeneity that can bias the estimation results. Furthermore, it is more difficult to establish causality because time trends hinder identification in the long run.

were not entitled to the bonus. Agents did, however, switch from temporary help agent contracts to fixed-term contracts within the sample period.

The average service quality provided by agents is 0.403, with a standard deviation of 0.082. This corresponds to an original value of about -0.25 on a scale from -1 to one. This number can be interpreted such that agents provide, on average, 25 percentage points fewer calls of high quality ($N_{it,9-10}$) than of low quality ($N_{it,0-6}$). The mean work speed is 0.326, which corresponds to an average handling time of 5.11 minutes. On average, customers stated that agents solved more than two-thirds (0.698) of the problems for which they had contacted the call centre.

Column (2) of Table 1 shows the descriptive statistics for the sample with agent-week observations containing information on service quality. Of the 429 agents in the overall sample, 312 (73%) do have information on service quality. A comparison of the means, however, shows that there is hardly a difference between agent-week observations containing information on service quality and those that do not.

3.2 Descriptive results

Figure 2 shows the distribution of performance bonuses paid for the first quarter after the introduction of performance pay. On average, the bonus is 5.9% of the quarterly wage.

Table 2 shows descriptive statistics of the estimation sample, comparing the quarters before and after the introduction of the bonus. The table shows that the gender and tenure composition of the agents do not significantly differ between the periods before and after the introduction of the bonus. As first, descriptive evidence of the effect of the bonus

introduction, the table shows that service quality is slightly higher after the introduction though the difference is not significantly different from zero. The same holds for the two alternative outcomes of performance, share of problems solved and average handling time.

Panels (a) and (b) of Figure 3 depict the development of service quality over time. Despite the fact that service quality varies over time, it does not seem to follow seasonal patterns. In line with the descriptive results shown in Table 2, this figure suggests no significant increase in performance, despite the fact that time effects are controlled for by including linear and quadratic time trends. The figure shows, however, that the line seems to become less volatile after the introduction of performance pay.

3.3 Estimation strategy

The effect of the introduction of explicit performance bonuses on the incentivised performance outcome is estimated by a regression of the output y_{it}^q on a dummy variable that equals one in the period after the introduction and zero before (p_{it}):

$$y_{it}^q = \alpha_i + \tau p_{it} + \beta_1 t_t + \beta_2 X_{it} + u_{it} \quad (2)$$

where the α_i are individual fixed effects to account for individual heterogeneity, t_t contains controls for overall time trends, the X_{it} are covariates such as working hours in week t and agent tenure, and u_{it} is an idiosyncratic error term.¹² Throughout all regressions, standard errors are clustered at the agent level.¹³

¹²Throughout this study, the regressions do not control for individual tenure because tenure, individual fixed effects, and the linear time trend are perfectly collinear.

¹³The regressions using service quality and share of problems solved as measures of outcome are weighted by the number of evaluated calls in week t . This weighting is introduced because this weekly

The identification strategy to estimate the effect of bonus pay on the underlying performance outcome relies on the comparison of the performance outcomes of the (same) workers before and after the introduction of the bonus pay. This requires appropriately controlling for other, potentially confounding effects such as trends in performance and seasonal effects.

Because appropriately controlling for time trends is important in this setting, where *all* agents are subject to the new pay scheme, the regressions include linear and squared time trends. In addition, dummies for the month of the year are used to take seasonal patterns into account.

Furthermore, estimation of the effect of bonus pay on performance outcomes may be confounded by other, for example, organisational changes within the firm that took place at the same time as the introduction of the bonus pay. In January 2011, 2.5 months before the introduction of the bonus pay, the departments were reorganised. However, no other organisational changes took place at the same time as the performance bonuses were introduced, or any other changes, such as sudden changes in the structure of calls, for example, due to newly introduced products. The estimated effect of the treatment dummy p_{it} ($\hat{\tau}$) should thus provide an unbiased estimate of the effect of the introduction of the bonus related to service quality.

number of evaluated calls varies, which potentially affects the accuracy of the measurement of the outcome variable. In addition, these estimations contain dummy variables for each possible number of evaluations to control for within-agent differences in performance outcomes due to the varying number of evaluations.

3.4 Estimation results

Average effects

Using information on performance outcomes at the individual level before and after the introduction of the individual performance bonuses, Table 3 shows the results when estimating Equation (2) with service quality as the dependent variable. As a baseline estimate, Column (1) of Table 3 shows the effect of the introduction of performance pay on service quality controlling only for a linear and a quadratic time trend. Conditional on time trends, performance is 0.027 higher after the introduction, of individual performance bonuses, compared to before. This corresponds to about a third of the standard deviation in service quality.¹⁴

In Columns (2) and (3), we further control for the department the agent is working for, the agent's number of working hours in a week, whether the agent is employed as a temporary help agent (and therefore is not eligible for the bonus pay), and agent-level individual fixed effects. The estimated effect slightly decreases to 0.022 and 0.023 in Columns (2) and (3), respectively, which corresponds to 28% of one standard deviation of service quality.

These results show that workers do react to the incentives set by management by providing higher service quality to customers.

¹⁴Estimation results excluding agents who were not eligible due to tenure or their working contract shows similar results as the ones presented in this section.

Alternative performance outcomes

Though the bonus is based on service quality only, one can expect an effect on non-incentivised performance outcomes as well. The first argument for an effect on non-incentivised outcomes is that agents will focus on the incentivised outcome, thereby ‘neglecting’ other, potentially conflicting performance outcomes. If performance outcomes conflict one expects a negative effect on other performance outcomes and a positive effect if these are positively related to each other. The second argument for externalities on other performance outcomes is that these were implicitly incentivised under the old incentive scheme, where *any* behaviour mattered for the annual performance rating and thus for the annual bonus paid.

Figure 4 shows the development before and after the introduction of performance pay for average handling time (Panel (a)) and the share of problems solved (Panel (b)). Over the sample period, average handling time shows a downward trend before the introduction.¹⁵ The overall correlation between service quality and average handling time *before* the introduction is -0.039 (significant at the 5% level). On the other hand, the share of problems solved, which has a strong positive correlation with service quality (0.38), shows a relatively stable pattern before and after the introduction of performance pay.

To test whether the introduction of incentivising service quality affects alternative performance outcomes, the regressions shown in Table 3 are replicated with the performance outcomes’ average handling time and share of problems solved. For average handling time (Columns (1) to (3) of Table 4), the results show a significant increase of

¹⁵According to the firm’s management, this was mainly due to the fact that agents were pushed to perform better on service quality than on other measures, such as average handling time.

0.021 to 0.027, respectively, which corresponds to an increase of roughly one-fourth of a standard deviation in average handling time. For the share of problems solved, the effect is slightly higher, ranging from 0.021 to 0.029 (one-fourth of one standard deviation).¹⁶

These findings suggest that the introduction of bonus pay based on incentivised performance outcomes does not have negative effects on non-incentivised performance outcomes. The results for the average handling time could be explained by the fact that they are relevant to the annual wage increase.¹⁷ The effect on the share of problems solved is, on the contrary, likely due to the complementary relationship with service quality.

These results provide evidence against the multitasking hypothesis Holmstrom and Milgrom (1991) because agents do perform better, even on non-incentivised performance outcomes. Despite the fact that the relative importance of different performance outcomes has changed (i.e., service quality is incentivised with the introduction of the bonus pay), the alternative performance outcomes may still matter for the annual wage increase or more generally for promotion decisions.

Heterogeneous effects

Under performance pay, agents receive individual performance bonuses when outperforming performance thresholds on service quality that are set in advance by management. The design of the incentive scheme implies that agents of high ability, who easily outperform the highest performance threshold, do not have an incentive to perform even better since they will receive the maximum bonus in any case. On the other hand, low-ability

¹⁶The number of observations is smaller in regressions where the share of problems solved is the measure of outcome because this measure is based on the aggregate of customer evaluations of agent i in week t .

¹⁷This result may also be explained by the argument that customers simply prefer shorter calls, irrespective of the outcome of the call.

agents, who perform below the lowest threshold, do have an incentive to increase their efforts to achieve a bonus by reaching (one of) the performance thresholds (Figure 1).

The descriptive evidence suggests that there are indeed heterogeneous effects due to the design of the incentive scheme applied by the firm. Figure 5 shows the kernel distribution of agents' average service quality in the quarters before (solid line) and after (dashed line) the introduction of performance pay. The vertical lines show the lowest and highest performance thresholds, respectively. Below the lowest threshold, agents receive no bonus, while agents above the highest threshold receive the maximum bonus of 12% of their wage. The figure suggests that the distribution in the lower part moves slightly to the right (an increase in performance). However, the performance to the right of the highest performance threshold moves slightly to the left (a decrease in performance). This suggests that the effect of the bonus on the performance of the high-ability agents is negative.

This pattern is confirmed by the estimation results shown in Panel (a) of Table 5. The table replicates the regression used in Column (3) of Table 3 by ability quartile. For this purpose, the sample is differentiated by the average performance in the quarter *before* the introduction of the performance pay. In line with predictions, the results show that the effect is highest for the lowest quartile of the ability distribution (0.088) and negative (-0.034) for the highest quartile (high-ability agents). The effect for the second quartile is roughly the same as the average effect, whereas performance of the third quartile did not increase significantly with the introduction of bonus pay. While the average effects are positive (Table 3), these results show that this effect is driven by a strong increase for low-ability agents and even a decrease for high-ability agents.

For the two alternative performance outcomes not subject to the new bonus pay, the results show slightly different patterns. Panel (a) of Figure 6 shows the kernel density of the average handling time in the quarters before and after the introduction of performance pay. It suggests that there is only a moderate increase in average handling time related to the introduction of the bonus pay scheme. In line with this figure, Panel (b) of Table 5 shows that the increase in average handling time is driven by the second to fourth quartiles (0.029–0.037), while the effect is insignificant for the lowest quartile.

The effect for the share of problems solved is similar to the effect of service quality: Panel (b) of Figure 6 suggests a small increase in the lower part of the distribution. Indeed, the estimation results in Panel (c) of Table 5 show that the effect is significantly positive only for the lowest quartile while it is insignificant for the other quartiles. As for service quality, this result shows that the effect is driven by low-ability agents for whom the incentive to perform better on service quality is higher than for high-ability agents.

4 Robustness analyses

4.1 Seasonality and confounding factors

Compared to settings where the researcher decides the timing of the treatment or observes randomised treatment and control groups at the same time (see Bandiera *et al.*, 2007; Shi, 2010; De Grip and Sauermann, 2012), the bonus pay was introduced for all agents at the same time. The effects are thus identified by observing the same workers over time, before and after the introduction of bonus pay. A major concern about the identification

strategy is that general time effects, such as seasonal patterns, may confound the estimated treatment effect. If, for instance, the treatment (post-introduction) period is characterised by higher performance in each year, we may interpret the estimated treatment effect as a causal effect of the treatment while it is in fact due to seasonal effects.

To explore whether the estimated treatment effect is contaminated by seasonal effects, the main equation (shown in Column (4) of Table 3) is estimated in different specifications and for different sample periods around the introduction date of the performance pay. As first part of the evidence, Column (1) of Table 6 shows the main regression, with month of the year dummies added. These variables should pick up recurring seasonal variation that is not captured by the time trends included. The estimated treatment effect is slightly higher than for the regression shown in Table 3.

As a second piece of evidence against the alternative hypothesis of time effects, Columns (2) through (6) of Table 6 show the main regression, for varying time periods. First, Columns (2) through (4) show the estimated treatment effects if the sample period starts later than in the main results shown in the previous section. For this purpose, Column (2) shows the results if the sample starts in the second quarter of 2010, Column (3) for the sample starting in the third quarter of 2010, and Column (4) for the sample starting in the fourth quarter of 2010. Irrespective of the length of the sample, these results show that the estimated treatment effect $\hat{\tau}$ remains stable.

Columns (5) and (6) show the estimated treatment effect when the estimation sample contains only the quarters before and after the introduction and just the months before and after, respectively. If there are no announcement effects, the estimated treatment

effect should also be determined when comparing the periods just before and just after the introduction of the bonus pay. The results show that both the quarter and month samples are significant, with 0.018 and 0.032, and comparable to the main results.

One may also be concerned about the announcement effect of the introduction of the bonus pay. The agents were first informed about the fact that service quality would become the basis for bonus pay in November 2010. A reorganisation of the departments that came along with the introduction of performance pay was carried out in January 2011. In the second half of March 2011, agents were informed that they would receive a bonus on top of their wage paid from April 2011. To explore this, the baseline regression is estimated with hypothetical dates for the introduction, such as the date of the announcement instead of the actual introduction. If this leads to a significant treatment effect, such evidence would suggest that the announcement already affected worker performance. Figure 7 plots estimated treatment effects for any possible hypothetical date. The vertical lines show four important dates: (1) the announcement, (2) the reorganisation, (3) the actual announcement about the details and the starting date, and (4) the actual introduction.

The estimated treatment effects plotted in Figure 7 show that neither the announcement date (1) nor the reorganisation date (2) is associated with a significant treatment effect. When we define the treatment dummy as being one from any week between January to March 2011 onwards, however, the estimated treatment effects are significantly different from zero. This suggests that a part of the treatment effect can be explained by announcement effects, that is, that agents improved their performance already *before* the actual introduction of the bonus pay.

Furthermore, Figure 7 shows evidence that the date of the introduction of the bonus scheme is not prone to (recurring) seasonal effects. The figure shows that when the introduction is artificially set to $t - 1$ (year), the estimated treatment effect is not significantly different from zero. Besides general time trends, however, the estimated treatment effect may also be the result of individual trends, for instance, due to learning on the job. De Grip *et al.* (2011) show that learning is most important in the first year of working for the call centre.

To investigate this effect, Table 7 shows the baseline regression augmented by the interaction of the linear time trend and individual fixed effects. This takes any (heterogeneous) learning effects at the individual level into account. The estimation results show that the estimated treatment effect remains almost unchanged compared to the baseline results shown in Column (3) in Table 3.

4.2 Sorting and turnover

Previous studies show that changes in incentives also change the ability distribution in the workplace Lazear (2000). In call centres, turnover is traditionally relatively high (Batt *et al.*, 2005). Figure 8 shows the separation rates over time.¹⁸ Separation rates show a peak in the quarter before the introduction, suggesting that agents left the firm to avoid performance pay.

To analyse whether there is sorting, we use a measure of ability that is calculated from the fixed effects coefficients in a regression controlling for tenure and other covariates.

¹⁸For the purpose of analysing the effects of sorting, a longer sample is used that considers observation until the first quarter of 2012.

This ability measure is then compared for new starters just before and just after the introduction of performance pay. This allows to analyse whether incoming agents differ from before to after the introduction of performance pay. The average ability for starters is 0.400 before the introduction of the performance bonus and 0.384 afterward. The difference is, however, not significant.

The picture is different, however, when comparing the ability of agents who left in the quarter before the introduction (average ability 0.313) with that of agents who left in the quarter after the introduction (0.361). The agents who left their job just after the introduction are of about 10 percentage points higher ability than the agents who left before the introduction.

5 Conclusion

This study analyses the effect of the introduction of bonus pay on worker performance using unique data on agents working in the call centre in a multi-national telephone company. The data contain qualitative as well as quantitative performance information on performance before and after the introduction of a performance bonus. The bonus pay, however, was based merely on service quality performance outcomes, while the performance outcome, which is based on average handling times, was not incentivised.

We find that agents increase their service quality by about a third of a standard deviation. This shows that agents do react to incentives set by management and increase their performance to get a monetary bonus. Furthermore, we show that agents also perform better on alternative outcomes, namely work speed and share of problems solved.

This result may be explained by the fact that alternative performance outcomes may still matter for less well-defined incentives, such as promotion decisions.

Furthermore, the results show that the estimated effect of the bonus introduced is driven by low-ability agents. These agents reacted much more strongly to the incentives set, while high-ability agents even reacted negatively to the incentives.

References

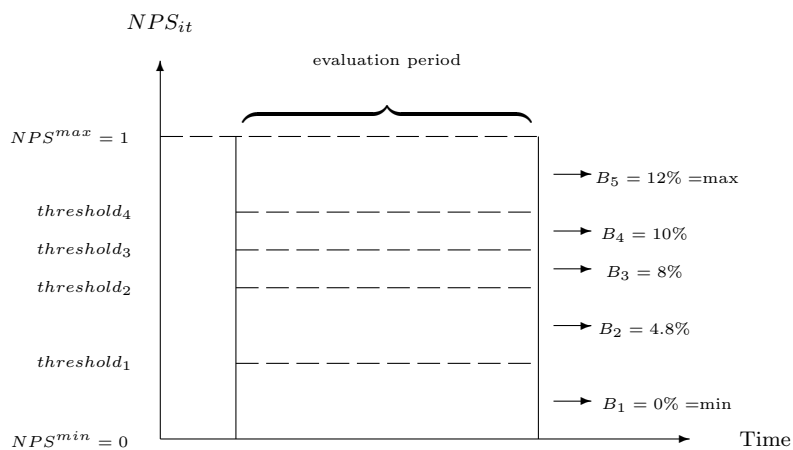
- AL-UBAYDLI, O., S. ANDERSEN, U. GNEEZY, AND J. A. LIST (2008): “For love or money? Comparing the effects of non-pecuniary and pecuniary incentive schemes in the workplace,” Discussion paper, George Mason University, mimeo.
- ASCH, B. J. (1990): “Do Incentives Matter? The Case of Navy Recruiters,” *Industrial and Labor Relations Review*, 43, pp. 89S–106S.
- AZMAT, G. AND N. IRIBERRI (2010): “The importance of relative performance feedback information: Evidence from a natural experiment using high school students,” *Journal of Public Economics*, 94, 435–452.
- BANDIERA, O., I. BARANKAY, AND I. RASUL (2005): “Social Preferences and the Response to Incentives: Evidence from Personnel Data,” *Quarterly Journal of Economics*, 120, 917–962.
- (2007): “Incentives for Managers and Inequality Among Workers: Evidence From a Firm-Level Experiment,” *Quarterly Journal of Economics*, 122, 729–773.
- (2012): “Team Incentives: Evidence from a Firm Level Experiment,” *Journal of the European Economic Association*, forthcoming.
- BATT, R., V. DOELLGAST, AND H. KWON (2005): “Service Management and Employment Systems in U.S. and Indian Call Centers,” in *Brookings Trade Forum 2005: Offshoring White-Collar Work—The Issues and Implications*, ed. by S. M. Collins and L. Brainard, Washington, D.C.: Brookings Institution Press, 335–372.

- DE GRIP, A. AND J. SAUERMANN (2012): “The Effects of Training on Own and Co-Worker Productivity: Evidence from a Field Experiment,” *Economic Journal*, 122, 376–399.
- DE GRIP, A., J. SAUERMANN, AND I. SIEBEN (2011): “Tenure-Performance Profiles and the Role of Peers: Evidence from Personnel Data,” IZA Discussion Paper 6164, Institute for the Study of Labor (IZA), Bonn.
- DOHMEN, T. AND A. FALK (2011): “Performance Pay and Multidimensional Sorting: Productivity, Preferences, and Gender,” *American Economic Review*, 101, 556–90.
- FLABBI, L. AND A. ICHINO (2001): “Productivity, seniority and wages: new evidence from personnel data,” *Labour Economics*, 8, 359–387.
- HAMILTON, B. H., J. A. NICKERSON, AND H. OWAN (2003): “Team Incentives and Worker Heterogeneity: An Empirical Analysis of the Impact of Teams on Productivity and Participation,” *Journal of Political Economy*, 111, 465–497.
- HEYWOOD, J. S., X. WEI, AND G. YE (2011): “Piece rates for professors,” *Economics Letters*, 113, 285–287.
- HOLMSTROM, B. AND P. MILGROM (1991): “Multitask principal-agent analyses: incentive contracts, asset ownership and job design,” *Journal of Law, Economics and Organization*, 7, 24–52.
- KEININGHAM, T. L., B. COOIL, T. W. ANDREASSEN, AND L. AKSOY (2007): “A Longitudinal Examination of Net Promoter and Firm Revenue Growth,” *Journal of Marketing*, 71, 39–51.

- KRIECHEL, B. AND J. SAUERMAN (2012): “Under pressure: Supervisor’s role in implicit targets and effort,” working paper, Research Centre for Education and the Labour Market (ROA), Maastricht University, mimeo.
- LAZEAR, E. P. (2000): “Performance Pay and Productivity,” *American Economic Review*, 90, 1346–1361.
- LIU, X. AND R. BATT (2007): “The Economic Pay-Offs to Informal Training: Evidence from Routine Service Work,” *Industrial and Labor Relations Review*, 61, 75–89.
- MURALIDHARAN, K. AND V. SUNDARARAMAN (2011): “Teacher Performance Pay: Experimental Evidence from India,” *Journal of Political Economy*, 119, 39–77.
- SHEARER, B. (2004): “Piece Rates, Fixed Wages and Incentives: Evidence from a Field Experiment,” *Review of Economic Studies*, 71, pp. 513–534.
- SHI, L. (2010): “Incentive Effect of Piece-Rate Contracts: Evidence from Two Small Field Experiments,” *B.E. Journal of Economic Analysis & Policy*, 10, 61.

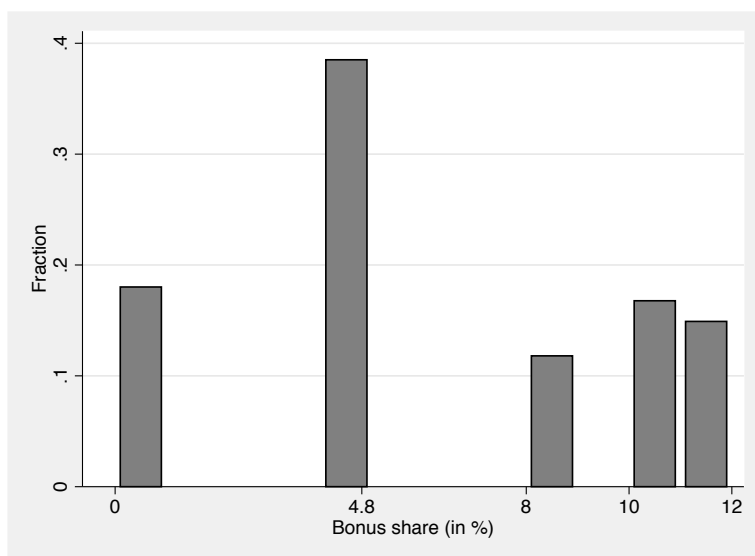
A Figures

Figure 1: Design of the bonus system



Note: B_j denotes bonus levels as a percentage of an agent's gross wage in the bonus quarter when achieving a performance level of $threshold_j$.

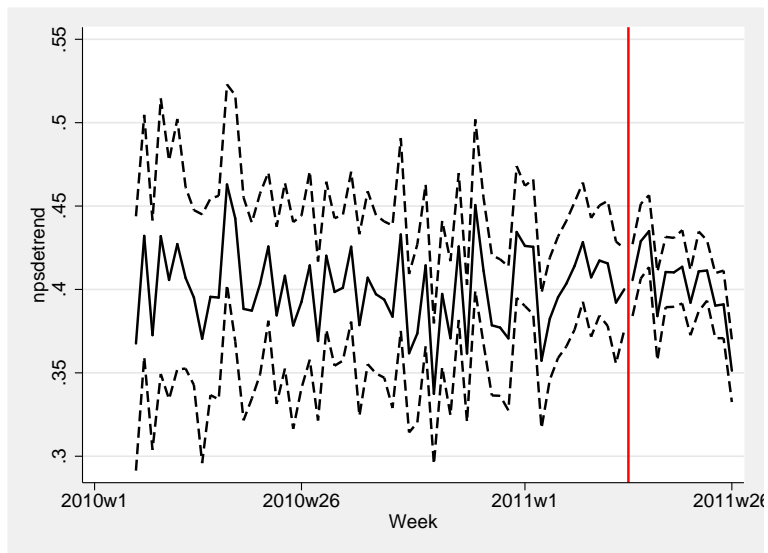
Figure 2: Distribution of bonuses paid in the first performance pay quarter



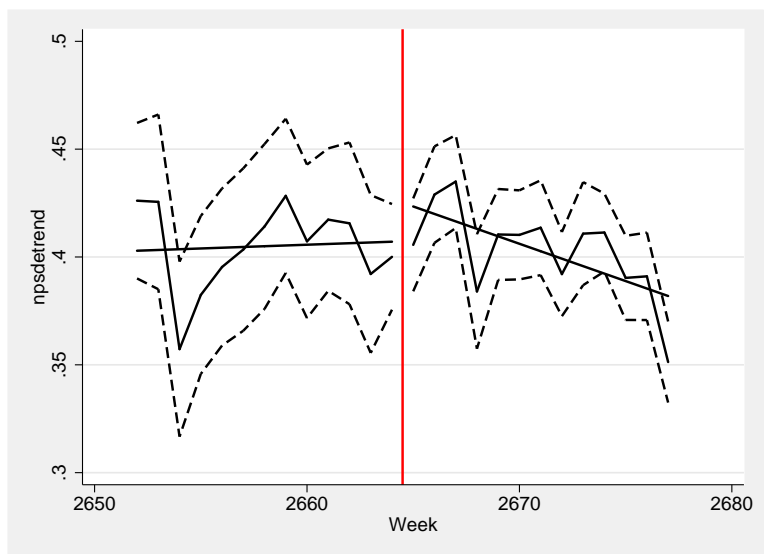
Note: This histogram shows the distribution of bonuses paid in the first quarter after the introduction of performance bonuses for service quality.

Figure 3: Service quality before and after the introduction of performance bonuses

(a) Whole sample period

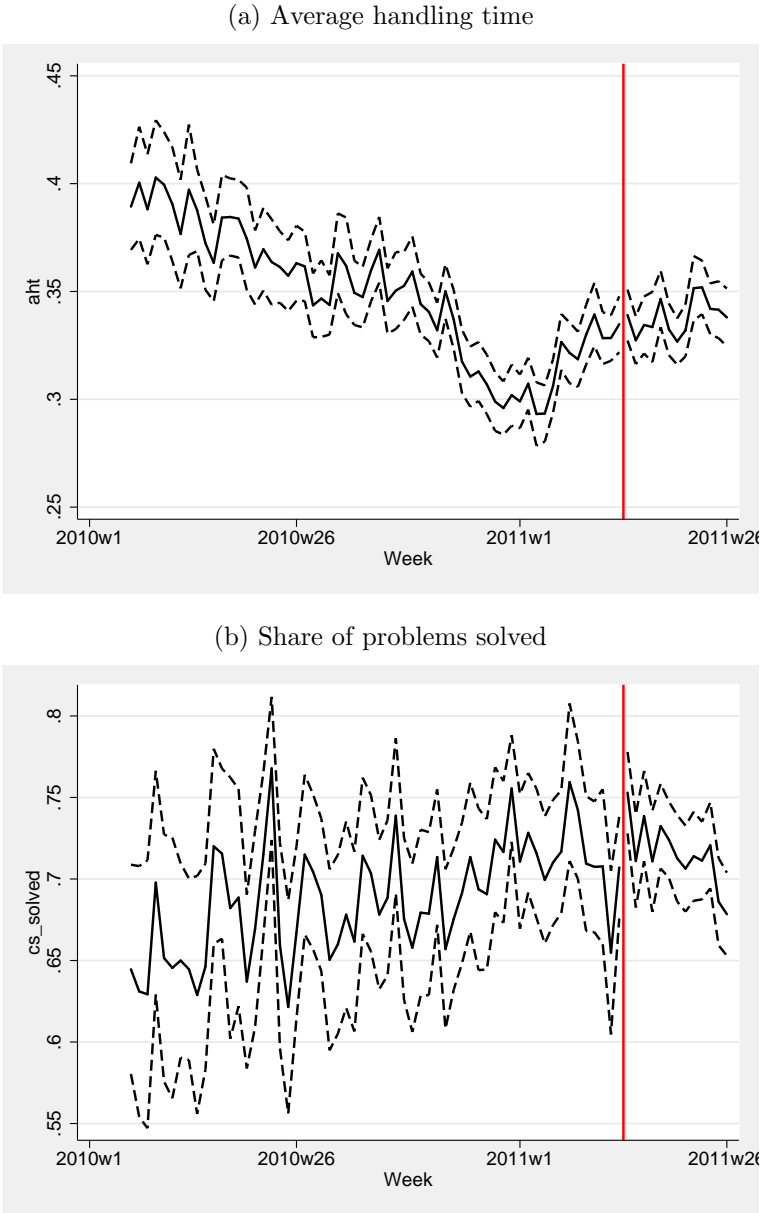


(b) Quarters before and after the introduction



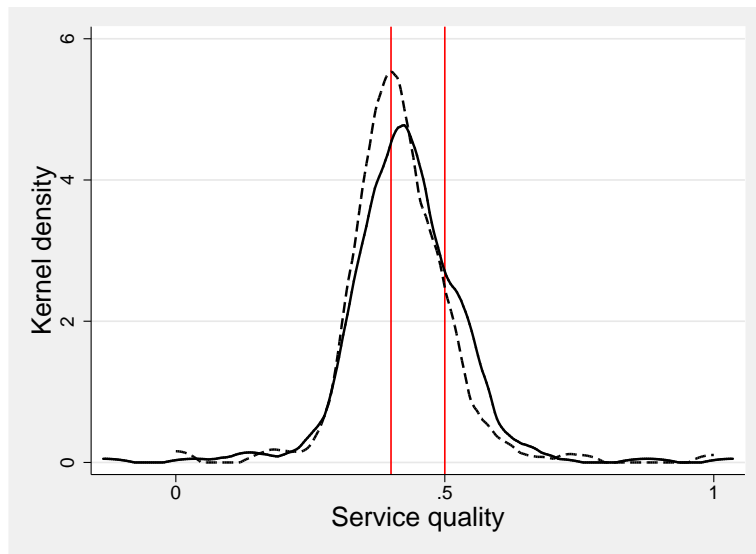
Note: This figure shows the average levels of service quality y_{it}^q before and after the introduction of incentives (vertical line). Observations are weighted by the number of evaluated calls and detrended in a regression with a linear and a squared time trend included.

Figure 4: (a) Average handling times and (b) shares of problem solved before and after the introduction of performance bonuses



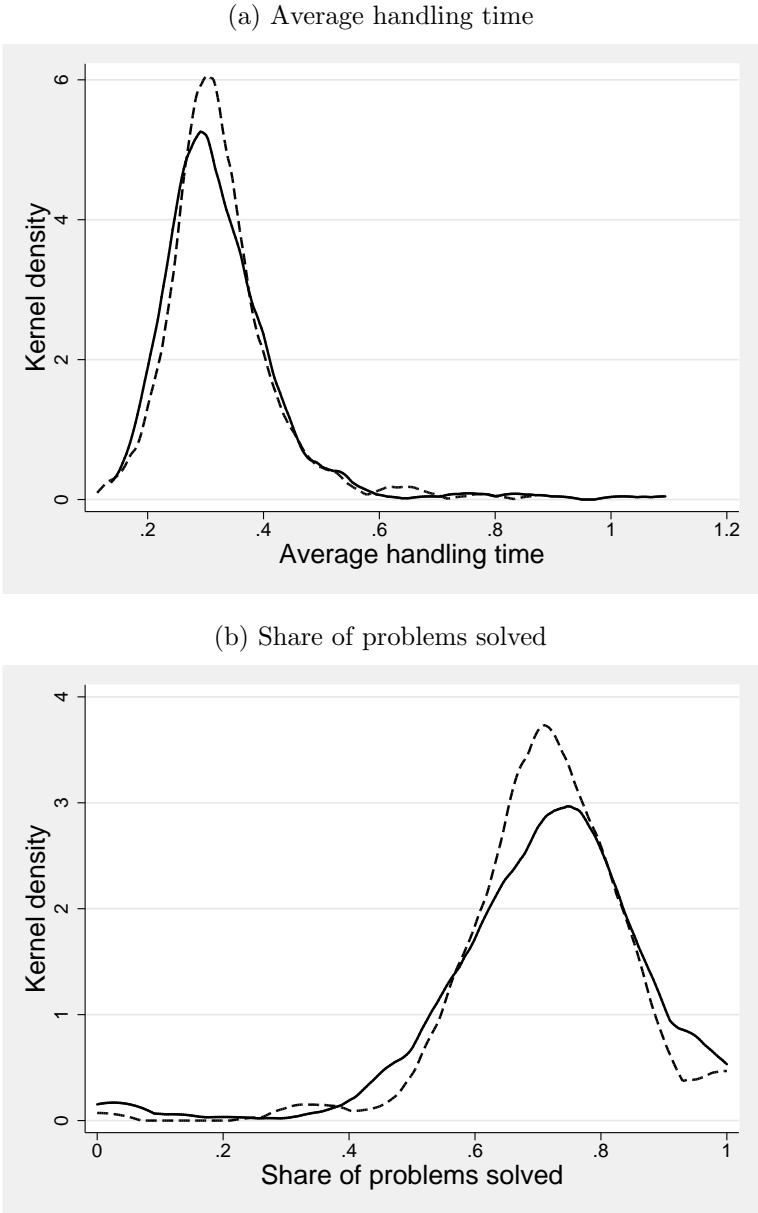
Note: Panel (a) shows the average handling performance outcomes before and after the introduction of incentives (vertical line); Panel (b) shows the corresponding outcomes for the share of problems solved. The observations in Panel (b) are weighted by the number of evaluated calls.

Figure 5: Distribution of service quality by payment scheme



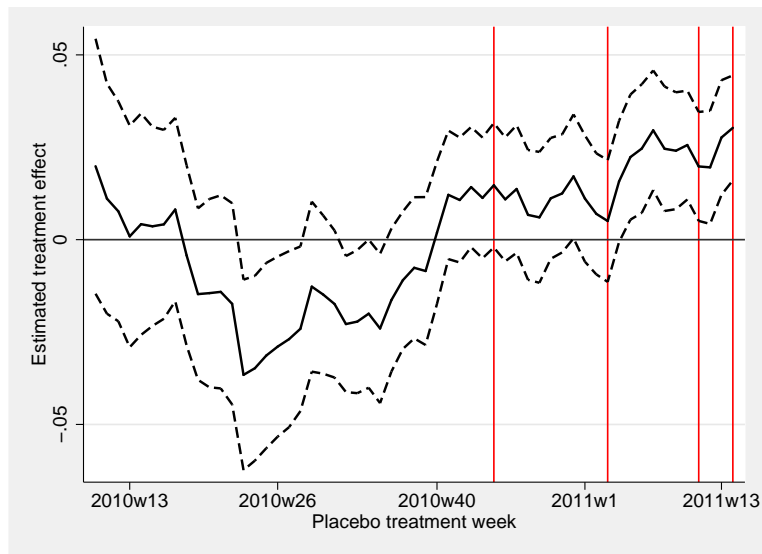
Note: This figure shows the distributions of service quality y_{it}^q in the last quarter under fixed pay (solid line) and in the first quarter under variable pay (dashed line). Vertical lines denote the lowest and highest performance thresholds for achieving the bonus under the new incentive scheme.

Figure 6: Distribution of (a) average handling times and (b) share of problem solved by payment scheme



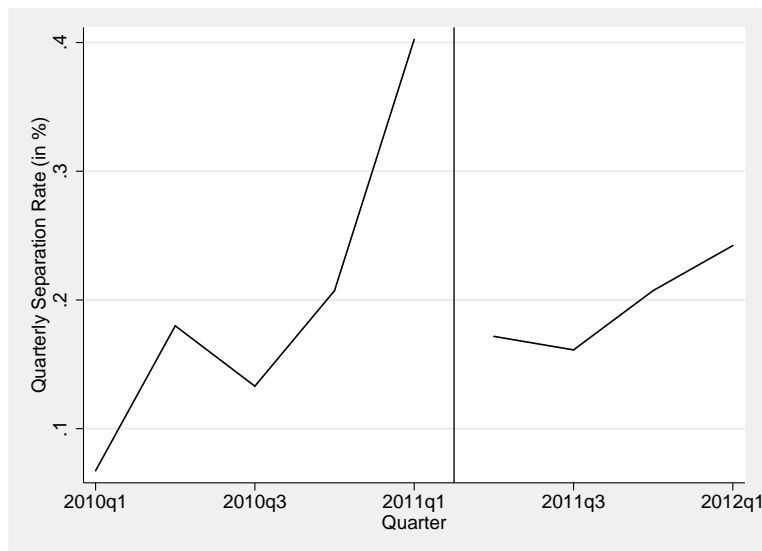
Note: This figure shows (a) the distribution of average handling times and (b) the share of problems solved in the last quarter under fixed pay (solid line) and in the first quarter under variable pay (dashed line).

Figure 7: The effect of placebo treatments on the estimated treatment effect



Note: This figure shows the estimated treatment effect when shifting the introduction hypothetically to the week mentioned on the x -axis (instead of the actual introduction in week 2011w14). The underlying regression is a regression of service quality on a linear and a quadratic time trend and worker fixed effects. The dashed lines show the corresponding 95% confidence interval.

Figure 8: Turnover rates over time



Note: This figure shows the turnover rate (ratio of the number of separations per quarter to the overall number of workers per quarter) by quarter.

B Tables

Table 1: Descriptive statistics

| | (1) | (2) |
|--|-------------|-------------------|
| | Full sample | Estimation sample |
| Gender | 0.408 | 0.404 |
| <i>(share of male agents)</i> | (0.492) | (0.492) |
| Tenure | 2.091 | 2.614 |
| <i>(in years)</i> | (3.408) | (3.753) |
| Temporary help agent | 0.612 | 0.589 |
| | (0.430) | (0.430) |
| Age | 30.085 | 31.183 |
| | (9.611) | (10.118) |
| Average working hours | 16.982 | 17.721 |
| | (7.039) | (6.574) |
| Service quality | 0.403 | 0.403 |
| | (0.082) | (0.082) |
| Average handling time | 0.326 | 0.329 |
| <i>($y_{it} = \frac{100}{ah_{it}}$)</i> | (0.095) | (0.084) |
| Share of problems solved | 0.698 | 0.699 |
| | (0.111) | (0.110) |
| Number of evaluated calls | 4.107 | 5.634 |
| | (4.049) | (3.725) |
| Number of agents | 429 | 312 |

Standard deviation in parentheses.

Table 2: Unconditional differences before and after the introduction of performance pay

| Agents: | (1) | (2) | (3) |
|---|-----------|--------------|--------------------|
| | Fixed pay | Variable pay | Difference (2)-(1) |
| Gender | 0.398 | 0.410 | 0.011 |
| <i>(share of male agents)</i> | (0.026) | (0.026) | (0.036) |
| Tenure | 2.670 | 2.584 | -0.086 |
| <i>(in years)</i> | (0.195) | (0.191) | (0.273) |
| Temporary help agent | .512 | 0.469 | -0.043 |
| | (0.025) | (0.025) | (0.036) |
| Age | 30.738 | 30.367 | -0.371 |
| | (0.544) | (0.530) | (0.761) |
| Working hours | 16.108 | 16.141 | 0.033 |
| | (0.439) | (0.414) | (0.603) |
| Service quality | 0.407 | 0.416 | 0.010 |
| | (0.008) | (0.006) | (0.008) |
| Average handling time | 0.320 | 0.327 | 0.007 |
| <i>($y_{it} = \frac{100}{aht_{it}}$)</i> | (0.006) | (0.005) | (0.008) |
| Share of problems solved | 0.711 | 0.714 | 0.004 |
| | (0.010) | (0.008) | (0.013) |
| Number of evaluated calls | 2.528 | 8.067 | 5.538 |
| | (0.129) | (0.329) | (0.358) |
| Number of agents | 359 | 371 | |

Standard errors in parentheses. Descriptive statistics are averaged for the quarter before and the quarter after the introduction of performance pay.

Table 3: The effect of performance pay on service quality (y_{it}^q)

| | (1) | (2) | (3) |
|-----------------------------|---------------------|----------------------|----------------------|
| Bonus pay dummy | 0.027*** (0.007) | 0.022*** (0.007) | 0.023*** (0.007) |
| Time trend | 0.002*** (0.001) | 0.003*** (0.001) | 0.003*** (0.001) |
| Time trend ² /10 | -0.000** (0.000) | -0.000*** (0.000) | -0.000*** (0.000) |
| Working hours | | -0.001*** (0.000) | -0.001** (0.000) |
| Temporary help agent | | -0.007 (0.005) | -0.007 (0.008) |
| Constant | 0.357*** (0.015) | 0.338*** (0.020) | 0.331*** (0.023) |
| Controls (department) | No | Yes | Yes |
| Individual fixed effects | No | No | Yes |
| R^2 | 0.012 | 0.058 | 0.140 |
| N (agents) | 312 | 312 | 312 |
| N | 9525 | 9525 | 9525 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Dependent variable: y_{it}^q . All regressions are weighted by the number of evaluated calls in week t for agent i and include dummies for the number of evaluated calls for each agent-week observation. All standard errors are clustered at the agent level.

Table 4: The effect of the introduction of performance bonuses on average handling time and share of problems solved

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------------|-----------------------|----------------------|----------------------|--------------------------|----------------------|----------------------|
| Performance outcome | Average handling time | | | Share of problems solved | | |
| Bonus pay dummy | 0.021*** (0.005) | 0.027*** (0.005) | 0.021*** (0.005) | 0.021** (0.009) | 0.028*** (0.009) | 0.029*** (0.009) |
| Time trend | -0.003*** (0.001) | -0.001** (0.001) | -0.001** (0.001) | 0.004*** (0.001) | 0.005*** (0.001) | 0.004*** (0.001) |
| Time trend ² /10 | 0.000*** (0.000) | -0.000 (0.000) | 0.000 (0.000) | -0.000*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) |
| Working hours | | -0.002*** (0.000) | -0.002*** (0.000) | | -0.001*** (0.000) | -0.001** (0.000) |
| Temporary help agent | | -0.023*** (0.006) | 0.001 (0.006) | | -0.000 (0.006) | -0.005 (0.010) |
| Constant | 0.411*** (0.012) | 0.429*** (0.016) | 0.399*** (0.015) | 0.618*** (0.018) | 0.623*** (0.024) | 0.638*** (0.025) |
| Weighting | No | No | No | Yes | Yes | Yes |
| Controls (department) | No | Yes | Yes | No | Yes | Yes |
| Individual fixed effects | No | No | Yes | No | No | Yes |
| R^2 | 0.038 | 0.239 | 0.553 | 0.018 | 0.078 | 0.165 |
| N (agents) | 428 | 428 | 428 | 312 | 312 | 312 |
| N | 15584 | 15584 | 15584 | 9495 | 9495 | 9495 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Dependent variable: average handling time (Columns (1) through (3)); share of problems solved (Columns (4) through (6)). Regression presented in Columns (4) through (6) furthermore include dummies for the number of evaluated calls for each agent-week observation. All standard errors are clustered at the agent level.

Table 5: Heterogenous effects of the introduction of performance bonuses on performance outcomes

| Ability quartile | (1) | (2) | (3) | (4) |
|---|---------------------|---------------------|---------------------|---------------------|
| (a) Dependent variable: Service quality | | | | |
| Bonus pay dummy | 0.088*** (0.014) | 0.034*** (0.012) | -0.007 (0.012) | -0.034** (0.015) |
| R^2 | 0.125 | 0.114 | 0.106 | 0.161 |
| N (agents) | 65 | 62 | 58 | 63 |
| N | 2303 | 2595 | 2243 | 2063 |
| (b) Dependent variable: Average handling time | | | | |
| Bonus pay dummy | 0.016 (0.012) | 0.034*** (0.007) | 0.037*** (0.008) | 0.029** (0.011) |
| R^2 | 0.426 | 0.660 | 0.605 | 0.497 |
| N (agents) | 65 | 62 | 58 | 63 |
| N | 3112.000 | 3083.000 | 3083.000 | 3029.000 |
| (c) Dependent variable: Share of problems solved | | | | |
| Bonus pay dummy | 0.088*** (0.021) | 0.024 (0.016) | 0.006 (0.018) | -0.005 (0.018) |
| R^2 | 0.191 | 0.139 | 0.124 | 0.180 |
| N (agents) | 65 | 62 | 58 | 63 |
| N | 2295 | 2587 | 2237 | 2056 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. All regressions for *service quality* and *share of problems solved* are weighted by the number of evaluated calls in week t for agent i and include dummies for the number of evaluated calls for each agent-week observation. All regressions control for department, and individual fixed effects. All standard errors are clustered at the agent level. Ability quartiles are generated based on agents' average service quality in the quarter *before* the introduction.

Table 6: Seasonal effects and performance pay

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--------------------|
| Sample period | All | 2010w14-2011w26 | 2010w27-2011w26 | 2010w40-2011w26 | 2011w1-2011w26 | 2011w10-2011w17 |
| Bonus pay dummy | 0.050** (0.021) | 0.023*** (0.007) | 0.027*** (0.007) | 0.026*** (0.008) | 0.018** (0.009) | 0.032** (0.016) |
| Time trend | 0.006*** (0.001) | 0.004*** (0.001) | 0.007*** (0.001) | 0.011*** (0.003) | 0.025*** (0.008) | -0.045 (0.116) |
| Time trend ² /10 | -0.001*** (0.000) | -0.000*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) | -0.002*** (0.001) | 0.003 (0.009) |
| Constant | 0.243*** (0.036) | 0.311*** (0.031) | 0.236*** (0.050) | 0.143 (0.096) | -0.286 (0.246) | 1.913 (3.565) |
| Seasonal controls | Yes | No | No | No | No | No |
| R^2 | 0.143 | 0.145 | 0.154 | 0.170 | 0.206 | 0.254 |
| N (agents) | 312 | 311 | 311 | 310 | 309 | 247 |
| N | 9525 | 9001 | 7995 | 6776 | 5155 | 1605 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Dependent variable: y_{it}^q . Weighted regressions are weighted by the number of evaluated calls in week t for agent i . All standard errors are clustered at the agent level. All regressions include controls for individual fixed effects, department dummies, controls for working hours, employment status, and dummies for the number of evaluated calls for each agent-week observation.

Table 7: The effect of performance pay on service quality and individual time trends

| | (1) |
|-----------------------------|----------------------|
| Bonus pay dummy | 0.024*** (0.007) |
| Time trend | -0.000 (0.000) |
| Time trend ² /10 | -0.000*** (0.000) |
| Working hours | -0.000 (0.000) |
| Temporary help agent | 0.005 (0.010) |
| Constant | 0.393*** (0.026) |
| R^2 | 0.180 |
| N (agents) | 312 |
| N | 9525 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. Dependent variable: y_{it}^a . The regression is weighted by the number of evaluated calls in week t for agent i and controls for department and individual fixed effects, working hours, employment status, and dummies for the number of evaluated calls for each agent-week observation. Furthermore, the regression contains all interactions between individual fixed effects and a linear time trend. All standard errors are clustered at the agent level.