How Much Does Your Boss Make?

The Effects of Salary Comparisons

Zoë Cullen  
Harvard Business School

Ricardo Perez-Truglia*  
University of California, Los Angeles

Preliminary Draft, Do Not Circulate
This Version: December 2017. Click Here for Latest Version

Abstract

We study how employees learn about the salaries of their peers and managers, and how those beliefs affect their own behavior. We conducted a field experiment with a sample of 2,000 employees from a multi-billion-dollar corporation. We combine rich data from surveys and administrative records with an experiment that provided some employees with accurate information about the salaries of others. First, we document large misperceptions about salaries and identify some of the sources of these misperceptions. Second, we find significant behavioral elasticities with respect to the perceived salaries of other employees. These effects are different for horizontal and vertical comparisons: while higher perceived peer salary decreases effort, output and retention, higher perceived manager salary has a positive effect on those same outcomes. We discuss evidence on the underlying mechanisms, and implications for pay inequality and pay transparency.

JEL Classification: D03, D60, D31, D80, I31, K34, Z10.

Keywords: salary, transparency, relative concerns, inequality, productivity.

* Cullen: zcullen@hbs.edu, Rock Center 312, Boston, MA 02163. Perez-Truglia: ricardo.truglia@anderson.ucla.edu, 110 Westwood Plaza, Los Angeles, CA 90095. We are thankful for comments from Mikhail Galashin, Bobak Pakzad-Hurson, Gautam Rao, Romain Wacziarg, Melanie Wasserman and seminar discussants at UCLA-Anderson, Wharton, Northwestern, Caltech, Dartmouth, Columbia and Berkeley. Anh Thi Ngoc Nguyen, Thanh Do Phuong and Ly Bui Hoang provided excellent research assistance. This project was reviewed and approved by the Institutional Review Board at University of California Los Angeles (IRB#17-001529).
1 Introduction

Employees may care about the salaries of other employees inside the firm, such as the salaries of peers and managers. They may use this information to form expectations about their own future salary, or they may have fairness or inequity concerns. As a result, changing the salary of one employee can affect the behavior of other employees in the firm. These externalities can have important implications for the provision of incentives within the firm. In this paper, we address this question using a large-scale, high-stakes field experiment in collaboration with a multi-billion-dollar corporation.

We designed and conducted a field experiment involving a sample of 2,000 employees from a large commercial bank. The research design allows us to explore how employees learn about the salaries of their peers and managers, and how those beliefs affect their own behavior. To do this, we combine three sources of data: a tailored survey, information-provision and information-acquisition experiments, and rich administrative data on the behavior of the employees such as real time data on the swipes in and out of the office, emails sent and received, sales performance, promotions, transfers and exits.

The first part of the research design addresses the formation of salary perceptions. Employees report to be equally interested in learning about the salaries of their peers (i.e., employees in the same position and unit) and about the salaries of their superiors. Our survey elicited beliefs about the average salary among one’s peers and the average salary among one’s managers, using an incentivized method. This research design distinguishes between two forms of pay comparisons: horizontal comparisons (i.e., own salary relative to peer salary) and vertical comparisons (i.e., own salary relative to the manager salary).

By comparing the perceived salaries with the actual salaries from the firm’s administrative records, we can measure salary misperceptions. Moreover, to disentangle the sources of these misperceptions, we embedded an information-acquisition experiment: we elicited the willingness to pay for information about peer salary and manager salary, using an incentive-compatible method.

The second part of the research design addresses the behavioral effects of salary perceptions. We employ an information-provision experiment: for each employee, we flipped a coin to decide whether she would receive a piece of information about the average salary among peers; and we flipped another coin to decide if the employee would receive a piece of information about the average salary among managers.

Because employees react to the information provided to them, this experiment generated exogenous variation in the salary perceptions that the employees held after the information-provision. We can use administrative records to see whether these exogenous shocks to
perceived salaries translated into differences in behavior in the days or months after the survey was completed. We introduce a simple instrumental-variables model that exploits the experimental variation in beliefs to estimate the structural parameters of interest, the cross-salary elasticities: e.g., the percent change in effort for each percent increase in the perceived manager salary.

The first set of findings documents significant information frictions. Employees have large and systematic misperceptions about the salaries of their managers and their peers. These misperceptions are substantial at all levels of the firm, and for all demographic subgroups. We show that a substantial part of these misperceptions are due to lack of information instead of just lack of interest: on average, employees are willing to pay 14 days worth of salary for a signal about the average salary of their peers, and a similar amount for a signal about the average salary of their managers.

We show evidence that the information frictions arise from barriers to social learning. Our information-experiment reveals that even though each employees learns from the information provided to herself, that information does not travel to other employees in the network, not even to her closest peers. This evidence is consistent with non-experimental evidence. We show that employees who gossip more and employees who are more central in the network do not have more accurate beliefs about the average peer salary. Moreover, employees perceptions about average peer salary are not more accurate than what you would expect if their own salary was the only information that they had access to.

The second set of findings documents large effects of salary perceptions on employee behavior. The cross-salary elasticities are statistically and economically significant, and their sign depends on whether the comparisons are vertical or horizontal. A higher perceived peer salary has negative effects on effort, output and retention. For example, a 1% increase in perceived peer salary decreases the number of emails sent by 0.63%, implying a behavioral elasticity of -0.63. Vertical comparisons have the opposite effects as horizontal comparisons: higher perceived manager salary has positive effects on effort, output and retention. For instance, a 1% increase in perceived manager salary increases the number of emails sent by 0.18%, implying a behavioral elasticity of 0.18.

These behavioral effects are persistent over time, they are distributed homogeneously through different groups of employees, and they are robust across different specifications. We do not find evidence of asymmetric effects, such as peer comparisons depending on whether the employee is above or below the average peer salary – however, we cannot rule out moderate asymmetries.

We provide some suggestive evidence about the mechanisms behind these behavioral elasticities. To accomplish this, we measure the effects of perceptions on survey outcomes
(e.g., future salary expectations), and we exploit heterogeneity analysis. Regarding horizontal comparisons, we find evidence of two channels being at play. On the one hand, higher peer salary increases expected future salary, which motivates employees. However, there is a separate negative channel that trumps the first channel, which could be attributed to social concerns. Regarding vertical comparisons, we find again evidence of career concerns: higher manager salary increases expected future salary, which motivates employees. However, we do not find any evidence of social concerns being at play in vertical comparisons.

Since it increased pay transparency at the margin, our information-provision experiment allows for an impact-evaluation of pay transparency. We find that higher transparency has an insignificant average effect on most forms of behavior, except for retention, for which it has a positive and significant average effect. This evidence suggests that this firm may be better off by increasing pay transparency at the margin. At the same time, our evidence suggests that the average employee would benefit from higher transparency. First, transparency provides employees with information for which they revealed to be willing to pay significant amounts. Second, according to survey data, the vast majority of employees report to be in favor of higher transparency as long as it discloses salary averages by positions instead of revealing the salaries of specific employees.

Our findings have a number of implications. First, we find that horizontal rewards have negative externalities while vertical rewards have positive externalities. This provides an explanation for the robust fact that firms provide most of the financial incentives vertically (e.g., promotions) instead of horizontally (e.g., performance pay). Similarly, our evidence can also explain why firms discriminate against minorities, such as females, vertically rather than horizontally: e.g., in the firm where the experiment was conducted, 92% of the gender pay gap comes from vertical differences and only 8% through horizontal differences.

Second, there is a widespread view that social comparisons put pressure to compress salary differentials within the firm (Frank, 1984; Hamermesh, 1975), and a similar morale-based argument is used to explain wage rigidities (e.g., Solow, 1979; Bewley, 1999). Our findings suggest that this view is only true in a narrow sense: while this channel may force firms to reduce horizontal inequality, firms are not restricted in their use of vertical inequality. Moreover, our findings suggest that policies aimed at reducing pay inequality by promoting pay transparency may be less effective than previously thought.

Our paper is related to several strands of literature. While there is a long standing theoretical literature on relative salary (e.g., Frank, 1984; Romer, 1984; Summers, 1988; Akerlof and Yellen, 1990), the empirical evidence has been lagging behind. In a seminal contribution, Card, Mas, Moretti and Saez (2012) conducted a field experiment to explore the effects of wage transparency in a university. They took a sample of university employees,
and sent a random subsample of them an email with information about the website that listed the salaries of every employee at that university. One week later, the researchers sent a follow-up survey to the entire subject pool. They found that, for workers with below-median salaries within their occupation, receiving the link to the website decreased job satisfaction and increased the stated job search effort.

Since Card et al. (2012), others have studied the broader consequences of pay transparency (Cullen and Pakzad-Hurson, 2015; Perez-Truglia, 2015; Rege and Solli, 2015; Mas, 2017). Additionally, there is a long standing literature in psychology and economics that measures the effects of unequal piece-rates on task performance, both in the laboratory (Charness and Kuhn, 2007; Clark, Masclet and Villeval, 2010) and in the field (Pritchard, Dunnette & Jorgenson, 1972; Valenzi and Andrews, 1971; Schmitt and Marwell, 1972; Breza, Kaur, Shamdasan, 2017; Huet-Vaughn, 2017).

Our study makes four key contributions to the existing literature. First, while the existing evidence focuses on horizontal comparisons, we are the first to incorporate vertical comparisons as well. This is important because vertical inequality comprises the vast majority of the within-firm inequality. In the firm where our experiment was conducted, 95% of the pay inequality is vertical and the remaining 5% is horizontal – this decomposition is in the same order of magnitude for other firms.1 Since individuals react with opposite signs to horizontal and vertical comparisons, the distinction between the two ends up being critical.

Second, we contribute from a methodological perspective. Rather than estimating the reduced-form effects of inequality or transparency, our novel research design identifies the structural parameters of interest, the cross-salary elasticities, by combining an information provision experiment, survey data and behavioral data.

Third, this study is unique in terms of the scope of the field experiment. This is a high-stakes environment for our subjects, with thousands of careers and billions in revenues at stake. This firm provides an environment that is quite representative of large firms around the world in key aspects such as pay transparency, salary inequality and norms about pay secrecy. Moreover, the close collaboration with the firm allowed us to measure some aspects of the employee’s life that had not been studied before, such as their behavior, perceptions, willingness to pay for information and diffusion of information in the network, among others.

Fourth, our information-provision experiment provides arguably the first impact-evaluation analysis of higher pay transparency. Most companies in the world, including the firm where this experiment was implemented, actively choose not to be transparent about pay even though they do not have hard evidence that such policy is in the firm’s best interest. Even though we cannot generalize the findings to all firms, our evidence at least suggests

---

1 Details about the inequality decomposition reported in Appendix B.
that more firms should experiment with higher transparency, and that governments should consider disclosure policies too.

Our study also contributes to a growing literature showing that individuals have substantial misperceptions of their relative income (e.g., Cruces, Perez-Truglia, and Tetaz 2013; Karadja, Mollerstrom, and Seim 2017). While this literature shows that correcting these misperceptions has significant effects on stated preferences for redistribution, there is little evidence on whether these misperceptions affect behavior (Bottan and Perez-Truglia, 2017). We show that misperceptions about relative salary can have substantial consequences for behavior.

The rest of the paper proceeds as follows. Sections 2 and 4 describe the research design and the survey design, respectively. Section 4 presents the implementation details and the administrative data. Section 5 presents the results about the formation of salary perceptions. Section 6 presents the results on behavioral elasticities. Section 7 presents the impact-evaluation of transparency. The last section concludes.

2 Research Design

In this section, we introduce the conceptual framework, hypotheses and the econometric model used to identify the behavioral elasticities.

2.1 Conceptual Framework and Hypotheses

We focus on perceptions of average salary among peers and among managers. Following Card et al. (2012), we define peers as those employees who share the same position title and organizational unit. For instance, the peers of a teller in a certain branch would be all the other tellers in the same branch; the peers of a junior researcher in the investment banking division would be all the other junior researchers in the same division. In turn, one’s manager can consist of employees who are in positions of higher level, which supervise the individual’s work to some extent and to which the employee could aspire to be promoted to. For example, the managers of a teller could be the teller supervisors; the managers of a junior researcher in the investment banking division could be the senior researchers.

Let subscript $i$ index employees. Let $O_i$ be $i$’s own salary – think of basic salary, without any commissions or bonuses. Let $P_i$ be $i$’s perception about the average salary among $i$’s peers. Let $M_i$ be $i$’s perception about the average salary among $i$’s managers.

Let $Y_i$ be a form of employee $i$’s behavior, such as the effort or sales performance. The following equation establishes the potential relationship between behavior and salaries: