Envy in the Workplace

Ester Manna*

February 11, 2016

Abstract

I study how envy in the workplace affects the optimal employment contract when employees differ in their productivity and this is their private information. The employees' envy towards their colleagues distorts the levels of effort exerted by the less productive employees. However, when employees are also envious towards their boss this distortion is mitigated.

Keywords: Adverse-Selection Model, Envious Employees.

JEL classifications: D03, D82, M54.

1 Introduction

Lavish CEO compensation often makes headlines and many commentators highlight how executives' bonuses and perks can rankle. This is especially so when there is a hefty difference with the average worker pay (see Mishel and Sabadish, 2012). Moreover, pay inequality among peers can also be detrimental to the work atmosphere as highlighted by recent experimental evidence (see Breza et al., 2015). Surveys and empirical evidence show that employees are interested in how their wage compares to the firm's profits and/or to the colleagues' wage (see Bewley, 1995, 1999, Blinder and Choi, 1990, Campbell and Kamlani, 1997, and Card et al., 2012).

This paper studies the interaction between envy towards the boss and the colleagues. So far these two forms of envy have been studied separately. Dur and Glazer (2008) have studied the case in which employees are envious towards their boss. The present article departs from their analysis considering that employees can differ in their productivity and this is their own private information. Moreover, like Desiraju and Sappington (2007) and von Siemens (2011, 2012), I assume that employees can envy their peers. In the model, I consider both forms of envy simultaneously and I highlight the presence of an interaction effect between them.

By focusing on an adverse-selection problem, this paper also complements the literature that studies optimal incentive contracts when employees are motivated by fairness considerations in a moral hazard setting (see among others Bartling and von Siemens, 2010, Englmaier and Wambach, 2010, Kragl and Schmid, 2009, and Neilson and Stowe, 2010).[1]

*ester.manna1@gmail.com. Universitat de Barcelona, Department of Economic Theory, Av. Diagonal, 696, 08034 Barcelona, Spain.

[1]With the exception of Englmaier and Wambach (2010), the other articles cited in the text study a situation in which the employees envy their colleagues but not their boss.

2 The Model

I develop a model with one principal (the boss) and multiple agents (employees). The boss offers a contract to her employees which consists of a wage ω and effort e. The effort of each employee is observable and verifiable.

There is a continuum of employees with measure one. Employees may differ in their cost of exerting effort (henceforth, productivity) θ with $\theta \in \{\underline{\theta}, \overline{\theta}\}$ and $\Delta\theta = \overline{\theta} - \underline{\theta} > 0$; μ is the fraction of high-productivity employees and $1-\mu$ is the fraction of low-productivity employees and $\mu \in (0,1)$. Employees are risk neutral, wealth constrained, and have a reservation wage of zero. The low-productivity and the high-productivity employees' utilities are:

$$\begin{aligned} V_L &= \omega_L - \frac{\overline{\theta}}{2}e_L^2 - \alpha(\max\{\Pi - R_L, 0\}) - \beta(\max\{R_H - R_L, 0\}); \\ V_H &= \omega_H - \frac{\underline{\theta}}{2}e_H^2 - \alpha(\max\{\Pi - R_H, 0\}) - \beta(\max\{R_L - R_H, 0\}). \end{aligned} \tag{1}$$

where Π are the boss' profits and R_i is the material rent paid to employee i with $i = L, H$. The material rent is defined as the difference between the wage and the cost of exerting effort.

Employees may suffer a utility loss whenever they feel worse off than their boss and/or colleagues. An employee may be envious towards the boss if the difference between the boss' profits and his own rent is positive. The parameter $\alpha \geq 0$ measures the employees' envy towards their boss. An employee may be envious towards his colleagues if he receives a lower rent than that of other employees in the firm. The parameter $\beta \geq 0$ measures the employees' envy towards a higher-net-earner colleague. α and β are common knowledge.[2]

The **timing of the game** is as follows. In stage 0, each employee is informed about his own type; in stage 1, the boss offers a menu of contracts consisting of levels of effort and wages; in stage 2, employees independently decide whether or not to accept the contract. Once hired the employment contract and the type of each employee become common knowledge;[3] in stage 3, the effort is exerted, production is undertaken, wages are paid, and profits are realized.

2.1 The Benchmark Case

If productivity is observable, the boss can exactly compensate each employee for his production costs. Since there will be no rent inequality, the employees' envy may solely be directed towards their boss. The wages cover the cost of effort plus the employee's disutility due to envy, making each employee indifferent between accepting and rejecting the contract, given the required level of effort:

$$\omega_L = \frac{\overline{\theta}}{2}e_L^2 + \alpha(\Pi - R_L); \quad \omega_H = \frac{\underline{\theta}}{2}e_H^2 + \alpha(\Pi - R_H). \tag{2}$$

Since $R_L = \omega_L - \frac{\overline{\theta}}{2}e_L^2$ and $R_H = \omega_H - \frac{\underline{\theta}}{2}e_H^2$, equation (2) can be rewritten as:

$$\omega_L = \frac{\overline{\theta}}{2}e_L^2 + \frac{\alpha}{1+\alpha}\Pi; \quad \omega_H = \frac{\underline{\theta}}{2}e_H^2 + \frac{\alpha}{1+\alpha}\Pi. \tag{3}$$

Proposition 1 illustrates the optimal contract:

[2]The assumption that employees compare material rents is supported by social psychologists like Adams (1963) and Festinger (1962). They argue that workers desire a fair relation between production costs and income.

[3]There is no renegotiation between the boss and the employees. This assumption allows the employees to compare their rents.

Proposition 1. *With perfect information on the employees' productivity,*

- *required levels of effort are:* $e_L^{FB} = \frac{1}{\overline{\theta}} < e_H^{FB} = \frac{1}{\underline{\theta}}$;
- *wages are:* $\omega_L^{FB} = \frac{1}{2\overline{\theta}} + \frac{\alpha(\underline{\theta}+\mu\Delta\theta)}{2(1+2\alpha)\underline{\theta}\overline{\theta}} < \omega_H^{FB} = \frac{1}{2\underline{\theta}} + \frac{\alpha(\underline{\theta}+\mu\Delta\theta)}{2(1+2\alpha)\underline{\theta}\overline{\theta}}$.

With perfect information on the employees' productivity, the levels of effort exerted by the employees are not affected by α. But a higher α has a positive impact on wages, i.e. $\frac{\partial \omega_i^{FB}}{\partial \alpha} = \frac{(\underline{\theta}+\mu\Delta\theta)}{2(1+2\alpha)^2\underline{\theta}\overline{\theta}} > 0$ with $i = L, H$. An employee who is envious towards his boss receives a higher wage irrespective of whether he has high or low productive abilities. The boss shares her profits with her employees and α has a negative impact on them. Thus, the presence of envy towards the boss affects the employees' wages even when there is perfect information. In contrast, the presence of envy towards colleagues is inconsequential at this stage of the analysis.

3 Screening Problem

When the employees' productivity is their private information, the boss maximizes her profits subject to participation and incentive constraints.

Proposition 2 illustrates the optimal contract:

Proposition 2. *With asymmetric information on the employees' productivity,*

- *required levels of effort are:* $e_L^{SB} = \frac{(1-\mu)(1+\alpha)}{\overline{\theta}(1-\mu)(1+\alpha)+[\beta+\mu(1+\alpha)]\Delta\theta} < e_H^{SB} = \frac{1}{\underline{\theta}}$;
- *wages satisfy the following:*

$$\begin{aligned} \omega_L^{SB} &= \frac{\overline{\theta}}{2}(e_L^{SB})^2 + \frac{\alpha}{1+\alpha}\Pi + \frac{\beta}{2(1+\alpha)}\Delta\theta(e_L^{SB})^2; \\ \omega_H^{SB} &= \frac{\underline{\theta}}{2}(e_H^{SB})^2 + \frac{\alpha}{1+\alpha}\Pi + \frac{\beta}{2(1+\alpha)}\Delta\theta(e_L^{SB})^2 + \frac{1}{2}\Delta\theta(e_L^{SB})^2. \end{aligned} \tag{4}$$

To better understand the complementarity between these two forms of envy, I start analyzing them separately.

When employees are only envious towards their boss, i.e. $\alpha > 0$ and $\beta = 0$, the levels of effort exerted by the employees are not affected by α:

$$e_L^{SB} = \frac{1-\mu}{\overline{\theta}(1-\mu)+\mu\Delta\theta}; \quad e_H^{SB} = \frac{1}{\underline{\theta}}.$$

The presence of asymmetric information only leads to an information rent given to the high-productivity employees and a distortion in the level of effort exerted by the low-productivity employees. However, this is the standard distortion observed in an adverse-selection model and is not affected by the presence of envy towards the boss.

When employees are only envious towards their colleagues, i.e. $\alpha = 0$ and $\beta > 0$, β has a negative impact on the effort provided by the low-productivity employees:

$$e_L^{SB} = \frac{1-\mu}{\overline{\theta}(1-\mu)+(\beta+\mu)\Delta\theta}; \quad e_H^{SB} = \frac{1}{\underline{\theta}}.$$

As β increases so do the material rents paid to both types of employees. The boss has to compensate the low-productivity employees who suffer a utility loss since the high-productivity ones receive an information rent. This gives rise to a material rent which is given to the low-productivity employees. In addition to the information rent, the boss must pay the same material rent to the high-productivity employees to avoid them mimicking the low-productivity ones. Since these material rents are costly for the boss and they depend on e_L, the boss finds it profitable to further distort away from efficiency the effort of the low-productivity employees with respect to the standard adverse-selection problem without envy.[4] Unlike the envy towards their boss, the envy towards a higher-net-earner colleague magnifies the distortion in the effort exerted by the low-productivity employees.

When both forms of envy are present, β continues to impact negatively on the effort exerted by the low-productivity employees. However, since $\alpha > 0$, the distortion in the low-productivity employees' effort is mitigated.[5] Intuitively, for the reasons previously explained, the boss must provide both types of employees with some material rents because $\beta > 0$. This leads to a reduction in the differences between the boss' profits and the material rents, which are the objects of the employees' envy towards the boss. In other words, being envious towards a higher-net-earner colleague reduces the envy towards the boss. Since an increase in e_L leads to an increase in R_L and R_H, and then in a reduction in the differences $\Pi - R_L$ and $\Pi - R_H$, the boss finds it profitable to distort less the effort exerted by the low-productivity employees as compared to the case in which $\alpha = 0$. This result demonstrates the presence of a complementarity between these two forms of envy:

$$\frac{\partial^2 e_L^{SB}}{\partial\alpha\partial\beta} = \frac{\Delta\theta(1-\mu)}{[\overline{\theta}(1-\mu)(1+\alpha)+[\beta+\mu(1+\alpha)]\Delta\theta]^2} - \frac{2\beta\Delta\theta^2(1-\mu)}{[\overline{\theta}(1-\mu)(1+\alpha)+[\beta+\mu(1+\alpha)]\Delta\theta]^3} > 0.$$

4 Conclusions

Envy affects the optimal contracts offered to heterogenous employees and its impact crucially depends on who is the object of the employees' envy. Envy never distorts the effort of the high-productivity employees. However, it distorts the effort of the low-productivity employees when the envy is directed towards the high-productivity colleagues. This distortion is mitigated when employees also envy their boss. I shed light on the complementarity between these two forms of envy which is new in the literature.

A Appendix A

A.1 Proof of Proposition 1

Profits are given by:

$$\Pi = \mu[e_H - \omega_H] + (1-\mu)[e_L - \omega_L], \tag{5}$$

[4] As in the previous case, since the material rents do not depend on the effort exerted by the high-productivity employees, optimization calls for no distortion away from the first-best for these employees.

[5] α and β have an opposite impact on the levels of effort exerted by the less productive employees:

$$\frac{\partial e_L^{SB}}{\partial\alpha} = \frac{\beta\Delta\theta(1-\mu)}{[\overline{\theta}(1-\mu)(1+\alpha)+[\beta+\mu(1+\alpha)]\Delta\theta]^2} > 0; \quad \frac{\partial e_L^{SB}}{\partial\beta} = -\frac{(1+\alpha)\Delta\theta(1-\mu)}{[\overline{\theta}(1-\mu)(1+\alpha)+[\beta+\mu(1+\alpha)]\Delta\theta]^2} < 0.$$

The boss maximizes equation (5) subject to equation (3). Profits can be rewritten as:

$$\Pi = \frac{1+\alpha}{1+2\alpha}\left[\mu\left(e_H - \frac{\underline{\theta}}{2}e_H^2\right) + (1-\mu)\left(e_L - \frac{\overline{\theta}}{2}e_L^2\right)\right]. \tag{6}$$

Applying the first order condition with respect to e_H and e_L, the levels of effort are obtained:

$$e_L^{FB} = \frac{1}{\overline{\theta}}; \quad e_H^{FB} = \frac{1}{\underline{\theta}}. \tag{7}$$

Substituting the levels of effort into equation (6), profits are obtained:

$$\Pi^{FB} = \frac{1+\alpha}{1+2\alpha}\left[\mu\left(\frac{1}{\underline{\theta}} - \frac{1}{2\underline{\theta}}\right) + (1-\mu)\left(\frac{1}{\overline{\theta}} - \frac{1}{2\overline{\theta}}\right)\right]$$

After some simple computations, profits are equal to:

$$\Pi^{FB} = \frac{1+\alpha}{1+2\alpha}\left(\frac{\underline{\theta} + \mu\Delta\theta}{2\underline{\theta}\overline{\theta}}\right). \tag{8}$$

And the first-best wages are:

$$\begin{aligned} \omega_L^{FB} &= \frac{\overline{\theta}}{2}e_L^{FB2} + \frac{\alpha}{1+\alpha}\Pi^{FB} \Leftrightarrow \omega_L^{FB} = \frac{1}{2\overline{\theta}} + \frac{\alpha}{1+2\alpha}\left(\frac{\underline{\theta} + \mu\Delta\theta}{2\underline{\theta}\overline{\theta}}\right); \\ \omega_H^{FB} &= \frac{\underline{\theta}}{2}e_H^{FB2} + \frac{\alpha}{1+\alpha}\Pi^{FB} \Leftrightarrow \omega_H^{FB} = \frac{1}{2\underline{\theta}} + \frac{\alpha}{1+2\alpha}\left(\frac{\underline{\theta} + \mu\Delta\theta}{2\underline{\theta}\overline{\theta}}\right). \end{aligned} \tag{9}$$

A.2 Proof of Proposition 2

The participation and incentive constraints are:

$$\omega_L - \frac{\overline{\theta}}{2}e_L^2 - \alpha(\Pi - R_L) - \beta(R_H - R_L) \geq 0 \tag{PC_L}$$

$$\omega_H - \frac{\underline{\theta}}{2}e_H^2 - \alpha(\Pi - R_H) \geq 0 \tag{PC_H}$$

$$\omega_L - \frac{\overline{\theta}}{2}e_L^2 - \alpha(\Pi - R_L) - \beta(R_H - R_L) \geq \omega_H - \frac{\overline{\theta}}{2}e_H^2 - \alpha(\Pi - \hat{R}_H) - \beta(R_H - \hat{R}_H) \tag{IC_L}$$

$$\omega_H - \frac{\underline{\theta}}{2}e_H^2 - \alpha(\Pi - R_H) \geq \omega_L - \frac{\underline{\theta}}{2}e_L^2 - \alpha(\Pi - \hat{R}_L) - \beta(R_H - \hat{R}_L) \tag{IC_H}$$

$\hat{R}_H = \omega_H - \frac{\overline{\theta}}{2}e_H^2$ is the rent that the low-productivity employees attain when they pretend to be high; $\hat{R}_L = \omega_L - \frac{\underline{\theta}}{2}e_L^2$ is the rent that the high-productivity employees attain when they pretend to be low.

First, if equations (IC_H) and (PC_L) are satisfied, then

$$\omega_H - \frac{\underline{\theta}}{2}e_H^2 - \alpha(\Pi - R_H) \geq \frac{\Delta\theta}{2}e_L^2(1+\alpha+\beta) \geq 0. \tag{10}$$

Equation (10) reflects the fact that the high-productivity employees receive higher benefits from production than the low-productivity ones. The participation constraint for the high-productivity employees is satisfied

$$\omega_H - \frac{\underline{\theta}}{2}e_H^2 - \alpha(\Pi - R_H) \geq 0.$$

Furthermore, it will not be binding because $\frac{\Delta\theta}{2}e_L^2(1+\alpha+\beta) \geq 0$ has to be satisfied as well. In contrast, the participation constraint for the low-productivity employees must be binding.

Next, the incentive constraint for the high-productivity employees must be binding:

$$\omega_H = \frac{\underline{\theta}}{2}e_H^2 + \alpha(\Pi - R_H) + \frac{\Delta\theta}{2}e_L^2(1+\alpha+\beta).$$

If this incentive were not binding, the boss could increase ω_H slightly and keep all constraints satisfied. And the incentive constraint for the low-productivity employees, that is

$$\omega_L \geq \frac{\overline{\theta}}{2}e_L^2 + \alpha(\Pi - R_L) + \beta(R_H - R_L) - \frac{\Delta\theta}{2}(e_H^2 - e_L^2)(1+\alpha+\beta)$$

cannot be binding given that $\frac{\Delta\theta}{2}(e_H^2 - e_L^2)(1+\alpha+\beta) \geq 0$ has to be satisfied.

The participation constraint for the low-productivity employees (PC_L) and the incentive constraint for the high-productivity employees (IC_H) are binding. Using PC_L and IC_H, the optimal wages satisfy equation (4).

The boss maximizes profits subject to equation (4). Profits can be rewritten as:

$$\Pi(e_L, e_H) = \frac{1+\alpha}{1+2\alpha}\left[\mu\left(e_H - \frac{\underline{\theta}}{2}e_H^2 - \frac{1+\alpha+\beta}{2(1+\alpha)}\Delta\theta e_L^2\right) + (1-\mu)\left(e_L - \frac{\overline{\theta}}{2}e_L^2 - \frac{\beta}{2(1+\alpha)}\Delta\theta e_L^2\right)\right]. \tag{11}$$

Applying the first order condition with respect to e_H and e_L, the levels of effort are obtained:

$$\frac{\partial\Pi(e_L, e_H)}{\partial e_L} : -\mu\left(\frac{1+\alpha+\beta}{1+\alpha}\Delta\theta e_L\right) + (1-\mu)\left(1 - \overline{\theta}e_L - \frac{\beta}{1+\alpha}\Delta\theta e_L\right) = 0$$

$$\Leftrightarrow e_L^{SB} = \frac{(1-\mu)(1+\alpha)}{\overline{\theta}(1-\mu)(1+\alpha) + [\beta + \mu(1+\alpha)]\Delta\theta}$$

$$\frac{\partial\Pi(e_L, e_H)}{\partial e_H} : \left(\frac{1+\alpha}{1+2\alpha}\right)\mu\left(1 - \underline{\theta}e_H\right) = 0 \Leftrightarrow e_H^{SB} = \frac{1}{\underline{\theta}}$$

Substituting the levels of effort into equations (4) and (11), wages and profits are obtained:

$$\omega_L^{SB} = \frac{\overline{\theta}}{2}(e_L^{SB})^2 + \frac{\beta}{2(1+\alpha)}\Delta\theta(e_L^{SB})^2 + \frac{\alpha}{1+\alpha}\Pi(e_L^{SB}, e_H^{SB});$$

$$\omega_H^{SB} = \frac{\underline{\theta}}{2}(e_H^{SB})^2 + \frac{1+\alpha+\beta}{2(1+\alpha)}\Delta\theta(e_L^{SB})^2 + \frac{\alpha}{1+\alpha}\Pi(e_L^{SB}, e_H^{SB});$$

$$\Pi^{SB} = \frac{1+\alpha}{1+2\alpha}\left[\mu\left(e_H^{SB} - \frac{\underline{\theta}}{2}(e_H^{SB})^2 - \frac{1+\alpha+\beta}{2(1+\alpha)}\Delta\theta(e_L^{SB})^2\right)\right] +$$
$$+ \frac{1+\alpha}{1+2\alpha}\left[(1-\mu)\left(e_L^{SB} - \frac{\overline{\theta}}{2}(e_L^{SB})^2 - \frac{\beta}{2(1+\alpha)}\Delta\theta(e_L^{SB})^2\right)\right].$$

Acknowledgements

I would like to thank Alessandro De Chiara, Florian Englmaier and an anonymous referee for the helpful comments.

References

Adams, J. S., 1963. Towards an understanding of inequity. Journal of Abnormal and Social Psychology, 422–436.

Bartling, B., von Siemens, F. A., 2010. The intensity of incentives in firms and markets: Moral hazard with envious agents. Labour Economics 17 (3), 598–607.

Bewley, T. F., 1995. A depressed labour market as explained by participants. The American Economic Review 85 (2), 250–254.

Bewley, T. F., 1999. Why Wages Don't Fall During a Recession. Harvard University Press.

Blinder, A. S., Choi, D., 1990. A shred of evidence on theories of wage stickiness. Quarterly Journal of Economics 105 (4), 1003–1015.

Breza, E., Kaur, S., Shamdasani, Y., 2015. The morale effects of pay inequality. Tech. rep., Working paper.

Campbell, C. M., Kamlani, K., 1997. The reasons for wage rigidity: Evidence from a survey of firms. Quarterly Journal of Economics 112, 759–789.

Card, D., Mas, A., Moretti, E., Saez, E., 2012. Inequality at work: The effect of peer salaries on job satisfaction. The American Economic Review 102 (6), 2981–3003.

Desiraju, R., Sappington, D. E., 2007. Equity and adverse selection. Journal of Economics & Management Strategy 16 (2), 285–318.

Dur, R., Glazer, A., 2008. Optimal contracts when a worker envies his boss. Journal of Law, Economics, and Organization 24 (1), 120–137.

Englmaier, F., Wambach, A., 2010. Optimal incentive contracts under inequity aversion. Games and Economic Behavior 69 (2), 312–328.

Festinger, L., 1962. A theory of cognitive dissonance. Vol. 2. Stanford University Press.

Kragl, J., Schmid, J., 2009. The impact of envy on relational employment contracts. Journal of Economic Behavior & Organization 72 (2), 766–779.

Mishel, L., Sabadish, N., 2012. Ceo pay and the top 1%. Issue Brief 331.

Neilson, W. S., Stowe, J., 2010. Piece-rate contracts for other-regarding workers. Economic Inquiry 48 (3), 575–586.

von Siemens, F. A., 2011. Heterogeneous social preferences, screening, and employment contracts. Oxford Economic Papers 63, 499–522.

von Siemens, F. A., 2012. Social preferences, sorting, and competition. The Scandinavian Journal of Economics 114 (3), 780–807.