Relative Compensation Concerns and the Optimality of Wage Secrecy Policies.

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August 19, 2012

[Preliminary - Do Not Cite Without Permission]

Abstract

In this paper we hypothesize that if the quantity relative to which the agents compare their compensation is random, an agent forms a reference point equal to the expected value of such quantity (average payoff hypothesis). If agents are inequity averse, we show how the average payoff hypothesis produces implications for a principal on whether to enforce a secrecy or disclosure policy for compensation within an organization.

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1 Introduction

The compensation policy is one of the most crucial decision that the directors and the management of a firm have to make. Among other aspects, one important decision is whether to allow for wage transparency or not, that is, whether to make the compensation of the firm's employees accessible by their co-workers or even the general public. Also, such a decision plays a relevant role not only at the firm level but also at the country level. For example, Norway allows for transparency of the income of its citizens. On the other hand when in 2006 the Italian Agency of Internal Revenues published on the internet the income of all citizens for the 2005 fiscal year, in a matter of few hours the Authority for the Privacy Protection had this information removed, on the grounds that income data publication was against the right to individual privacy. At the firm level, consider the recent SEC requirement for those companies whose CEOs' compensation involves benchmarking. These companies are required to disclose the information about the group of peers the CEO is benchmarked to. The objective of such disclosure rule is to guarantee that executives are not paid excessively. Nevertheless, Faulkender and Yang (2010) found that disclosure of the peers' compensation resulted in an increase of the executives' compensations. In fact, given this new regulation the companies' directors could justify the increase in compensations by choosing as comparable CEOs (the peers) those that were more highly paid in the industry. Finally, wage transparency is a relevant issue not only for executive but also for rank and file employees. Card et al. (2010) report that in a recent survey one third of US companies enforce "no-disclosure contracts that forbid employees from discussing their pay with co-workers". Furthermore, the authors find that income dispersion within an organization, once made easily accessible by employees, might induce dissatisfaction for those employees paid below the average which, in turn, might even lead them to seek another employment.

In sum, the issue of wage transparency is pervasive; it spans aspects of country-level law-making activity to single firm-level compensation policy-making, for both executives and rank-and-file employees. Nonetheless, despite the evidence of the crucial role played by wage-transparency policy, the reasons behind its importance are not clear in the literature. In this work we offer a preference-based explanation that can lead to the results outlined above. In particular, we assume that individuals not only care about their personal compensation but also about their compensation relative to their peers: employee not only enjoy being paid more but also being paid more than their colleagues. In particular, we assume that for an employee the disutility of earning one dollar less than her peers is higher in absolute value than the utility of earning one dollar more than her peers. This is the well-known concept of inequity aversion (Feher and Schmidt (1999)). In addition to inequity aversion, our (fairly intuitive) assumption is that when an employee does not know exactly what the compensation of her colleagues is, she uses an average measure of her colleagues' compensations as a reference wage relative to which she compares her own wage. We define this hypothesis as the *average-payoff* hypothesis. For example, if an agent earns 1000 dollars and she believes that her colleagues earn 1,000 dollars or 1,200 dollars with equal probability, the reference wage to which the agent will compare her compensation is the average wage of her colleagues, that is, 1,100 dollars. This will give a relative compensation of -100 dollars, in fact the agent is paid 100 dollars less than her colleagues. Our assumptions imply that when assessing her level of satisfaction, the employee will consider two things: the fact that she earns 1,000 dollars and the fact that she earns 100 dollars less then her co-workers. Albeit intuitive, the average-payoff hypothesis has some powerful implications: it can be proved that if there is high wage disparity within a firm, a firm can pay lower wages to its employees by enforcing a wage secrecy policy, without lowering their utility, i.e., their level of satisfaction. In other words, through a wage-secrecy regime the firm could achieve the same level of employee satisfaction by spending less in compensation than in a wage-disclosure regime.

2 Related Literature

The subject of other-looking preferences[1] is studied by a number of works. Among the most well known, Clark and Oswald (1998) propose a model where agents are status concerned and they have constant relative risk aversion. A stronger formulation of other looking preferences is provided by Fehr and Schmidt (1999) with the concept of inequity aversion, where agents' utility might be decreased not only by being poorer than their peers but also by being richer than them. The impact of relative compensation on the wage level and the effort exerted by employees is studied in earlier studies by Frank (1984a, 1984b) and Akerlof and Yellen (1990). The first shows that if workers are concerned about their relative standing they might not be paid according to their marginal productivities as theory would suggest. Akerlof and Yellen (1990) suggest that employees have a reference wage that they

[1] By other-looking preferences we mean the class of preferences where an agent's utility is affected by other people's situation, even if this situation does not affect the agent's consumption.

consider fair. If compensated less than such reference wage, they would "retaliate" by exerting a lower level of effort. In the last decade the impact of other-looking concerns and in particular fairness concerns on the optimal compensation contract in a principal-agent framework has been addressed by a number of authors: Fershtman et al (2003) consider the case of two separate principals, each relating to one agent that is risk averse in his relative payoff, and show the optimality of implementing a compensation schedule that is linked to group performance. Bartling (2008) considers a setting, where agents are risk averse with respect to their absolute payoff, but are inequity averse when it comes to their relative payoff. More recently Card et al. (2011) find that once employees are informed about their peers' wages they display inequity aversion, while Bault et al (2011) directly measure the brain reaction when agents earn more than their peers finding such reaction to be higher once compared to stand-alone gains. Dijk (2011) finds in an experimental setting that, in a social context, agents take more risk and prefer negative correlation between their payoffs in a coin-toss bet. A few papers have investigated how the asymmetry in agents' payoffs affects their effort exertion, addressing in more detail the fair wage hypothesis of Akerlof and Yellen (1990). Charness and Kuhn (2007) study experimentally how the effort exerted by an agent is influenced by relative compensation, finding no significant impact. On the other hand Gächter and Thoeni (2010) find that "disadvantageous wage discrimination leads to lower efforts while advantageous wage discrimination does not increase efforts on average". Finally, in a coordination experiment Agranov and Schotter (2012) find that in the presence of high payoff asymmetry agents better coordinate if they have more imprecise information (less transparency) about their relative payoff. Miglietta (2011), runs a laboratory experiment aiming at the detection of relative-wealth concerns in agents' choices finding that agents displaying higher interest in other people payoffs, acted consistently with the theoretical prediction of relative-wealth concerned preferences.

Overall, the importance of payoff asymmetry has been observed in many studies. The payoff of a group of agents is a reference point relative to which each one of them compares her own payoff, and such comparison might affect the economic choices of agents. Nevertheless, it is unclear 1) how this reference point is formed, 2) how the information transparency about the reference group of an agent affects her economic choices; our work exactly aims at filling these gaps.[2]

3 The Average-Payoff Hypothesis

In this section we give a brief exposition of the theoretical predictions that follows from the average-payoff hypothesis. By average-payoff hypothesis we mean that 1) agents are interested in comparing her payoff with the payoff of their peers and that 2) when an agent does not know exactly what the payoffs of her peers are, she will use an average measure of her peers' payoffs as a reference point relative to which she will compare her own payoff. For simplicity assume that the there are two agents in a group: agent i and agent j. Assume that t_i is the monetary payoff received by agent i while t_j is the monetary payoff received by agent j. Assume that both t_i and t_j are non-random and will be received at time 1. Then the utility of agent i at

[2] A theoretical work that endogenously determines the reference point and that provides us with a fully fledged equilibrium definition is Koszegi and Rabin (2006). Nonetheless, to date, we are not aware of any direct test of this theory.

time 0 (assuming a discount rate equal to zero) is given by:

$$u_i = t_i + \beta_1 \max\{t_i - t_j; 0\} + \beta_2 \min\{t_i - t_j; 0\}$$

where

u_i : utility of agent i

$0 \leq \beta_1 \leq \beta_2 \leq 1$

Notice that $0 \leq \beta_1 \leq \beta_2 \leq 1$ implies that the decrease in agent i's utility when she is one dollar poorer than agent j is larger than the increase in agent i's utility when she is one dollar richer than agent j.

If the monetary transfers are random, then we distinguish two cases:

1. If the agents know that in the future they will observe the payoffs of their colleagues, then the utility for agent i is given by:

$$U_{i,obs} = E[t_i] + E[\beta_1 \max\{t_i - t_j; 0\} + \beta_2 \min\{t_i - t_j; 0\}] \tag{1}$$

2. If the agents know that in the future they will not observe the payoffs of their colleagues, then the utility for agent i is given by:

$$U_{i,no\,obs} = E[t_i] + \beta_1 \max\{E[t_i - t_j]; 0\} + \beta_2 \min\{E[t_i - t_j]; 0\} \tag{2}$$

The specification in (2) is the formal expression of our average-payoff hypothesis: in a setting of wage secrecy, the reference point of agent i is computed as the average wage of agent j, and it is plugged into the utility function. Notice that the specification in (1) is the specification that is commonly used in the economic literature as it has an expected utility form (Von Neuman-Morgenstern expected utility function). In an Von Neuman-Morgenstern world, no matter whether the wages are secret or observable, the utility at time 0 for agent i is given by (1), while with our average-payoff hypothesis, in case of wage secrecy the utility for agent i is computed according to (2).

To see how the average-payoff hypothesis implies the optimality of wage secrecy for an employer, consider for simplicity the case where t_i is non random, while t_j is random and given. Assume further that the reservation utility for agent i is given and equal to $\overline{u}_i$. Call $t_{i,obs}$ the wage that agent i has to receive to match her reservation utility under a wage-transparency setting:

$$U_{i,obs} = t_{i,obs} + E\left[\beta_1 \max\left\{t_{i,obs} - t_j; 0\right\} + \beta_2 \min\left\{t_{i,obs} - t_j; 0\right\}\right] = \overline{u}_i \qquad (3)$$

In the case of wage secrecy, ast_j is given, we have by the Jensen's inequality:

$$U_{i,no\,obs} = t_{i,obs} + \beta_1 \max\left\{t_{i,obs} - E\left[t_j\right]; 0\right\} + \beta_2 \min\left\{t_{i,obs} - E\left[t_j\right]; 0\right\} \geq \overline{u}_i \qquad (4)$$

In particular, if there are at least two states of nature, 1 and 2, that can occur with positive probability and such that $t_{i,obs} < t_j^1$ and $t_{i,obs} > t_j^2$, where t_j^h is the monetary transfer received by agent j contingent to the occurrence of state h, then the inequality in (4) holds strictly. This simplified example shows that if the average-payoff hypothesis holds, in the wage secrecy case the employer could decrease the compensation of agent i without affecting her utility level. Moreover, in this case there is no reason for the agent not to accept a wage secrecy agreement as her "satisfaction" level stays untouched.

4 The Importance of Observation

What follows describes two simple exercises that show under what conditions it might be optimal (or not) for a company to enforce a wage secrecy policy, or avoid wages visibility, in order to maximize its profit. Also, following the same intuition, this idea can be useful to develop a theory in which the release of more information about agent wages, will induce an increase in their compensation. Translated in real-world terms, this idea can produce results that can be applied to executive compensation. In the last years, the executive wages raise has been a great concern. This concern led to broader requirements about executive compensation disclosure. In the framework we are about to expose, the increase in disclosure not only might not set back executive compensation level, but, paradoxically, even make it grow larger. In what follows we first describe the case of two agents, in which one has an uncertain reservation utility and the other has a known reservation utility. We then cover the case of two agents both having an ex-ante uncertain reservation utility with the same variance.

4.1 Case 1: Two Agents,Uncertain and Known Reservation Utility

Consider two risk neutral agents that have relative wealth preferences represented by the following function:

$$U_i\left(t_i, t_j\right) = t_i + \beta_1 \max\left\{t_i - t_j; 0\right\} + \beta_2 \min\left\{t_i - t_j; 0\right\}$$

Where

U_i : utility of agent i

t_i : money transfer to agent i

$0 \leq \beta_1 \leq \beta_2 \leq 1$

This utility function has many traits in common with the utility function proposed by Fehr and Schmidt (1999)[3].

We will indicate the two agent with the indexes i and j. Agent i has a fixed reservation utility equal to u_M. Agent j has a reservation utility that a priori is not known, but it might be equal to u_L or u_H with probability $\frac{1}{2}$:

$u_L < u_M < u_H$

$u_L = u_M - \Delta$

$u_H = u_M + \Delta$

$\Delta > 0$

Each agent produces for the principal revenues equal to y.

Consider now two different scenarios, the agents might be working closely, and therefore know exactly their own reservation utilities, or, as a second scenario, they might be apart. In this last case agent j will know that agent i's reservation is u_M, but agent i will have a prior distribution regarding agent j's reservation utility given by a uniform distribution with parameter $\frac{1}{2}$. In the second scenario agent i, although unable to perfectly observe agent j's reservation utility, can observe an informative signal s, such that:

$$\Pr\left(u_H | s = s_H\right) = \Pr\left(u_L | s = s_L\right) = q > \frac{1}{2}$$

Assume that in the second scenario we have two principals, and each principal has the same information set of the corresponding agent.

[3]The most notable difference is that in Fehr and Schmidt 1999, $\beta_1 < 0$, therefore agents would obtain a negative utility even when they are richer than their peers. Of course, even in this utility specification, $|\beta_2| > |\beta_1|$.

The role of the principals in this case is to offer wages in order to match the reservation utility of the agents.

Scenario 1

In this case the problem for the principal is fairly simple, there are two alternative states of the world that will be known by all the individuals:

1) $u_j = u_H$ (that is, the reservation utility of agent j is equal to u_H)

In this case the problem the principal has to solve is[4]:

$$\begin{cases} t_{iT}^H + \beta_2 \left(t_{iT}^H - t_{jT}^H\right) = u_M \\ t_{jT}^H + \beta_1 \left(t_{jT}^H - t_{iT}^H\right) = u_H \end{cases}$$

The solution to this simple system gives:

$$\begin{cases} t_{iT}^H = \dfrac{u_M\left(1+\beta_1\right)+\beta_2 u_H}{1+\beta_1+\beta_2} \\ t_{jT}^H = \dfrac{u_H\left(1+\beta_2\right)+\beta_1 u_M}{1+\beta_1+\beta_2} \end{cases} \text{that is} \begin{cases} t_{iT}^H = u_M + \dfrac{\beta_2\Delta}{1+\beta_1+\beta_2} \\ t_{jT}^H = u_M + \dfrac{\Delta\left(1+\beta_2\right)}{1+\beta_1+\beta_2} \end{cases}$$

Where

t_{iT}^H :is the wage when the state of the world is $u_j = u_H$ for agent i when the agent are together (T).

2) $u_j = u_L$

In this case the participation constraints the principal has to match are

$$\begin{cases} t_{iT}^L + \beta_1 \left(t_{iT}^L - t_{jT}^L\right) = u_M \\ t_{jT}^L + \beta_2 \left(t_{jT}^L - t_{iT}^L\right) = u_L \end{cases}$$

That will have the following solution:

$$\begin{cases} t_{iT}^L = \dfrac{u_M\left(1+\beta_2\right)+\beta_1 u_L}{1+\beta_1+\beta_2} \\ t_{jT}^L = \dfrac{u_L\left(1+\beta_1\right)+\beta_2 u_M}{1+\beta_1+\beta_2} \end{cases} \text{that is} \begin{cases} t_{iT}^L = u_M - \dfrac{\beta_1\Delta}{1+\beta_1+\beta_2} \\ t_{jT}^L = u_M - \dfrac{\Delta\left(1+\beta_1\right)}{1+\beta_1+\beta_2} \end{cases}$$

The overall ex-ante profit for the principal, in this case, will therefore be:

[4]Note that at this stage we are conjecturing that t_i is smaller than t_j when $u_j = u_H$. Once we solve the problem it will be easy to verify that this conjecture holds.

$$\pi_T = 2y - \frac{1}{2}\left(t_{iT}^H + t_{jT}^H\right) - \frac{1}{2}\left(t_{iT}^L + t_{jT}^L\right)$$

Scenario 2

In this case we will consider separately each principal-agent couple. Moreover, we assume that in the case of agent i the reference wage (that is the wage to which he/she compares his/her own) will be given by the expected wage of the other agent, according to the signal i receives. Therefore, for the principal-agent couple i, there are two possible sub-scenarios, namely, $s = s_H$ or $s = s_L$, in which the two participation constraints are given by the following:

$$\begin{array}{ll} t_{iS}^H + \beta_1 \max\left\{t_{iS}^H - \left(qt_{jS}^H + (1-q)\, qt_{jS}^L\right); 0\right\} + \beta_2 \min\left\{t_{iS}^H - \left(qt_{jS}^H + (1-q)\, qt_{jS}^L\right); 0\right\} = u_M & if\ s = s_H \\ t_{iS}^L + \beta_1 \max\left\{t_{iS}^L - \left(qt_{jS}^L + (1-q)\, qt_{jS}^H\right); 0\right\} + \beta_2 \min\left\{t_{iS}^L - \left(qt_{jS}^L + (1-q)\, qt_{jS}^H\right); 0\right\} = u_M & if\ s = s_L \end{array}$$

where

t_{iS}^H : transfer to agent i, when he/she receives the signal s_H, when the two agents are separated (S).

Consider now the principal-agent couple j, in this case the two sub-scenarios are given by agent j observing his/her own reservation utility. By Bayes rule assuming $\Pr(s = s_H) = \Pr(s = s_L) = \dfrac{1}{2}$:

$$\Pr(s_H | u_j = u_H) = \Pr(s_L | u_j = u_L) = q$$

Therefore the participation constraints for agent j are given by:

$$\begin{array}{ll} t_{jS}^H + \beta_1 \max\left\{t_{jS}^H - \left(qt_{iS}^H + (1-q)\, qt_{iS}^L\right); 0\right\} + \beta_2 \min\left\{t_{jS}^H - \left(qt_{iS}^H + (1-q)\, qt_{iS}^L\right); 0\right\} = u_H & if\ u_j = u_H \\ t_{jS}^L + \beta_1 \max\left\{t_{jS}^L - \left(qt_{iS}^L + (1-q)\, qt_{iS}^H\right); 0\right\} + \beta_2 \min\left\{t_{jS}^L - \left(qt_{iS}^L + (1-q)\, qt_{iS}^H\right); 0\right\} = u_L & if\ u_j = u_L \end{array}$$

Therefore we have a system of four equation in four unknowns:

$$\left\{\begin{array}{ll} t_{iS}^H + \beta_1 \max\left\{t_{iS}^H - \left(qt_{jS}^H + (1-q)\, qt_{jS}^L\right); 0\right\} + \beta_2 \min\left\{t_{iS}^H - \left(qt_{jS}^H + (1-q)\, qt_{jS}^L\right); 0\right\} = u_M & ifs = s_H \\ t_{iS}^L + \beta_1 \max\left\{t_{iS}^L - \left(qt_{jS}^L + (1-q)\, qt_{jS}^H\right); 0\right\} + \beta_2 \min\left\{t_{iS}^L - \left(qt_{jS}^L + (1-q)\, qt_{jS}^H\right); 0\right\} = u_M & ifs = s_L \\ t_{jS}^H + \beta_1 \max\left\{t_{jS}^H - \left(qt_{iS}^H + (1-q)\, qt_{iS}^L\right); 0\right\} + \beta_2 \min\left\{t_{jS}^H - \left(qt_{iS}^H + (1-q)\, qt_{iS}^L\right); 0\right\} = u_H & ifu_j = u_H \\ t_{jS}^L + \beta_1 \max\left\{t_{jS}^L - \left(qt_{iS}^L + (1-q)\, qt_{iS}^H\right); 0\right\} + \beta_2 \min\left\{t_{jS}^L - \left(qt_{iS}^L + (1-q)\, qt_{iS}^H\right); 0\right\} = u_L & ifu_j = u_L \end{array}\right. \tag{5}$$

And the overall expected profit is given by:

$$\pi_S = 2y - \frac{1}{2}\left(t^H_{iS} + t^H_{jS}\right) - \frac{1}{2}\left(t^L_{iS} + t^L_{jS}\right)$$

Consider now (5), each equation, on the left hand side, is formed by two terms. The first one is the monetary transfer received by the agent and the second is the relative wealth position of the agent, multiplied by a coefficient (either β_1 or β_2). The coefficient multiplying the second term is a function of the sign of this term, hence, it is important to verify under what conditions, the coefficients agree with the sign of the second term.

Proposition 1.
There exists a $q^* \in \left(\frac{1}{2};1\right)$ *such that*

(i) if $q < q^*$ then

$$\pi_S - \pi_T = \frac{\Delta\left(\beta_2 - \beta_1\right)\left[(1-q)\,4\beta_2 q\left(\beta_1\beta_2 - (1-\beta_2)^2\right) + (1-\beta_2)^2 + \beta_1\left(1+2\beta_2\right) + \beta_2\left(1+\beta_2\right)\right]}{G\left(\beta_1,\beta_2,q\right)\left(1+\beta_1+\beta_2\right)} > 0$$

where $G(.)$ *is a polynomial function always positive on the support of the function*

(ii) *if* $q \geq q^*$ then

$$\pi_S - \pi_T = \frac{1}{2}\frac{\Delta\left(\beta_2-\beta_1\right)(1-q)}{\left(1+\beta_1+\beta_2\right)\left(1+q\beta_1+q\beta_2\right)} > 0$$

Proof of Proposition. See Appendix■

Profit Comparison

We can now compare the expected profit in the two scenarios, and see which organizational form delivers the highest combined expected wealth to the principal(s). In both cases ($q \geq q^*$ or $q < q^*$) under Scenario 2, the principal(s) always attain(s) a higher expected profit by separating the two agents. There are two cases in which there is no difference between the overall expected profits in the two organizational forms. The first case is when $\beta_1 = \beta_2$, in fact, under this circumstance, the extra-compensation that the principal has to pay to the agent that receives the lowest transfer, is perfectly compensated by the money he can save for paying less the other agent (the one who has the highest wage). The second circumstance, is when $q = 1$, that is when the signal is perfectly informative, and therefore we are in a situation equivalent to both agent being able to observe each other's reservation utility (of course in this last instance we will have $q > q^*$).

4.2 Case 2: Two Agents, Both with Uncertain Reservation Utility

We will consider now the case of two agents that have both ex ante uncertain reservation utility. So, both of them can have a reservation utility of u_H or u_L with probability $\frac{1}{2}$ each, assume further that the two reservation utilities are independent. Once more, we will consider two different scenarios, the first one where the two agents can perfectly observe their peer's reservation utility, and the second one where the two agents only receive a signal about their peer's reservation utility.

Scenario 1

In this scenario the system of participation constraints for agent i, is given by:

$$\begin{cases} t_{iT}^{HH} = u_H \\ t_{iT}^{LL} = u_L \\ t_{iT}^{HL} + \beta_1 \left(t_{iT}^{HL} - t_{jT}^{LH} \right) = u_H \\ t_{iT}^{LH} + \beta_2 \left(t_{iT}^{LH} - t_{jT}^{HL} \right) = u_L \end{cases}$$

And the equilibrium wages are given by:

$$\begin{cases} t_{iT}^{HH} = u_H \\ t_{iT}^{LL} = u_L \\ t_{iT}^{HL} = \dfrac{\beta_1 u_L + (1+\beta_2)\, u_H}{1+\beta_1+\beta_2} \\ t_{iT}^{LH} = \dfrac{\beta_2 u_H + (1+\beta_1)\, u_L}{1+\beta_1+\beta_2} \end{cases}$$

The equilibrium compensation schedule for agent j will be the same.

Scenario 2

In this case the two agents can not observe their peer's reservation utility, but they receive a signal about it, just like in the case before.

$$\begin{cases} t_{iS}^{HH} + \beta_1 \left\{ t_{iS}^{HH} - \left[q \left[q t_{jS}^{HH} + (1-q)\, t_{jL}^{HL} \right] + (1-q) \left[q t_{jS}^{LH} + (1-q)\, t_{jS}^{LL} \right] \right] \right\} = u_H & if\ s = s_H,\, u_i = u_H \\ t_{iS}^{HL} + \beta_1 \left\{ t_{iS}^{HL} - \left[q \left[q t_{jS}^{HH} + (1-q)\, t_{jL}^{HL} \right] + (1-q) \left[q t_{jS}^{LH} + (1-q)\, t_{jS}^{LL} \right] \right] \right\} = u_H & if\ s = s_L,\, u_i = u_H \\ t_{iS}^{LH} + \beta_2 \left\{ t_{iS}^{LH} - \left[q \left[q t_{jS}^{HL} + (1-q)\, t_{jL}^{HH} \right] + (1-q) \left[q t_{jS}^{LL} + (1-q)\, t_{jS}^{LH} \right] \right] \right\} = u_L & if\ s = s_H,\, u_i = u_L \\ t_{iS}^{LL} + \beta_2 \left\{ t_{iS}^{LL} - \left[q \left[q t_{jS}^{LL} + (1-q)\, t_{jL}^{LH} \right] + (1-q) \left[q t_{jS}^{HL} + (1-q)\, t_{jS}^{HH} \right] \right] \right\} = u_L & if\ s = s_L,\, u_i = u_L \end{cases} \tag{6}$$

Since the two agents have the same distribution of both reservation utilities and signals, agent j participation constraints are given by the same set of equations, and his/her equilibrium compensation will be just the same as the one received by agent i. It is also apparent that we are conjecturing the following:

$$\begin{cases} t_{iS}^{HH} - \left[q \left[q t_{jS}^{HH} + (1-q)\, t_{jL}^{HL} \right] + (1-q) \left[q t_{jS}^{LH} + (1-q)\, t_{jS}^{LL} \right] \right] > 0 \\ t_{iS}^{HL} - \left[q \left[q t_{jS}^{HH} + (1-q)\, t_{jL}^{HL} \right] + (1-q) \left[q t_{jS}^{LH} + (1-q)\, t_{jS}^{LL} \right] \right] > 0 \\ t_{iS}^{LH} - \left[q \left[q t_{jS}^{HL} + (1-q)\, t_{jL}^{HH} \right] + (1-q) \left[q t_{jS}^{LL} + (1-q)\, t_{jS}^{LH} \right] \right] < 0 \\ t_{iS}^{LL} - \left[q \left[q t_{jS}^{LL} + (1-q)\, t_{jL}^{LH} \right] + (1-q) \left[q t_{jS}^{HL} + (1-q)\, t_{jS}^{HH} \right] \right] < 0 \end{cases}$$

It will be easy to verify that the above conditions will hold, once we solve system (6).

The solution for the optimal wages is once more cumbersome and does not add any particular insight.

Profit Comparison

Subtracting the ex-ante expected profit in Scenario 2 from the ex-ante expected profit in Scenario 1, and defining $\Delta = u_H - u_L$, we obtain the following:

$$\pi_S - \pi_T = \frac{q\,(1-q)\,\Delta\,(\beta_2 - \beta_1) \left\{ (q-1)\, q \left[4\beta_2\beta_1 (1+\beta_1) + 8\beta_1\beta_2 \right] - \left(\beta_1 + \beta_2 + \beta_1^2 + \beta_2^2 \right) \right\}}{\left[(q-1)\, q 4\beta_1\beta_2 - (1+\beta_1+\beta_2) \right] \left[2q\,(q-1)\,(\beta_1+\beta_2) - 1 \right] (1+\beta_1+\beta_2)} < 0$$

Differently from what we found in the previous case, now the optimal choice is *not* to separate the two agents, since this would lead to a reduction of the ex-ante expected overall profit for the principal(s).

Similarly to what we observed in Case 1 the difference in the expected profits vanishes when $q = 1$ (that is when the signal is perfectly informative) or when $\beta_1 = \beta_2$.

4.3 Case 1 vs. Case 2

Comparing the results obtained in Case 1 and Case 2, this model provides a prediction of aggregation or separation of agents, based on:

- the distribution of their outside options

- the information they have relative to their (and their peers') outside options.

The reason why in the two cases we obtain opposite optimal organizational forms, is due to what can be called the cost of asymmetry. One of the basic features of the relative wealth preferences is that asymmetry in compensation is costly for a risk neutral and self concerned principal(s). This cost originates from the fact that $\beta_1 < \beta_2$. In fact, should these two parameters be equal (i.e. $\beta_1 = \beta_2$), in presence of asymmetry of remuneration, the money the principal can save on the highly-paid agent perfectly offsets the money the principal has to award to the low-paid agent, therefore, the expected compensation cost will always be given by $u_i + u_j$. When $\beta_1 < \beta_2$, any difference in remuneration, makes the overall compensation cost raise. In fact, simplifying the problem, calling d the difference between agents' wages, the principal will save, in order to match the participation constraint, $\beta_1 d$ for the compensation of the highly paid agent, and will bear a cost of $\beta_2 d$ for the compensation of the low-paid agent. The overall cost originating by the presence of compensation inequity is, therefore, $d(\beta_2 - \beta_1) > 0$. Keeping this idea in mind, in Case 1 there are two possible states of the world, namely, one state when agent j has a lower reservation utility than agent i and one state where agent j has a higher reservation utility. In this case, if the agents were able to observe each other reservation utility, an asymmetry in payment would be unavoidable. Making the information about each other outside option more opaque, would smooth out this inequity lowering the costs emerging from wage inequality. On the other hand, in the case of two agent having the same variance of the distribution of their reservation utilities, there are four possible states of the world for each individual, in two of which, the agents have perfectly aligned reservation utilities. In these last two cases, the cost induced by the non observability (asymmetry cost) more than offsets the gain obtained in the other cases.

4.4 A Short Discussion of the Utility Function

The above results show how from the average payoff hypothesis it follows a clear indication of whether to allow or not for transparency in the compensation practice. It can be argued that the way we proceeded above it is not correct, in fact, in analogy with the expected utility theory, the utility for an agent when facing an uncertain wage of his peer might be described by:

$$U_i = t_i + E\left[\beta_1 \max\left\{t_i - t_j; 0\right\} + \beta_2 \min\left\{t_i - t_j; 0\right\}\right] \tag{7}$$

Instead of

$$U_i = t_i + \beta_1 \max\left\{E\left[t_i\right] - E\left[t_j\right]; 0\right\} + \beta_2 \min\left\{E\left[t_i\right] - E\left[t_j\right]; 0\right\} \tag{8}$$

Under (7) the conclusions of the previous section, might be completely reversed. The appeal of (7) is in the parallelism with the Von Neuman Morgenstern expected utility theory. In this theory, choices are ordered according to the (discounted) expected utility that the individual will obtain in unknown states of the world. An argument favorable to (7) could be made if agent i would be able to observe j's wage at future point in time at some point in the future so that the uncertainty will be resolved, and agent i will observe what is the actual state of the world occurring. In the exercise outlined above, the reservation utility of agent j will never be in agent i's information set. Moreover, within the inequity aversion concept, a unique reference point (the wage of the peer or some expectation of it) as it is in (8) might be more appropriate.

5 Conclusions

If agents care about their relative payoffs, if their reference point is obtained as the expected value of the quantity they compare their status to, and if they are inequity averse, then it could be optimal for a principal to enforce a wage secrecy policy within an organization. The above discussion provides a behavioral explanation not only for the optimality of wage secrecy policies but also in favor of putting agents in separate organizations (spin offs). In addition, under the average payoff hypothesis it might be the case that a wage disclosure policy and the information circulating about executive compensation might lead to an increase in their wages instead of lowering them.

References

[1] Akerlof, G., Yellen, J., 1990. "The Fair Wage Hypothesis and Unemployment". *Quarterly Journal of Economics.* Vol. 105, 255-283.

[2] Agranov, M., Schotter, A., 2012. "Ignorance is Bliss: An Experimental Study of the Use of Ambiguity and Vagueness in the Coordination Games with Asymmetric Payoffs". *AEJ: Microeconomics.* Vol. 4, 77-103.

[3] Bartling, B., 2008. "Relative Performance or Team Evaluation? Optimal Contracts for Other-Regarding Agents". Working paper.

[4] Bault, N., Joffily, M., Rustichini, A., Coricelli, G., 2011. "Medial Prefrontal Cortex and Striatum Mediate the Influence of Social Comparison on the Decision Process" *Proceedings of the National Academy of Sciences of the United States of America.* Vol. 108, 16044-16049.

[5] Card, D., Mas, A., Moretti, E., Saez, E., 2011, "Inequality at work: The Effect of Peer Salaries on Job Satisfaction". *American Economic Review.* Forthcoming.

[6] Charnes, G., Kuhn, P., 2007. "Does Pay Inequality Affect Worker Effort? Experimental Evidence". *Journal of Labor Economics.* Vol. 25, 693-723.

[7] Clark, A. E. ,Oswald, A. J., 1998. "Comparison Concave Utility and Following Behaviour in Social and Economic Settings". *Journal of Public Economics.* Vol. 70, 133-155.

[8] Dijk, O., 2011. "Risky Competition. Does Social Comparison Induce Risk-Taking?". Working Paper.

[9] Faulkender, M., Yang, J., (2010). "Inside the Black Box: The Role and Composition of Compensation Peer Groups". *Journal of Financial Economics.* Vol. 96, 257-270.

[10] Fehr, E.,Schmidt, K. M., 1999. "A Theory of Fairness, Competition and Cooperation". *Quarterly Journal of Economics.* Vol. 114, 817-868.

[11] Fershtman C., Hvide, H. K., Weiss Y., 2003. "A Behavioral explanation of the Relative Performance Evaluation Puzzle". *Annales d'economie et de statistique.* 71-72, 349-361.

[12] Frank, R. H., 1984a. "Are Workers Paid their Marginal Products?". *American Economic Review.* Vol. 74, 549-571.

[13] Frank, R. H., 1984. "Interdependent Preferences and the Competitive Wage Structure". *Rand Journal of Economics.* Vol. 15, 510-520.

[14] Gächter, S., Thoeni, C., 2010. "Social Comparison and Performance: Experimental Evidence on the Fair Wage–effort Hypothesis". *Journal of Economic Behavior and Organization.* Vol. 76, 531-543.

[15] Koszegi, B., Rabin, M., 2006. "A Model of Reference-Dependent Preferences ". *Quarterly Journal of Economics*. Vol. 121, 1133-1166.

[16] Miglietta, S., (2010). "Incentive Contracts and Status-Conerned Agents". *Working Paper.*

[17] Miglietta, S., (2011). "Incentives and Relative Wealth Concerns: Theory and Evidence". *Working Paper.*

Appendix

Proof of Proposition 1

The strategy to prove this proposition is to conjecture a solution and verify it later. Let us conjecture that in equilibrium the participation constraints are given by:

$$\begin{cases} t_{iH}^S + \beta_2 \left(t_{iH}^S - \left(qt_{jH}^S + (1-q)\, qt_{jL}^S\right)\right) = u_M & if s = s_H \quad (a) \\ t_{iL}^S + \beta_1 \left(t_{iL}^S - \left(qt_{jL}^S + (1-q)\, qt_{jH}^S\right)\right) = u_M & if\ s = s_L \quad (b) \\ t_{jH}^S + \beta_1 \left(t_{jH}^S - \left(qt_{iH}^S + (1-q)\, qt_{iL}^S\right)\right) = u_H & if\ u_j = u_H \quad (c) \\ t_{jL}^S + \beta_2 \left(t_{jL}^S - \left(qt_{iL}^S + (1-q)\, qt_{iH}^S\right)\right) = u_L & if\ u_j = u_L \quad (d) \end{cases}$$

Equations (a), (c) and (d), can be shown to always hold true. Equation (b) does not. Plugging in (b) the solutions wages obtained by solving the above system, and substituting $\beta_1 = \beta_2 - h$, where $h \in (0, \beta_2]$, the term $\left(t_{iL}^S - \left(qt_{jL}^S + (1-q)\, qt_{jH}^S\right)\right)$ in equation (b) is given by:

$$-\frac{\Delta \left(4q\beta_2 - qh - 2\beta_2 + 2q - 2q\beta_2 h + 2\beta_2 q^2 h - 1\right)}{\left(2q\beta_2 + 4\beta_2^2 q - 4q\beta_2 h - 4\beta_2 - 4\beta_2^2 + 4\beta_2 h - 1 - qh + 2h\right)\left(2q\beta_2 + 1 - qh\right)} \qquad (e)$$

in order for (e) to be positive it must be the case that:

$$q > \frac{1}{4}\frac{(h-2)(1+2\beta_2) + \sqrt{(1+2\beta_2)\left(2\beta_2\left(4+h^2\right) + (2-h)^2\right)}}{\beta_2 h} = q^*$$

q^* is clearly a function of β_2 and h, and it is increasing in both these parameters.

The only thing we have left to prove is that $q^* \in \left(\frac{1}{2}; 1\right)$. Knowing that q^* is a continuous monotone function of β and h, to have the two extremes of the value range q^* can take, we first compute the limit of q^* for $h \to 0$, and the value taken by q^* for $h = \beta_2 = 1$.

$$\lim_{h \to 0} \frac{1}{4}\frac{(h-2)(1+2\beta_2) + \sqrt{(1+2\beta_2)\left(2\beta_2\left(4+h^2\right) + (2-h)^2\right)}}{\beta_2 h} =$$

$$\lim_{h \to 0} \frac{1}{4}\frac{\frac{\partial}{\partial h}\left[(h-2)(1+2\beta_2) + \sqrt{(1+2\beta_2)\left(2\beta_2\left(4+h^2\right) + (2-h)^2\right)}\right]}{\frac{\partial}{\partial h}\beta_2 h} = \frac{1}{2}$$

and

$q^*(\beta_2 = 1, h = 1) \simeq 0.68.$

Hence, if $q \geq q^*$ equation (b) will hold true in equilibrium. If $q < q^*$ the system of participation constraints will be, in equilibrium:

$$\begin{cases} t_{iH}^S + \beta_2 \left(t_{iH}^S - \left(qt_{jH}^S + (1-q)\, qt_{jL}^S\right)\right) = u_M & if s = s_H \\ t_{iL}^S + \beta_2 \left(t_{iL}^S - \left(qt_{jL}^S + (1-q)\, qt_{jH}^S\right)\right) = u_M & if\ s = s_L \\ t_{jH}^S + \beta_1 \left(t_{jH}^S - \left(qt_{iH}^S + (1-q)\, qt_{iL}^S\right)\right) = u_H & if\ u_j = u_H \\ t_{jL}^S + \beta_2 \left(t_{jL}^S - \left(qt_{iL}^S + (1-q)\, qt_{iH}^S\right)\right) = u_L & if\ u_j = u_L \end{cases}$$

The two values of the profit differential $(\pi_S - \pi_T)$ will follow from the two different systems of participation constraints■