



Cahiers du LASER

n°010-01-04

Career Concerns and Asymmetric Missions

*Radoslava Nikolova**

* LASER-LAEC, Université de Montpellier 1 et

CREST - LEI

Laboratoire de Sciences Economiques de Richter

UNIVERSITE DE MONTPELLIER I - Faculté des Sciences Economiques,
Espace Richter - Avenue de la mer, B.P. 9606 - 34 060 Montpellier Cedex, France

Tel : (33) 04 67 15 84 50 Fax : (33) 04 67 15 83 61

E-mail : wzantman@univ-tlse1.fr

Web : <http://www.sceco.univ-montp1.fr/laser/accueil.htm>

Career Concerns and Asymmetric Missions ^{*}

Radoslava Nikolova[†]
CREST - LEI and LASER-LAEC

February 2004

Abstract

We use a simple career concerns model with two tasks and additive technology to shed some light on agent's incentives for effort repartition. We establish the conditions under which the agent concentrates his effort on one of the tasks and discuss the implications of the informational structure on his choice. In particular, it is shown that increasing information precision may distort incentives and harms the principal's interest.

1 Introduction

Consider a firm hiring an agent with two tasks to realize, the first one requires trading ability the second one entrepreneurship. In such a multitask framework the agent has to choose not only the intensity of his effort but also its allocation among tasks. The consequences of multitasking on explicit contracts are now well understood. The Holmström and Milgrom (1991)'s seminal article emphasizes that in multitask settings low powered incentives may be used to avoid effort concentration on a subset of tasks.

However there are organizations (think about the government sector for example) where formal incentive schemes are constrained and agents are motivated essentially by career concerns (see Fama (1980) and Holmström (1982/1999)). Our purpose is to establish the consequences of expanding the set of tasks in a dynamic framework with observable but not verifiable performances. So we extend the Holmström's basic model to the case of an agent who has two missions to deal with.

^{*}I would like to thank Wilfried Sand-Zantman for helpful comments.

[†]CREST-LEI, 28, rue des Saints Pères, 75007 Paris. nikolova@ensae.fr.

Some implications of multitasking in the career concerns setting have been stressed first by Dewatripont, Jewitt and Tirole (DJT hereafter) (1999). They study the conditions under which increasing the number of tasks pursued by the agent will decrease the total effort realized. However since their analysis focuses on the symmetric case they don't consider the problems of effort concentration and interest congruence.

We remove the assumption of perfect symmetry of missions to shed light on the effort concentration phenomenon. We establish the conditions under which this problem occurs, and we give some indications for task clustering. We also show that the lack of a commitment device for the principal implies that more precise information may be harmful for his interests.

In Section 2 we present the framework of our model. In Section 3 and 4 we study the incentives for effort allocation in the case of aggregated performance and in the case of disaggregated performance accounting. Section 5 concludes.

2 The Model

There are two risk neutral parties - the agent (or manager) and the principal (or market). Each manager is characterized by his intrinsic ability (or talent) θ . Talent is assumed unknown for both parties but they have the same prior beliefs on it. The agent chooses his effort a , unobservable for the principal (possibly multidimensional), and incurs private cost $c(a)$. The principal observes the agent's performance y , which depends on the manager's effort, on his ability and on some shock ε . In our framework no contingent contracts can be written on the output observed. However the present performance acts as information about the future one. In other words the reward w of the period t depends on the outputs observed by the principal up to the end of $(t - 1)$. So the only motivation for the agent is to influence the principal's perception about his talent.

Thus the manager exerts effort as long as 1) there is a next period, 2) his ability is unknown for the principal and 3) his future pay-off is contingent to the observed performances.

We study the multitask problem in the two-period case, with an additive technology. We suppose that the agent has to deal with two tasks at the first period. The output for each of them writes:

$$\begin{aligned} y_1 &= \theta_1 + a_1 + \varepsilon_1 \\ y_2 &= \theta_2 + a_2 + \varepsilon_2 \end{aligned}$$

We suppose that θ_i and ε_i are normally distributed: $\theta_i \sim N(\bar{\theta}, \sigma_\theta^2)$ and $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$. Shocks are independently and identically distributed variables while ρ is the correlation coefficient between θ_1 and θ_2 . $f(\theta, y/a)$ denotes the joint density of talent and performance given effort.

Assuming a competitive market of risk neutral potential employers, the agent's wage will be equal the principal's expected gain, conditional on the performances observed: $w^t = E[y^t/y^{t-1}, y^{t-2} \dots] = E[\theta/y^{t-1}, y^{t-2} \dots] + a^t$.

To introduce asymmetry between talents and thus between tasks we assume that at the second period the agent has to realize a unique mission, requiring different proportions of θ_i , α for θ_1 and $(1 - \alpha)$ for θ_2 ¹.

Finally to focus our analysis on the informational task asymmetry we assume away any economies or diseconomies of scope and consider a separable cost function of the following form:

$$c(a_1, a_2) = c(a_1) + c(a_2)$$

3 Observation of aggregated performance

Consider first the case where only the aggregated performance, $Y = y_1 + y_2$, is available for the principal. Then the marginal density of Y conditional on total effort $\hat{a} = a_1 + a_2$ is:

$$\hat{f} \propto \exp\left(\frac{-(Y - 2\bar{\theta} - \hat{a})^2}{2(2(1 + \rho)\sigma_\theta^2 + 2\sigma_\varepsilon^2)}\right)$$

The agent will choose his effort in order to maximize his intertemporal expected utility (the discount factor is normalized to one).

$$\underset{\hat{a}}{\text{Max}} E[E(\alpha\theta_1 + (1 - \alpha)\theta_2/Y, \hat{a}^*)] - c(\hat{a})$$

where \hat{a}^* represents the equilibrium effort. As shown by DJT (1999) the corresponding equilibrium condition is:

$$\text{cov}\left(\alpha\theta_1 + (1 - \alpha)\theta_2, \frac{\hat{f}_{\hat{a}}}{\hat{f}}\right) = c_{\hat{a}}(\hat{a}^*)$$

The covariance between the talent and the likelihood ratio describes the agent's marginal incentive.

The likelihood ratio can be easily obtained from the marginal density expression:

¹We also assume that the inside principal and the market put the same weights to each of two talents.

$$\frac{\widehat{f}_{\widehat{a}}}{\widehat{f}} = \frac{(\theta_1 + \theta_2 - 2\bar{\theta}) + \varepsilon_1 + \varepsilon_2}{2(1 + \rho)\sigma_{\theta}^2 + 2\sigma_{\varepsilon}^2}$$

The first order condition becomes:

$$\frac{1}{2} \frac{(1 + \rho)\sigma_{\theta}^2}{(1 + \rho)\sigma_{\theta}^2 + \sigma_{\varepsilon}^2} = c_{\widehat{a}}(\widehat{a})$$

From this result we can make the next proposition:

Proposition 1 *As long as the principal observes the total output only, the equilibrium marginal incentive is independent on the weights associated to each talent in the second period output.*

If the only information available for the principal is an aggregated one, an asymmetric weighting of talents will not influence the agent's incentives for effort allocation.

4 Observation of disaggregated performance

Let us now suppose that the principal's information is a disaggregated one. In this case \widehat{f} is the joint marginal density of y_1 and y_2 , conditional on a_1 and a_2 . It is proportional to:

$$\exp \left[-\frac{1}{2(1 - \gamma^2)} \left(\frac{(y_1 - \bar{\theta} - a_1)^2}{\sigma_{\theta}^2 + \sigma_{\varepsilon}^2} + \frac{(y_2 - \bar{\theta} - a_2)^2}{\sigma_{\theta}^2 + \sigma_{\varepsilon}^2} - 2\gamma \frac{(y_1 - \bar{\theta} - a_1)(y_2 - \bar{\theta} - a_2)}{\sigma_{\theta}^2 + \sigma_{\varepsilon}^2} \right) \right]$$

where $\gamma = \frac{\rho\sigma_{\theta}^2}{\sigma_{\theta}^2 + \sigma_{\varepsilon}^2}$ is the correlation coefficient between y_1 and y_2 .

As the principal observes the agent's performance on each task, we have two first order conditions to consider:

$$\alpha \text{cov} \left(\theta_1, \frac{\widehat{f}_{a_1}}{\widehat{f}} \right) + (1 - \alpha) \text{cov} \left(\theta_2, \frac{\widehat{f}_{a_1}}{\widehat{f}} \right) = c_{a_1}(a)$$

and

$$(1 - \alpha) \text{cov} \left(\theta_2, \frac{\widehat{f}_{a_2}}{\widehat{f}} \right) + \alpha \text{cov} \left(\theta_1, \frac{\widehat{f}_{a_2}}{\widehat{f}} \right) = c_{a_2}(a)$$

The corresponding likelihood ratios are:

$$\frac{\widehat{f}_{a_1}}{\widehat{f}} = \frac{[\left((\theta_1 - \bar{\theta}) + \varepsilon_1\right) - \gamma \left((\theta_2 - \bar{\theta}) + \varepsilon_2\right)]}{(1 - \gamma^2)(\sigma_\theta^2 + \sigma_\varepsilon^2)}$$

$$\frac{\widehat{f}_{a_2}}{\widehat{f}} = \frac{[\left((\theta_2 - \bar{\theta}) + \varepsilon_2\right) - \gamma \left((\theta_1 - \bar{\theta}) + \varepsilon_1\right)]}{(1 - \gamma^2)(\sigma_\theta^2 + \sigma_\varepsilon^2)}$$

So we can express the marginal benefits at the equilibrium for each task:

$$\frac{\alpha \sigma_\theta^2 (\sigma_\theta^2 + \sigma_\varepsilon^2 - \rho^2 \sigma_\theta^2)}{(\sigma_\theta^2 + \sigma_\varepsilon^2)^2 - (\rho \sigma_\theta^2)^2} + \frac{(1 - \alpha) \rho \sigma_\theta^2 \sigma_\varepsilon^2}{(\sigma_\theta^2 + \sigma_\varepsilon^2)^2 - (\rho \sigma_\theta^2)^2} \text{ for task 1}$$

$$\frac{\alpha \rho \sigma_\theta^2 \sigma_\varepsilon^2}{(\sigma_\theta^2 + \sigma_\varepsilon^2)^2 - (\rho \sigma_\theta^2)^2} + \frac{(1 - \alpha) \sigma_\theta^2 (\sigma_\theta^2 + \sigma_\varepsilon^2 - \rho^2 \sigma_\theta^2)}{(\sigma_\theta^2 + \sigma_\varepsilon^2)^2 - (\rho \sigma_\theta^2)^2} \text{ for task 2}$$

To simplify the analysis we consider the limit case² where $\alpha = 1$. This situation occurs when at the second period the agent has to deal with a mission requiring a unique talent - the one revealed by the first task. So at the equilibrium we have:

$$\frac{\sigma_\theta^2 (\sigma_\theta^2 + \sigma_\varepsilon^2 - \rho^2 \sigma_\theta^2)}{(\sigma_\theta^2 + \sigma_\varepsilon^2)^2 - (\rho \sigma_\theta^2)^2} = c_{a_1}(a)$$

$$\frac{\rho \sigma_\theta^2 \sigma_\varepsilon^2}{(\sigma_\theta^2 + \sigma_\varepsilon^2)^2 - (\rho \sigma_\theta^2)^2} = c_{a_2}(a)$$

There is no change concerning the total effort that the agent supplies at the equilibrium. However the asymmetric weighting of talents affects the effort allocation. The missions the agent deals with don't have the same informational impact over the θ_1 value, so incentives differ across tasks. Remark that, except in the limit case of perfect positive correlation between talents ($\rho = 1$), the agent devotes more effort to the first task than to the second one. In the absence of correlation ($\rho = 0$) the agent performs the first task only.

Since ρ influences the informational value of the second task concerning θ_1 , it is an important element for the manager's incentives. When ρ is positive and close to 1, shirking on the second task is detrimental to the agent. Inferring a low ability θ_2 influences negatively the principal's beliefs about θ_1 . This observation has some implications in terms of task clustering.

Proposition 2 *In the case of disaggregated information, grouping tasks that require similar talents leads to a reduction of the effort concentration phenomenon.*

²The intuitions are the same in the general case since there is asymmetry between tasks i.e. $\alpha \neq 1/2$.

This effect adds to the one obtained by DJT (1999). They have shown that higher correlation of talents leads to an increase in total equilibrium effort.

By comparing the results of sections 3 and 4, we remark that the effort concentration depends on the informational structure available. In fact it arises only in the case of disaggregated performance accounting. So we can formulate the next proposition.

Proposition 3 *Disaggregated performance measurement is harmful for the principal's interests as long as he prefers an even effort allocation among tasks.*

Indeed if the principal has the possibility to choose the informational structure and if he wants to avoid effort concentration, he will prefer the aggregated performance accounting. This is reminiscent of some results of the literature of incomplete contracts and lack of commitment in dynamic models (see for example Crémer (1995)). In such frameworks increasing the quality of information available to the principal does not necessarily improve incentives.

5 Conclusion

The problems of effort concentration and congruence of the principal's and agent's interests in the multitask setting have been largely studied in the case of explicit contracting. In this article we have proposed some intuitions about the extend of this phenomena in the career concerns model.

We have shown that as long as the principal observes the total output only, the asymmetry between tasks will not influence the agent's choice of effort sharing. In this sense the employer prefers an aggregated performance accounting to a disaggregated one. However if the output of each task is observable, the principal can remedy on effort concentration by grouping missions requiring similar talents.

Our analysis leaves open several issues. An interesting extension for example would be to consider a situation in which the internal principal and the market don't put the same weight to each aspect of the agent's talent. We think that in such a framework the agents preferences for a career path would be of a concern.

References

- [1] CREMER, J. (1995), "Arms Length Relationships", *The Quarterly Journal of Economics*, vol.110, pp. 275-296.
- [2] DEWATRIPONT, M., JEWITT, I., and TIROLE, J. (1999), "The Economics of Career Concerns, Part 2: Application to Missions and Accountability to Government Agencies", *Review of Economic Studies*, vol. 66, p. 199-217.
- [3] FAMA, E. (1980), "Agency Problems and the Theory of the Firm", *Journal of Political Economy*, vol 88, p. 288-307.
- [4] HOLMSTRÖM, B. (1999), "Managerial Incentive Problems: A Dynamic Perspective", *Review of Economic Studies*, vol. 66, p. 169-182.
- [5] HOLMSTRÖM, B. and MILGROM, P. (1991), "Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership and Job Design", *Journal of Law, Economics and Organization*, vol. 7, p. 24-52.