Career Concerns and Career Choice*

Marc Blatter† Andras Niedermayer‡

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Abstract

In many industries workers face a choice between high and low visibility jobs. The former let all potential employers observe performance, the latter only the current employer. This paper argues that workers getting a positive initial signal about their talent are willing to incur costs to work in high visibility jobs in order to avoid a hold up problem with the current employer in the second period. We show that workers' ability to choose jobs and to observe an initial signal about talent reverses predictions by standard models. In particular, (i) workers may exert less effort in high visibility jobs in a career concerns setup and (ii) firms may invest more in general human capital in more visible jobs.

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†Economics Department, University of Bern, Schanzeneckstrasse 1, CH-3001 Bern, Switzerland. Email: marc.blatter@vwi.unibe.ch.

‡Kellogg School of Management, CMS-EMS, Northwestern University, Evanston, IL 60208. Email: a-niedermayer@kellogg.northwestern.edu.

1 Introduction

In many industries workers can choose between high visibility jobs and low visibility jobs. Performance in high visibility jobs is publicly observable, whereas in low visibility jobs it is observable only by the current employer. Examples include CEOs of publicly listed companies with large media exposure versus CEOs of firms funded by private equity; politicians in federal and state versus local governments; consulting (with contact to many clients) versus management jobs, and more generally front office versus back office work; mutual funds managers whose names are versus whose names are not disclosed; academia (publications being visible to everyone) versus private industry; conducting open science with published results for a commercial firm versus research which is kept secret, and more generally basic research versus specific research; open source versus closed source software development.[1] Often, workers are motivated by career concerns: performing well in the current position makes a good impression on potential future employers (be it the current or another employer).[2] It is therefore an important question what effect job visibility has on effort induced by career concerns.

We will argue in the following that with two additional assumptions to standard models, (i) that workers have an initial signal about their ability and (ii) that workers can freely choose between high and low visibility jobs, we may end up in an Alice-through-the-looking-glass world where intuitive results are reversed: workers may exert less effort in high than in low vis-

[1]See e.g., Massa, Reuter, and Zitzewitz (2006) for the disclosure of the names of mutual funds managers, Loveman and O'Connell (1996) for on-site versus off-site software development for a client, Mukherjee and Stern (2007) for open science, and Lerner and Tirole (2001) for open source software.

[2]See e.g., Dewatripont, Jewitt, and Tirole (1999b), Suurmond, Swank, and Visser (2004), and Chevalier and Ellison (1999) for the relevance of career concerns in for civil servants, politicians, and mutual funds managers.

ibility jobs; employers may invest in more rather than less general human capital in high visibility jobs.[3]

These at first sight counterintuitive results stem from an effect which has – to the best of our knowledge – not been identified in the literature so far, an effect we will call *career choice effect*. To explain this effect on the effort level, consider a career concerns model with two periods (see e.g., Dewatripont, Jewitt, and Tirole (1999a)). First period performance depends on a worker's talent, effort, and luck. Since second period employers only observe total performance and not the individual components, a higher performance will lead to higher posterior beliefs about the worker's talent and hence a higher second period wage. This gives a worker the incentive to exercise effort. Ceteris paribus, higher visibility makes it more attractive for the worker to exert effort. However, if the worker faces a choice between a high and a low visibility job in the first period and if choosing a high visibility job causes some costs, only workers who get high initial signals about their abilities will choose high visibility jobs. This makes the job choice (or choice how one starts one's career) a signal for ability. Workers in high visibility jobs are expected to be more talented. To take it to the extreme, consider the case where high visibility jobs are chosen only by workers who are talented for sure. Then there is no need to observe performance in high visibility jobs, since talent is known.[4] Performance being ignored by employers, there is no need to exert effort.

[3]We also conjecture that our results should carry over to the introduction of incentive schemes: firms paying managers based on performance may end up with managers exerting less effort. While it seems plausible (as it will be seen later) that results should carry over, we have not been able to show it formally yet.

[4]Of course, the argument is more subtle than that: if performance is not considered by employers, workers with a low signal about their ability would imitate high signal workers. Therefore, this can only be a pure strategy equilibrium if a large proportion of, but not all, high visibility workers are talented.

A similar argument can be made for investment in general human capital. Becker (1964) shows that with symmetric information between current and other employers (high visibility jobs in our terminology) a firm will never invest in general human capital. The reason is that the worker can quit (or threaten to quit) and take the whole surplus of the investment. A newer strain of literature (see e.g., Acemoglu and Pischke (1998)) points out that if the current employer is better informed about a worker's performance or ability than other employers (low visibility), the result is reversed and he will invest in general human capital. This is because in equilibrium workers switching jobs are believed to be less talented. Hence the current employer can extract rents from his employee. We argue that the career choice effect leads to a non-monotonicity of investment in general human capital with respect to visibility. Intermediate levels of visibility may lead to higher levels of investment than very high or very low levels of visibility. To see why this is the case, one has to keep in mind that Acemoglu and Pischke's argument relies on investment having a larger impact on talented than untalented workers. Higher visibility may mitigate the employer's possibility to extract rents from the worker, but it also attracts more talented workers on average. Hence, investment in human capital becomes more profitable.

While we describe the career choice effect in its extremes for the sake of clarity, namely when it overturns other, well known effects, there is also a more subtle statement. Even when the career choice effect does not dominate other effects, it may still dampen them. Hence one would expect that in types of jobs where workers have a relatively precise initial signal about their ability and where they can choose between visibility levels, standard results concerning career concerns efforts and investment in general human capital should be weaker than in other types of jobs.

Related Literature. We see our primary contribution in adding to a debate on the role of career concerns. Initially, the argument had been made that managers' career concerns (stemming from high visibility of their performance) are a substitute, even if sometimes not a perfect one, for explicit incentives (i.e. performance related payment), since they induce managers' to exert more effort (see e.g. Fama (1980)). A later strain of literature (see e.g., the seminal paper by Holmstrom (1999, originally published 1982) and Dewatripont, Jewitt, and Tirole (1999a)) points out that implicit (i.e., career concerns) incentives may work in the right direction, but they have the wrong magnitude in general. We add to this that higher visibility of performance may not only have the wrong magnitude, but even the wrong sign if workers can choose between high and low visibility jobs.[5,6]

We see our secondary contribution to the literature on investment in general human capital (see e.g., Becker (1964) and Acemoglu and Pischke (1998)). As pointed out above, the career choice effect can lead to a non-monotonicity in investments in general human capital with respect to visibility.

While we differ from the remaining literature by showing that workers' initial signals about their talent and their choice of jobs lead to the career choice effect which can overturn standard results, there are similarities to many strains of literature. The career concerns literature looks at workers' incentives to exert effort when future employers observe performance

[5]Of course, the original discussion does not deal with high versus low visibility jobs explicitly. However, job visibility is implicitly at the core of career concerns.

[6]A further point, on which we have preliminary result not included here, is that with the career choice effect, not only implicit (career concerns) incentives become weaker, but also explicit incentive schemes. Risk averse workers are more likely to choose jobs with steep incentive schemes if they are confident about being talented. This reduces career concern incentives for workers in jobs with steep incentives.

(see e.g. Holmstrom (1999), Gibbons and Murphy (1992), Dewatripont, Jewitt, and Tirole (1999a), Dewatripont, Jewitt, and Tirole (1999b)). The recent and growing literature on information disclosure of firms (see e.g., Mukherjee (2008a), Mukherjee (2008b), and Bar-Isaac, Jewitt, and Leaver (2007)) considers firms' decisions whether and to what extent to disclose their workers' performance. More generally, there is a literature on labor markets focusing on the current employer's informational benefit compared to outside employers.[7] There are also several papers viewing open source development from a career concerns perspective.[8] Indeed, observations of open versus closed source development were the initial motivation for the current paper. In a wider sense, the paper also relates to the literature on "open science", i.e., the disclosure of research findings.[9] "Open science" can be viewed as high visibility in our context. There is also a large literature about the career concerns (usually called reputational concerns) of politicians, see e.g., Suurmond, Swank, and Visser (2004) and the references therein.

Three of these papers have effects leading to somewhat similar outcomes, however, coming from very different sources. Dewatripont, Jewitt, and Tirole (1999a) show that effort may increase if the signal about performance is coarser (rather than less likely to be observed). A lower probability of being observed can only lead to more effort in their paper if effort and talent have opposite effects on performance. In Spiegel (2005), the effect stems from the multiplicity of equilibria and unstable equilibria having different properties

[7] See e.g., Waldman (1984), Greenwald (1986), Acemoglu and Pischke (1998), Hermalin (2002), and Li (2007).

[8] Johnson (2002), Lerner and Tirole (2001), Spiegel (2005), Lee, Moisa, and Weiss (2003), and Leppämäki and Mustonen (2003).

[9] See Dasgupta and David (1994) for an early paper and also Mukherjee and Stern (2007) and the references therein.

from stable ones. In Suurmond, Swank, and Visser (2004), the effect is due to the agent having the possibility to cancel the project and thus hide information about his performance. The effects in all three papers are distinct from our career choice effect.

The remainder of the paper is structured as follows. Section 2 introduces the basic model. Section 3 considers the effort level in a career concerns setup with a career choice effect. Section 4 describes investment incentives in general human capital. Sections 5 and 6 discuss the results and conclude.

2 Basic Model

We will first introduce the basic model which will serve as a starting point for further analysis. There are two periods. In the first period, workers can decide whether to work in a high or in a low visibility job. At the beginning of the second period, employees receive outside offers from potential new employers. If an employee wants to switch jobs, the current employer can make a new wage offer. Employers are assumed to be perfectly competitive.

There are two types of workers: talented (T) and untalented (U). Let the proportion of talented workers be λ, that of untalented $1-\lambda$. A talented worker is successful (S) with probability p, which generates profits $\overline{\pi}_s$ in a high visibility job and $\underline{\pi}_s$ in a low visibility job. With probability $1-p$ the talented worker fails (F) and generates profits $\overline{\pi}_f$ and $\underline{\pi}_f$, respectively. An untalented worker always fails, and generates profits $\overline{\pi}_f$ and $\underline{\pi}_f$. The net present value of second period expected productivity of a talented worker is denoted by Π_T. Analogously, the net present value of second period expected productivity of an untalented worker is denoted by Π_U.

In order to introduce our model, we assume in a first step that the probability of success is exogenously given. Later on, we will assume that a talented worker's probability of success $p(e)$ depends on his effort choice e in the first period.

Neither a worker nor his prospective employer know whether the worker is talented or not. However, the worker observes a private signal σ about his talent before choosing his first job. For talented employees, σ is distributed according to the cumulative distribution function G_T, for untalented according to G_U. Most of the analysis so far is confined to a discrete distribution with two mass-points. However, we generalize the results to continuous distributions in parts of the analysis. Since we are dealing with two states of the world (T and U), we can assume without loss of generality that G_T and G_U satisfy the monotone likelihood ratio property, i.e. $g_T(\sigma)/g_U(\sigma)$ is increasing in σ. We define the random variable η, which is the posterior probability of being talented, as

$$\eta = H(\sigma) := \Pr[T|\sigma] = \frac{\lambda g_T(\sigma)}{\lambda g_T(\sigma) + (1-\lambda) g_U(\sigma)},$$

where g_T and g_U stand for the probability of a mass point for discrete and the density for continuous distributions. Denote η's distribution as $F(\eta) := \lambda G_T(H^{-1}(\eta)) + (1-\lambda) G_U(H^{-1}(\eta))$ and f the weight of a mass point or the density.

In most of the analysis we will consider η taking two possible values, η_1 and η_2 with $\eta_1 < \eta_2$. We will consider separating equilibria where workers with a good signal choose a high visibility job and workers with a bad signal a low visibility job ($\underline{\eta} = \eta_1$ and $\overline{\eta} = \eta_2$).

The exact timing of the first period is as follows (the items in brackets are introduced in further sections of the paper):

1. Employee observes private signal σ about his talent.

2. Employee chooses either a high or a low visibility job.

3. [The employer invests in human capital and thereby increases second period productivity.]

4. [Employee chooses effort e.] The probability of success is $p(e)$ for talented and 0 for untalented workers.

5. Success or failure are observed by the current employer for low visibility jobs and by all employers for high visibility jobs.

In the second period, employees receive outside offers from potential new employers. They can either switch jobs or renegotiate contracts with their current employer. In case of a high visibility job, every potential employer knows whether an employee has been successful or not in the first period and makes a corresponding wage offer. Employees in high visibility jobs will therefore receive a wage in the second period which is equal to their expected productivity given the observation in the first period. In contrast, in case of a low visibility job, success or failure is only observed by the current employer. The employer of a successful employee knows that his employee is talented and will have a higher expected productivity in the second period. Continuing the employment relation generates a surplus for the employee and the current employer, since the expected productivity of the successful employee is higher than the outside wage offer provided by employers who don't know that the employee has been successful in the first period. This surplus is the difference between the expected productivity of a successful worker and the outside wage offer. We assume that this surplus it is divided according to the Nash bargaining solution: the employer gets

$(1-\alpha)$, the employee α of the surplus.[10]

We first consider the case where an employee chooses a high visibility job in the first period. Success or failure is observable but not verifiable by a court. Since untalented workers never succeed, observing success is a sure sign of talent. The perfectly competitive employers will pay a successful employee the net present value of the expected productivity of a talented worker in period 2, Π_T. However, a talented employee may have bad luck and fail. If the employers observe failure, they will form a conditional expectation about the net present value productivity of an unsuccessful worker who has chosen a high visibility job in period 1, denoted by $\Pi_{\bar{F}}$.

The expected wage of a worker in a high visibility job is therefore given by

$$\overline{V}(\eta) = \bar{\eta} E[\overline{\pi}|T] + (1-\bar{\eta})\overline{\pi}_f + \eta p \Pi_T + (1-\eta p)\Pi_{\bar{F}},$$

where $\bar{\eta}$ is the expected η for workers in high visibility jobs, and the net present value expected productivity of unsuccessful workers in high visibility jobs is

$$\Pi_{\bar{F}} = \frac{\bar{\eta}(1-p)\Pi_T + (1-\bar{\eta})\Pi_U}{\bar{\eta}(1-p) + (1-\bar{\eta})}.$$

Next, we consider workers who have chosen a low visibility job in the first period. As described above, after the first period renegotiations take place and the employer of a successful worker in a low visibility job has a competitive advantage since he is the only one who has observed the success of his employee in the first period. This allows him to obtain a fraction $(1-\alpha)$ of the surplus which is generated by continuing to employ

[10] Alternatively, α can be interpreted as the probability that every employer observes success of failure in a low visibility job. With probability $1-\alpha$, only the current employer observes success or failure. With this interpretation, the high visibility job can be considered as a special case, with $\alpha = 1$. α can also be interpreted as a combination of the probability of the signal becoming public and bargaining.

his employee in period 2. However, because of perfect competition firms pay wages equal to expected profits. Thus, the expected benefits of retaining a successful employee are already anticipated in period 1 and the worker gets the expected surplus that will be bargained away from him in the second period as part of his wage in the first period.

The surplus is given by $(\Pi_T - \Pi_{\underline{F}})$, where $\Pi_{\underline{F}}$ is the equilibrium wage offered to job switchers in period 2. The outside option corresponds to the expected productivity of workers who failed in a low visibility job in period 1. In equilibrium firms believe that only unsuccessful workers will switch jobs in period 2. Hence, job switchers are offered the expected productivity of unsuccessful workers. Wages paid to successful workers who do not to switch jobs are then equal to $\alpha\Pi_T + (1-\alpha)\Pi_{\underline{F}}$.

The expected wage of a worker in a low visibility job is therefore given by

$$\begin{aligned}\underline{V}(\eta) =& \underline{\eta}E[\underline{\pi}|T] + (1-\underline{\eta})\underline{\pi}_f + (1-\alpha)\underline{\eta}p(\Pi_T - \Pi_{\underline{F}}) \\ &+ \alpha\eta p\Pi_T + (1-\alpha\eta p)\Pi_{\underline{F}},\end{aligned}$$

where $\underline{\eta}$ is the expected η for closed source developers and the net present value expected productivity of unsuccessful workers in low visibility jobs is

$$\Pi_{\underline{F}} = \frac{\underline{\eta}(1-p)\Pi_T + (1-\underline{\eta})\Pi_U}{\underline{\eta}(1-p) + (1-\underline{\eta})}.$$

3 Effort

In this section, we extend our analysis to a career concerns setup, where the probability of success depends on the effort level of the employee. A worker will exert effort in the first period in order to increase the probability of success and firms' posterior belief about his talent. The probability of success $p(e)$ of a talented employee depends on his effort e and is the same for high and low visibility jobs. We assume the following conditions to hold: $p' > 0$, $p'(0) = \infty$, $p'(\infty) = 0$, $p'' < 0$ (Inada conditions), and $p(0) > 0$. In order to simplify the analysis, we still assume that the probability of success is zero for the untalented worker.

Hence, if success is observed, employers can deduce that the employee is talented. If failure is observed, the probability of an employee to be talented is

$$\frac{(1-p(e))\overline{\eta}}{(1-p(e))\overline{\eta}+(1-\overline{\eta})} = \frac{\overline{\eta}(1-p(e))}{1-\overline{\eta}p(e)},$$

for the high-visibility job. For low visibility jobs replace $\overline{\eta}$ with $\underline{\eta}$.

The second period utility of a talented worker in a high visibility job is given by

$$\overline{U}(e,\hat{e}) := \eta p(e)\Pi_T + (1-\eta p(e))\Pi_{\bar{F}}(\hat{e}) - e,$$

where $\hat{e}$ is firm's expectation of effort and

$$\Pi_{\bar{F}}(\hat{e}) = E[\Pi|\overline{F},\hat{e}] = \frac{(1-p(\hat{e}))\overline{\eta}}{1-\overline{\eta}p(\hat{e})}\Pi_T + \frac{1-\overline{\eta}}{1-\overline{\eta}p(\hat{e})}\Pi_U$$

The rational expectations effort level $\overline{e}$ is given by the first-order condition $\overline{U}_e(\overline{e},\overline{e}) = 0$. The second-order condition $\overline{U}_{ee}(\overline{e},\overline{e}) < 0$ is satisfied because of global concavity of p. The rational expectations equilibrium is unique (and stable) if the first-order condition is decreasing in $\overline{e}$, i.e., $\overline{U}_{ee}(e,e) + U_{e\hat{e}}(e,e) < 0$ for all e, or equivalently,

$$p''(\overline{e}) < \frac{p'(\overline{e})\Pi'_{\bar{F}}(\overline{e})}{\Pi_T - \Pi_{\bar{F}}(\overline{e})} \qquad \forall \overline{e}.$$

We can either assume that this condition holds or consider the highest effort equilibrium in case of multiple equilibria (this equilibrium has to be stable, hence $\overline{U}_{ee}(e,e) + \overline{U}_{e\hat{e}}(e,e) < 0$ holds at the equilibrium effort level).

The second period utility of a talented worker in a low visibility job L is

$$\underline{U}(e,\hat{e}) := \eta p(e)[\alpha\Pi_T + (1-\alpha)\Pi_{\underline{F}}(\hat{e})] + (1-\eta p(e))\Pi_{\underline{F}}(\hat{e}) - e,$$

where

$$\Pi_{\underline{F}}(\hat{e}) := E[\Pi|\underline{F},\hat{e}] = \frac{(1-p(\hat{e}))\underline{\eta}}{1-\underline{\eta}p(\hat{e})}\Pi_T + \frac{1-\underline{\eta}}{1-\underline{\eta}p(\hat{e})}\Pi_U$$

The rational expectations effort level $\underline{e}$ is given by the first-order condition $\underline{U}_e(\underline{e},\underline{e}) = 0$. The second-order condition $\underline{U}_{ee}(\underline{e},\underline{e}) < 0$ is satisfied because of global concavity of p. The rational expectations equilibrium is unique (and stable) if $\underline{U}_{ee}(e,e) + \underline{U}_{e\hat{e}}(e,e) < 0$ for all e, or equivalently,

$$p''(\underline{e}) < \frac{p'(\underline{e})\Pi'_{\underline{F}}(\underline{e})}{\alpha\Pi_T + (1-\alpha)\Pi_U - \Pi_{\underline{F}}(\underline{e})} \qquad \forall \underline{e}.$$

For a comparison of $\overline{e}$ and $\underline{e}$ we can use the first-order conditions $\overline{U}_e(\overline{e},\overline{e}) = 0 = \underline{U}_e(\underline{e},\underline{e})$. Since by the uniqueness (and stability) condition both sides are decreasing in $\overline{e}$ and $\underline{e}$, respectively, $\overline{U}_e(e,e) < \underline{U}_e(e,e)$ for all e implies $\overline{e} < \underline{e}$, i.e., more effort in the low visibility job. $\overline{U}_e(e,e) < \underline{U}_e(e,e)$ can be transformed to

$$\overline{\eta}\frac{1-\overline{\eta}}{1-\overline{\eta}p(e)} < \alpha\underline{\eta}\frac{1-\underline{\eta}}{1-\underline{\eta}p(e)}, \qquad \forall e \tag{1}$$

This inequality represents the career choice effect. The left hand side determines the implicit incentives of a high visibility worker. $\overline{\eta}$ represents the probability of being talented and hence how useful it is to exert effort. The fraction represents the probability with which an unsuccessful worker is considered untalented and hence the costs of failure. The right hand side is the analog for the low visibility worker, adjusted by the bargaining position α of the worker.

In intuitive terms, it can be easily seen that if high visibility workers are (almost) perfectly sure to be talented ($\overline{\eta} \approx 1$) the left hand side becomes (almost) zero: if there are (almost) only talented workers in high visibility jobs, failure will be attributed to bad luck rather than to the lack of talent. Hence, high visibility workers will exercise less effort than low visibility workers.

In contrast, if workers are (almost) perfectly uninformed about their talent ($\underline{\eta} \approx \overline{\eta}$), the left hand side and the right hand side become almost equal save for $\alpha < 1$. Hence high visibility workers will exercise more effort.

Since $\eta \frac{1-\eta}{1-\eta p}$ has its maximum at $\eta = \frac{1-\sqrt{1-p}}{p}$, the closer η is to $\frac{1-\sqrt{1-p}}{p}$, the harder the agent will work.

In this reasoning, we have ignored so far that conditions have to be fulfilled for a separating equilibrium to exist. The incentive compatibility constraints are

$$\overline{u}_1 + \overline{U}(\overline{e}, \overline{e})\Big|_{\eta=\overline{\eta}} \geq \underline{u}_1 + \underline{U}(\overline{e}_d, \underline{e})\Big|_{\eta=\overline{\eta}}$$

for the high visibility worker and

$$\overline{u}_1 + \overline{U}(\underline{e}_d, \underline{e})\Big|_{\eta=\underline{\eta}} \leq \underline{u}_1 + \underline{U}(\underline{e}, \underline{e})\Big|_{\eta=\underline{\eta}}$$

for the low visibility worker, where $\overline{e}_d$ and $\underline{e}_d$ stand for the effort a high (low) visibility worker exerts when deviating and $\overline{u}_1$ and $\underline{u}_1$ for first period utility.

While we still need to derive analytical conditions under which high visibility workers exert less effort and a separating equilibrium exists, we already have numerical examples where this is the case.

Example. Take $\underline{\pi}_s = 5$, $\underline{\pi}_f = 4$, $\overline{\pi}_s = 1.73$, $\overline{\pi}_f = 0.73$, $\Pi_T = 5$, $\Pi_U = 0$, $\overline{\eta} = \frac{9}{10}$, $\underline{\eta} = \frac{1}{4}$, and $p(e) = 1 - \frac{1}{e^{3/4}+1}$. The resulting equilibrium effort level is $\overline{e} \approx 0.0111792$ for the high and $\underline{e} \approx 0.0119152$ for the low visibility worker, i.e., low visibility workers work harder. One can also check that this is a separating equilibrium indeed: the $\overline{\eta}$ worker's utility is larger in the high than the low visibility job ($5.24873 > 5.24368$) and the opposite is true for the $\underline{\eta}$ worker ($5.24679 > 5.24452$).[11]

4 Investment in General Human Capital

Our notion of the career choice effect can also be used to gain further insights about investment in general human capital. Becker (1964) shows that absent informational asymmetries, firms would invest in the specific human capital of their employees, but would never invest in general human capital. The reason is that the employee can switch jobs and take general human capital with him. Acemoglu and Pischke (1998) show that firms may nonetheless invest in general human capital if they have private information about their employees' abilities. An employee switching to another job cannot take the whole rent with him, since the new employer will assume him to be untalented.

In summary, it is known that for perfectly visible jobs, employers will not invest in general human capital, with low visibility they will. In the following we will argue that there is a non-monotonicity of investment with respect to job visibility. Intermediate levels of job visibility may lead to more investment if workers have the choice between different types of jobs.

For our analysis we can use the fact that α in the previous exposition can just as well be understood as the probability that the performance of the worker is revealed in the second period. In the following we will consider the case where for high visibility jobs the probability of the performance being revealed is $\overline{\alpha}$, for low visibility jobs $\underline{\alpha}$, with $\overline{\alpha} > \underline{\alpha}$.

We will look at the employer's investment in general human capital and

[11] This can be obtained by substituting $\overline{e}_d \approx 0.244361$ and $\underline{e}_d \approx 0.0000866016$ into the utility functions.

consider the effect of the worker having a signal about his ability and choosing a high or low visibility job accordingly. Assume that in the first period an employer makes investment $i \geq 0$ in the worker's general human capital. The investment is observable by everyone but not verifiable. The worker's second period productivity is $\Pi_T(i)$ if he is talented and $\Pi_U(i)$ if he is not. For the sake of clarity, we will assume the probability of success to be $p = 1$ for a talented worker in the following.

Acemoglu and Pischke's argument relies on supermodularity between talent and investment in human capital, in our case this means $\Pi'_T(i) > \Pi'_U(i)$ for all i. It can be shown that for $\Pi'_T < \Pi'_U$ the employer will never invest in human capital. We will consider the more interesting case where there is investment in human capital. The following assumptions on $\Delta\Pi(i) := \Pi_T(i) - \Pi_U(i)$ make sure that the optimal investment level is well behaved: $\Delta\Pi > 0$, $\Delta\Pi' > 0$, $\Delta\Pi'' < 0$, $\Delta\Pi'(0) = \infty$, and $\Delta\Pi'(\infty) < 1$.

A low visibility employer incurs costs i in the first period before observing success or failure of the worker. In the second period he can extract fraction $1-\underline{\alpha}$ from the increase in productivity of the worker in case the worker turns out to be talented (probability $\underline{\eta}$). His profits relevant for the investment are

$$-i + (1 - \underline{\alpha})\underline{\eta}\Delta\Pi(i)$$

The first order condition is

$$(1 - \underline{\alpha})\underline{\eta}\Delta\Pi'(\underline{i}) = 1 \tag{2}$$

For the high visibility job replace underline with overline.

A few things become apparent when considering (2). With $\overline{\alpha} = 1$ we have Becker's case for the high visibility firm and no investment in human capital by the employer. With $\underline{\alpha} < 1$ and $\underline{\eta} = \overline{\eta} = \lambda$ we have Acemoglu and Pischke's case for the low visibility firm: investment in general human capital is higher.

However, for $\underline{\alpha} < \overline{\alpha} < 1$ things can change. Iff

$$(1-\overline{\alpha})\overline{\eta} > (1-\underline{\alpha})\underline{\eta}$$

the high visibility firm invests more in human capital ($\bar{i} > \underline{i}$) because of the concavity of $\Delta\Pi$. Intuitively, less rents can be extracted in high visibility jobs ($1-\overline{\alpha} < 1-\underline{\alpha}$), but the worker is also more likely to be talented ($\overline{\eta} > \underline{\eta}$), which makes investments more likely to pay off. This gives us the career choice effect for distributions of η with two mass points, which is summarized in the following proposition.

Proposition 1. *High visibility employers invest more in general human capital than low visibility employers ($\bar{i} > \underline{i}$) if $\overline{\alpha}$ is sufficiently low, $\overline{\alpha} < 1-(1-\underline{\alpha})\underline{\eta}/\overline{\eta}$.*

We can derive sufficient conditions for this to hold for continuous distributions. It can be shown that if high and low visibility jobs coexist, the higher η, the more willing a worker is to take a high visibility job. Define η^* as the marginal agent who is indifferent between high and low visibility jobs. Let $\overline{\eta}(\eta^*) = E[\eta|\eta > \eta^*]$ be the average probability of being talented for high visibility workers and $\underline{\eta}(\eta^*) = E[\eta|\eta < \eta^*]$ the analog for low visibility workers.

η^* is endogenously given by $\underline{V}(\underline{\eta}(\eta^*), \eta^*) = \overline{V}(\overline{\eta}(\eta^*), \eta^*)$ where

$$\underline{V}(\underline{\eta}, \eta) = \underline{\eta}\underline{\pi}_s + (1-\underline{\eta})\underline{\pi}_f + (1-\underline{\alpha})\underline{\eta}\Delta\Pi(\underline{i}) - \underline{i} + [\underline{\alpha}\eta\Pi_T(\underline{i}) + (1-\underline{\alpha})\eta\Pi_U(\underline{i})]$$

and

$$\overline{V}(\overline{\eta}, \eta) = \overline{\eta}\overline{\pi}_s + (1-\overline{\eta})\overline{\pi}_f + (1-\overline{\alpha})\overline{\eta}\Delta\Pi(\bar{i}) - \bar{i} + [\overline{\alpha}\eta\Pi_T(\bar{i}) + (1-\overline{\alpha})\eta\Pi_U(\bar{i})]$$

Results will in general depend on the specific functional forms of F and $\Delta\Pi$. However, we can derive sufficient conditions, under which $\bar{i} > \underline{i}$ holds for any $\Delta\Pi$:

Proposition 2. *If* $\overline{\alpha} < 1 - (1 - \underline{\alpha})\lambda$ *and* $[\underline{\eta}(\eta^*)/\overline{\eta}(\eta^*)]' > 0$, *then* $\bar{i} > \underline{i}$.

Proof. The condition for $\overline{\alpha}$ ensures

$$\frac{1-\overline{\alpha}}{1-\underline{\alpha}} > \lambda = \left.\frac{\underline{\eta}(\eta^*)}{\overline{\eta}(\eta^*)}\right|_{\eta^*=1}$$

and because of $(\underline{\eta}/\overline{\eta})' > 0$ this also holds for $\eta^* < 1$. □

We still have to derive general conditions on F for which $(\underline{\eta}/\overline{\eta})' > 0$. However, we can already show that this condition always holds for a class of distributions which includes the uniform distribution: $F(\eta) = \eta^\beta$ with $\beta \geq 1$.

Proposition 3. *For* $F(\eta) = \eta^\beta$ *the condition* $(\underline{\eta}/\overline{\eta})' > 0$ *always holds.*

Proof.

$$\left(\frac{\overline{\eta}(\eta)}{\underline{\eta}(\eta)}\right)' = \left(\frac{\int_0^\eta \frac{yf(y)}{F(\eta)}\,dy}{\int_\eta^1 \frac{yf(y)}{1-F(\eta)}\,dy}\right)' = \left(\frac{\frac{\beta\eta}{1+\beta}}{\frac{\beta\left(1-\eta^{1+\beta}\right)}{(1+\beta)\left(1-\eta^\beta\right)}}\right)'$$

$$= \frac{\left(1+\beta\eta^{1+\beta}\right) - (1+\beta)\eta^\beta}{\left(1-\eta^{1+\beta}\right)^2} =: \frac{N}{D}$$

For $\eta \to 1$ the above expression goes to $\beta/(2+2\beta)$. For $\eta < 1$, the expression is also positive, since $D > 0$, $N = 0$ at $\eta = 1$, and N decreasing. □

5 Discussion and Further Research

We have considered a setup where a high visibility job bears some kind of direct costs compared to low visibility jobs, expressed in the productivity differences between $\overline{\pi}$ and $\underline{\pi}$. We believe that this can often be taken quite literally. Disclosing information about a publicly listed company's performance is costly and may provide valuable information to competitors; so does publication of research results by commercial companies; it is more difficult to commercialize the results of academic research and open source software development than say those of private consultancy work and closed source development.

In other cases, costs of high visibility jobs can come indirectly, from other sources. Note that low visibility jobs have both a loan and an insurance function (or side effect): in the first period, workers get part of their second-period average productivity, before it is realized whether they turn out to be talented or not. Therefore, if agents are risk averse or face liquidity constraints, it is costly for them to choose high visibility jobs, which provide neither loan nor insurance. While we see no reason why results should not carry over to such indirect rather than the direct costs of this paper, it is an interesting question how results would apply in setups with indirect costs.

A further question we have not yet answered conclusively – and which we therefore have not included here – is to what extent explicit incentives (performance based payment) can crowd out implicit incentives. After all, being willing to choose a job with steep incentives can serve as a sign of confidence about one's ability. It therefore reduces the necessity to signal to prospective employers.

We also want to get further characterizations of sufficient conditions when the career concerns effect dominates other effects and also sufficient conditions when it does not. A further question of interest is under which conditions the career choice effect is negligible; in such cases the simplifying assumption of the worker not observing a signal can be made for the sake of analytical tractability.

While we have stated our results for two visibility levels, they should carry over to multiple visibility levels with $\overline{\alpha}_i$, $i = 1, ..., N$. A similar analysis should hold for such setups, with the difference that multiple equilibria can exists, with different subsets of all possible visibility levels being chosen.

6 Conclusions

We have shown how the career choice effect can overturn results suspected by standard intuition if workers have an initial signal about their ability and can choose between high and low visibility jobs. We are convinced that these are important features of many real world labor markets and should be taken into account.

The assumption that there is no initial signal about workers' abilities is in many cases a reasonable approximation of reality and buys analytical tractability and is therefore justified. However, one has to keep in mind that predictions can change once an initial signal and job choice are introduced. The more precise workers' initial signal and the more costly high visibility jobs, the stronger the career choice effect altering predictions by standard models.

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