European Economic Review 67 (2014) 82–106

Contents lists available at ScienceDirect

European Economic Review

journal homepage: www.elsevier.com/locate/eer

Optimal incentive contracts for knowledge workers

Florian Englmaier [a,b], Gerd Muehlheusser [b,c,d], Andreas Roider [b,d,e,f,*]

[a] University of Munich, Department of Economics, Kaulbachstr. 45, D-80539 Munich, Germany
[b] CESifo, Germany
[c] University of Hamburg, Department of Economics, Von-Melle-Park 5, D-20146 Hamburg, Germany
[d] IZA, Germany
[e] University of Regensburg, Department of Economics, Universitätsstr. 31, D-93040 Regensburg, Germany
[f] CEPR, United Kingdom

ARTICLE INFO

Article history:
Received 15 November 2012
Accepted 9 January 2014
Available online 25 January 2014

JEL classification:
D86
D82
K31
M52

Keywords:
Knowledge workers
Moral hazard
Limited commitment
Ex post outside option

ABSTRACT

We study optimal incentive provision for "knowledge workers", a crucial resource for many organizations. We augment a standard moral-hazard framework to reflect two key patterns: First, retention is a challenge because workers are free to leave; thereby harming their employer. Second, the value of the worker's outside option might depend on effort on the job. Optimal contracts that retain workers exhibit properties such as first-best effort and surplus, or non-responsiveness to changes in underlying conditions. Due to large rents, full retention is, however, costly for employers. Hence, even when socially inefficient, separation might occur in equilibrium.

1. Introduction

Recent estimates suggest that "knowledge workers" (Drucker, 1959), such as scientists, engineers, and other specialists, constitute more than a quarter of advanced economies' workforce (see e.g., Roberts, 2007, or the 2006 survey in The Economist). Moreover, many authors have deemed the human capital of knowledge workers essential for organizational success and sustained economic growth in advanced economies (see e.g., Pakes and Nitzan, 1983; Frank et al., 2004; Ready and Conger, 2007). At the same, the job mobility of knowledge workers is high (see e.g., Chambers et al., 1998).

Not surprisingly, in various surveys conducted among CEOs, the retention of such talent is considered a key organizational challenge (see e.g., Roberts, 2007). Potential reasons are twofold: First, when knowledge workers leave their current employer then, because of their crucial human capital, this often jeopardizes the successful completion of ongoing projects. For example, according to Frank et al. (2004), the loss of organizational knowledge is considered the most dangerous threat from turnover among knowledge workers.

* Corresponding author at: University of Regensburg, Department of Economics, Universitätsstr. 31, D-93040 Regensburg, Germany. Tel.: +49 941 9432701.
E-mail addresses: florian.englmaier@econ.lmu.de (F. Englmaier), gerd.muehlheusser@wiso.uni-hamburg.de (G. Muehlheusser), andreas.roider@ur.de (A. Roider).

0014-2921/$ - see front matter © 2014 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.euroecorev.2014.01.006

Second, retention might turn out to be quite difficult if a (knowledge) worker really wants to leave. For example, it has been highlighted that – despite a formal contract with their employer – in many cases employees are basically free to leave at any time (see e.g., Harris and Holmstrom, 1982; Holmstrom, 1983; Meyer, 1987). Potential factors contributing to this phenomenon include the employment-at-will doctrine in U.S. employment law or difficulties in forcing participation on an unwilling employee (see e.g., Malcomson, 1999, p. 2304.).

In some cases, non-compete clauses are stipulated with the purpose of preventing employees who leave their current employer from using their acquired skills outside the relationship. However, unless the current employer's legitimate business interests (e.g., trade secrets) are affected, courts are often reluctant to enforce such clauses; worrying that employers might abuse them to prevent employees from working elsewhere at all.[1]

Summing up, this suggests that in order to retain workers, employers must make staying sufficiently attractive for them compared to their outside options. Importantly, this creates a potential challenge for incentive design because knowledge workers' outside options are often *endogenous* in the sense of being crucially driven by their effort, acquired skills, or experience in the current work relationship. For example, they might discover potential process or product innovations, which they might exploit themselves, e.g., by quitting and starting their own business. Empirically, Klepper and Thompson (2007) study spin-off entry in high-tech industries and find that many entering entrepreneurs had built their human intellectual capital through work experience in established firms. Similarly, in a sample of high-growth firms, Bhide (2000) finds that 71% of entrepreneurs used ideas encountered in the previous employment (for similar findings, see Cooper, 1986; Delaney, 1993). As a result, the potential interaction between retention and incentive provision needs to be taken into account when designing incentive schemes for knowledge workers: On the one hand, providing strong effort incentives tends to induce a more attractive outside option; thereby potentially triggering separation, which might be harmful for the employer. On the other hand, the prospect of separation might foster knowledge workers' effort incentives (through the endogeneity of their outside option), on which employers could potentially "free-ride".

Consequently, this paper is centered around the following two research questions: First, when the aim is to retain knowledge workers, how should employers optimally structure incentive contracts? Second, in the light of the high turnover rates of knowledge workers, under what circumstances will employers optimally choose *not to retain* them, even if, through a sufficiently attractive contract, retention would be possible (and even socially efficient)?

To address these questions, we employ a workhorse moral hazard model (risk-neutrality, limited liability, and binary output space) and modify it in the following two ways[2]: First, while the principal (she) can commit to the contract terms (i.e., output-dependent payments), the agent (he) is free to leave. In particular, after effort provision the agent (privately) learns to which degree a project holds promise within the firm. He then faces a choice between either staying with the principal and completing the project or instead leaving in order to pursue his *ex post outside option*, in which case the principal forgoes (part of) the project return. Second, we focus on the case where this outside option is increasing in effort, and hence endogenous.[3]

Compared to the standard moral hazard model, these additional features have a non-trivial impact on the incentive structure. In particular, the agent's ex post participation decision will not only depend on the terms of the initial contract (which determines his payoff when staying with the principal), but may also depend on his chosen effort level (which, via the value of his ex post outside option, determines his payoff when leaving). As a result, the agent's optimal effort and ex post participation decisions are intertwined. Compared to the standard model, this makes the principal's contract design problem substantially more challenging.

As for our first research question, we characterize optimal *no-separation contracts*, under which all specified payments are sufficiently large such that the agent is retained in both states of the world. One key insight of our analysis is that the retention of knowledge workers is particularly costly for employers. The reason is that the agent earns a rent in each state in which he stays with the principal (i.e., the principal cannot simply match the agent's outside option). This is in contrast to the standard case, where a rent accrues in some states only. Moreover, the qualitative properties of optimal no-separation contracts vary substantially with the output spread (i.e., the difference of output across states, which in our model can be interpreted as a measure of the importance of the agent's effort for total surplus). First, when the output spread is below some threshold, the principal finds it optimal to induce first-best incentives, which also leads to first-best surplus. Interestingly, in this case the additional source of frictions (limited commitment by the agent in addition to moral hazard and limited liability) leads to lower equilibrium agency costs. This result could also be seen as to corroborate the reluctance of courts to enforce non-compete clauses. Second, there exists an intermediate range where the principal optimally offers exactly the same contract in the entire range; thereby also inducing a constant (intermediate) effort level. This non-responsiveness is interesting in the light of the long-standing observation that real-world contracts are often much simpler than one might expect, e.g., not fully responsive to changes in underlying conditions (for example, see Macaulay, 1963;

[1] A prominent example is Mark Papermaster, who (despite a non-compete clause) moved from IBM to Apple Inc. (to replace Tony Fadell, "father" of the iPod, as Senior Vice President): While IBM tried to stop the move, the case was finally settled in 2009: Papermaster was allowed to move with the only condition of having to testify in court that he would not share IBM business secrets, see e.g., The Financial Times (2008) and http://www.apple.com/pr/library/2009/01/27papermaster.html.

[2] See e.g., Laffont and Martimort (2002, p. 194) for a textbook treatment.

[3] In the following, we will frequently omit the term "ex post" and simply refer to the agent's "outside option". As will become clear, participation ex ante will always be ensured, and hence is not an issue.