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Coexistence of long-term and short-term contracts <sup>☆</sup>Inés Macho-Stadler <sup>a,\*</sup>, David Pérez-Castrillo <sup>a</sup>, Nicolás Porteiro <sup>b,1</sup><sup>a</sup> *Universitat Autònoma de Barcelona and Barcelona GSE, Dept. Economía e Hist. Económica, UAB edifici B, E-08193 Bellaterra, Barcelona, Spain*<sup>b</sup> *Universidad Pablo Olavide, Department of Economics, Spain*

## ARTICLE INFO

## Article history:

Received 16 September 2012

Available online 31 March 2014

## JEL classification:

D86

C78

## Keywords:

Matching  
Moral hazard  
Contracts  
Assignment

## ABSTRACT

We study the length of agreements in a market in which infinitely-lived firms contract with agents that live for two periods. Firms differ in the expected values of their projects, as do workers in their abilities to manage projects. Worker effort is not contractible and worker ability is revealed during the relationship. The market dictates the trade-off between sorting and incentives. Short- and long-term contracts often coexist: The best firms always use short-term contracts to hire high-ability senior workers, firms with less profitable projects use short-term contracts to save on the cost of hiring junior workers, whereas intermediate firms use long-term agreements to provide better incentives to their workers. We relate our results to the optimal assignment literature that follows Becker (1973).

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## 1. Introduction

A key element of a contract is its duration. Some firms sign a long-term agreement with a worker for several years. Other firms sign contracts period by period, either with the same worker or with different workers over time. In this paper, we analyse the firms' choice of short-term or long-term contracts in a market where heterogeneous firms compete for heterogeneous workers who are subject to moral hazard.<sup>2</sup>

In our dynamic model, firms hire workers to run their projects. Firms are infinitely lived and differ with respect to the profitability of their projects. Workers live for two periods, starting as junior agents in the labour market. In any period, each firm requires two workers: a junior agent (with no specific skills) and a senior, experienced worker, whose expertise is crucial for the advancement of the project. All the participants are risk neutral and have the capacity to commit to long-term

<sup>☆</sup> We are grateful to the participants at seminars at CREST (Paris), U de Salamanca and U Autònoma de Barcelona and at SAE 2011 (Málaga), 20iDEA 2011 (Barcelona), Games 2012 (Istanbul), CICGTA 2012 (Qingdao), SAET 2013 (Paris), as well as four reviewers and the co-editor, for their insightful comments. Financial support from Ministerio de Ciencia y Tecnología (ECO2008-04321, ECO2009-07616 and ECO2012-31962), Generalitat de Catalunya (2009SGR-169), Junta de Andalucía (SEJ-02936 and SEJ-04992), Severo Ochoa Programme (SEV2011-0075), and ICREA Academia is gratefully acknowledged.

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<sup>1</sup> Nico passed away in April 2012. He was a talented, honest, brave, and enthusiastic friend. We miss him deeply.

<sup>2</sup> As the contributions by Dam and Pérez-Castrillo (2006), Serfes (2008), and Alonso-Paulí and Pérez-Castrillo (2012) show, when the analysis is enlarged to include market interactions, the shape of optimal contracts may differ substantially from the agreements obtained for a given relationship studied in isolation. When heterogeneous principals compete for heterogeneous agents, the identity of the partners in each relationship (in addition to the contract signed) is endogenous, as are the levels of utility obtained by the agents.

contracts.<sup>3</sup> Workers are protected by limited liability, and a moral hazard problem is present because the contract cannot specify the senior's effort when running a project.

When young, all workers are indistinguishable in ability. Working for a firm as a junior has a training component: workers acquire the knowledge and experience required to run projects as seniors. We assume that this training provides industry-specific human capital, which allows any worker hired by a firm as a junior to run a project as a senior for any firm in the market. Whereas the competence level needed to run a project as a senior is unknown to all market participants ex-ante, it is revealed during the training period: after the agent has worked for a firm as a junior, all firms and the worker himself discover whether he has high or low ability as a senior. In other words, we model a very simple training technology that combines two dimensions of learning. First, the innate ability of the worker is revealed through his training as a junior worker, with this information becoming common knowledge for the industry. Second, there is a learning-by-doing component: working as a junior is a prerequisite for subsequently running a project as a senior.

We characterise the equilibrium of this model. Our equilibrium concept is close to the idea of “stability” used in the matching literature that analyses contracts in environments where matching between firms and workers is endogenous.<sup>4</sup> To be at equilibrium, an outcome (that is, a matching and a set of contracts) must be immune to deviations by participants.

We first show that firms signing long-term contracts in equilibrium offer a young agent an agreement in every period that includes a low salary for the first period together with the promise of a higher reward when he becomes senior. This practise allows firms to alleviate the incentive problem they face with senior agents, improving the efficiency of the relationship, and their profits. Firms that sign short-term contracts hire a junior agent every period with no promise of a future position. They also sign short-term contracts every period with a senior worker (who may or may not be the same worker they hired as a junior in the previous period); the terms of the agreement will depend on the senior worker's value in the market (which may depend on the worker's ability level).

Second, we show that the market equilibrium depends on the characteristics of the set of firms considered. When all firms in the market have very profitable projects, all of them sign long-term contracts in equilibrium. Each firm offers the same contract that it would offer in an agency problem (no market) situation.<sup>5</sup>

More interestingly, when heterogeneity in the population of firms is sufficiently large, some firms sign short-term contracts with their junior workers and recruit in the market for senior workers. These firms specialise in a particular type of senior: firms with the most profitable projects hire high-ability senior agents, whereas those with the least profitable ventures employ low-ability senior workers.

The firms with highly profitable projects obtain large profits by hiring high-ability senior agents and are willing to offer high wages in the market to attract them to run their projects. As a result, the expected utility of junior workers, when they accept short-term contracts, is high because, if they turn out to be of high ability, they will obtain a reward in the market as seniors. This prospective reward leads workers to accept low wages as juniors. Firms with relatively poor projects take advantage of this willingness of junior workers to accept low wages during the training period. For these firms, the savings they achieve on juniors' wages is more important than the losses they incur from hiring low-ability seniors. Therefore, in these equilibria, the firms with the most profitable projects use short-term contracts to obtain the services of high-ability workers, whereas the firms with the least profitable projects use short-term contracts to economise on the costs of junior workers. In this sense, the matching between firms and senior agents is positive assortative for the set of firms that use short-term contracts. Finally, for firms with intermediate projects, the trade-off between the advantages of long- and short-term contracts is often resolved in favour of long-term contracts.

The results and intuitions of our model can be applied to industries where talent (agents' ability) can be publicly assessed and is not firm-specific. These industries are also analysed by [Terviö \(2009\)](#), who finds that under short-term contracts, firms rely too much on the pool of incumbent workers, that there is market failure in the discovery of talent, and that wages for known talents are too high. Our focus is not on the discovery of talent but on the market assignment of workers to firms, in particular through the choice of contract length.<sup>6</sup>

The arts and sports are examples of markets in which the abilities of senior workers are widely known, as they are subject to public scrutiny through the performance of these workers, and the human capital involved is mainly industry

<sup>3</sup> When it is difficult to ensure commitment from agents, contracts may include, for example, non-compete clauses under which the agent agrees not to pursue a similar profession or trade with a firm in the same industry if he breaks the contract. Contracts may also include other clauses that reduce the worker's mobility by increasing the cost of the worker being hired by another firm. If no participant can commit to a long-term contract, then all contracts must be short-term. If the participants on one side of the market (say, the firms) can commit but the others cannot, then there can still be room for long-term contracts, but they are typically less efficient than in an environment with full commitment. In terms of the commitment possibilities, we place ourselves in the best scenario for the prevalence of long-term contracts.

<sup>4</sup> Stability and competitive equilibrium are very closely related concepts. Any stable outcome is also a competitive equilibrium and vice-versa. For (early) matching models in which the parties decide on money instead of contracts, see the original contribution by [Shapley and Shubik \(1972\)](#) and the excellent literature review by [Roth and Sotomayor \(1990\)](#).

<sup>5</sup> In an isolated long-term relationship between a firm (principal) and a worker (agent), if both are able to commit to the duration of the contract, the solution to the repeated moral hazard problem is to offer a long-term contract (see, e.g., [Lambert, 1983](#); [Rogerson, 1985](#); [Malcomson and Spinnewyn, 1988](#), and [Chiappori et al., 1994](#)).

<sup>6</sup> As [Terviö \(2009\)](#) observes, in his model, “inexperienced individuals would pay for the chance to discover their talent”. In our model, junior workers implicitly pay to discover their talent by accepting a short-term low-wage contract. This reduction in the wage has implications not only for the workers and the firms that are ready to pay for talent but also for other firms that benefit from the low salary.

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