



An adverse selection model of optimal unemployment insurance

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ABSTRACT

We ask whether offering a menu of unemployment insurance contracts is welfare-improving in a heterogeneous population. We adopt a repeated moral hazard framework as in [Shavell and Weiss \(1979\)](#), supplemented by unobserved heterogeneity about agents' job opportunities. Our main theoretical contribution is a quasi-recursive formulation of our adverse selection problem, including a geometric characterization of the state space. Our main economic result is that optimal contracts for "bad" searchers tend to be upward-sloping due to an adverse selection effect. This is in contrast to the well-known optimal decreasing time profile of benefits in pure moral hazard environments that continue to be optimal for "good" searchers in our model.

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1. Introduction

People flowing into unemployment are heterogeneous with respect to their chances of finding a new job. These differences include different innate ability, general education, human capital accumulated on the last job and their unemployment history. Also, chances of reemployment generally vary over different segments of the labor market. Typically, workers searching for a job are better informed about their job opportunities than a government agency in charge of providing (costly) unemployment insurance (UI). Such a situation of hidden knowledge (or private information) results in an adverse selection problem. A key issue is how to design a bilateral contract that balances the principal's (the UI agency's) desire for allocative efficiency (i.e. in our context, setting optimal search incentives for agents) against the costly information rent given up to induce the revelation of the agents' private information, for example through self-selection by the agents' choice of contracts.

This paper makes two main contributions to the literature on optimal unemployment insurance with asymmetric information. First, it provides a (quasi-) recursive formulation of a simple dynamic contract design problem with adverse selection and repeated moral hazard. A numerical solution procedure is developed that—although it is tailored to the specific environment and the recursive formulation of the problem—may also be applicable to models with a similar informational environment.

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Second, we develop our methodological contribution within a specific economic environment and we find new features in the optimal contract design. Our setup is a finite-horizon version of [Shavell and Weiss \(1979\)](#) with an additional adverse selection component in the first period that is due to agents' heterogeneity. We encompass heterogeneity in the job search technology, i.e. we introduce types of agents that differ with respect to their probability of finding a job when controlling for search effort. Our main economic result is that adverse selection imparts an increasing UI benefit component for bad searchers to the optimal UI benefit scheme. A stylized calibration exercise shows that this component may overturn the optimality of a decreasing benefit scheme in a pure moral hazard environment. The rent-extraction-efficiency trade-off well known from static contract theory drives this result.¹

Our paper technically builds on [Hopenhayn and Nicolini \(1997\)](#), who refined and simulated the [Shavell and Weiss \(1979\)](#) model. Their paper applies the recursive methods developed to solve repeated games and dynamic principal-agent problems, as analyzed in the papers by [Spear and Srivastava \(1987\)](#), [Thomas and Worrall \(1990\)](#), [Abreu et al. \(1990\)](#) (APS hereafter), [Atkeson and Lucas \(1992\)](#) and [Chang \(1998\)](#). This literature has introduced entitlement utilities as state variables in order to analyze models of repeated moral hazard. There is, however, one considerable difficulty in the numerical application of the APS methodology, namely the efficient calculation of the state space (the sets of "sustainable outcomes").² Our main theorem provides an *analytical* characterization of the set of sustainable outcomes (called "jointly feasible entitlements" in our context) which is used one-to-one in our numerical algorithm. In particular, we prove certain topological properties of the set of sustainable outcomes that ensure an efficient computation that considerably improves in terms of accuracy upon previous algorithms (compare e.g. section 8 of [Chang, 1998](#)).

Concerning the adverse selection problem, agents' types, which parameterize their chances of finding a job, are drawn only once but affect their chances in all future periods. This permanent heterogeneity in our model implies that the first period is distinct from the following periods. Both the adverse selection incentive constraints and the entitlement constraints in the principal's problem have to hold *only* in the first period whereas moral hazard incentive constraints hold in every period. Although we assume full commitment, there is no "natural" way to state such a problem recursively. Additional state variables that restrict the planner's choices have to be added, similar to [Fernandes and Phelan \(2000\)](#). This idea allows us, as it does for [Fernandes and Phelan \(2000\)](#), to provide a recursive formulation of our problem and a numerical algorithm to implement it.

Although we share this (technical) idea with [Fernandes and Phelan \(2000\)](#), the informational environments in the two models are quite different. [Fernandes and Phelan \(2000\)](#) study a repeated adverse selection problem where the agent experiences an unobservable income shock, which is correlated over time. In contrast, we consider a model of repeated moral hazard augmented with adverse selection in the first period only.

[Doepke and Townsend \(2006\)](#) generalize the setup considered by [Fernandes and Phelan \(2000\)](#). An agent in their setup receives hidden income shocks as before and additionally he can take hidden actions. The very general environment allows for a stochastic correlation of income realizations over time and also very different types of actions. They derive a general recursive formulation for their model. In contrast, in our model income is observable and contractible—the unemployed agent has no income, and there is one income level for the employed agent. The main theoretical difference to [Doepke and Townsend \(2006\)](#) is that the search technology is type-dependent in our model whereas it is type-independent in their setup. The key difference of our contribution in comparison to [Doepke and Townsend \(2006\)](#) is, however, the numerical algorithm that is tailored to the specific setup and our recursive formulation.

The main economic insights of our paper are developed in a stylized calibration of our model. We investigate the shape of optimal contracts numerically in a framework where two types of agents (good and bad) face different hazard rates of finding a job (given a certain search effort). We show that the contract for the good searcher has a decreasing benefit profile—so there is no full consumption smoothing—in order to set search incentives. In fact, the contract is the same as the one he would be offered in a pure moral hazard environment, i.e. the [Shavell and Weiss \(1979\)](#) setup. This is the well-known "No distortion at the top" result. Also, the good searcher receives an information rent, as in the standard static adverse selection model. The bad type's contract, however, is distorted with respect to the pure moral hazard environment and so is his search effort. Moreover, the bad type receives no information rent, as in the standard static adverse selection model. We thus recover basic economic insights, namely the rent extraction/efficiency trade-off, from a simple static adverse selection model without moral hazard (cf. [Laffont and Martimort, 2002, Chapter 2](#)).

To be more precise, in our more general case with moral hazard and adverse selection, the slope of the bad type's contract is ambiguous. Moral hazard considerations induce a negative slope whereas adverse selection consideration induces an increase in the slope (relative to the pure moral hazard contract). The reason for the latter can be understood by recalling the simpler setup when agents only differ in their hidden exogenous job finding probabilities (so that there is adverse selection, but no moral hazard). In that case, good searchers tend to enjoy a flat profile (full consumption smoothing) and receive an information rent over their promised utility. The bad searcher faces a higher risk of longer unemployment duration and will consequently discount future unemployment benefit payments less than the good type. An increasing profile partially insures bad searchers against unemployment without giving good searchers much of an

¹ See [Laffont and Martimort \(2002, Chapter 2\)](#).

² This terminology was introduced by [Abreu et al. \(1990\)](#). It describes the sets of contracts that are implementable taking into account future choices which again have to take into account initial choices and so on and so forth.

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