Games and Economic Behavior 86 (2014) 1–11

Contents lists available at ScienceDirect

Games and Economic Behavior

www.elsevier.com/locate/geb

Note

Wealth effects and agency costs [☆]

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ARTICLE INFO

Article history:
Received 8 January 2011
Available online 18 March 2014

JEL classification:
D86

Keywords:
Moral hazard
Principal–agent model
Contracts
Wealth effects

ABSTRACT

We analyze how the agent's initial wealth affects the principal's expected profits in the standard principal–agent model with moral hazard.
We show that if the principal prefers a poorer agent for all specifications of action sets, probability distributions, and disutility of effort, then the agent's utility of income *must* exhibit a coefficient of absolute prudence less than three times the coefficient of absolute risk aversion for all levels of income, thus strengthening the sufficiency result of Thiele and Wambach (1999). Also, we prove that there is no condition on the agent's utility of income alone that will make the principal prefer *richer* agents. Moreover, we show that, for an interesting class of problems, the principal prefers a relatively poorer agent if agent's wealth is sufficiently *large*. Finally, we discuss how alternative ways of modeling the agent's outside option affects the principal's preferences for agent's wealth.

Published by Elsevier Inc.

1. Introduction

The principal–agent problem with moral hazard is one of the cornerstones of the theory of incentives. In its standard formulation, a risk neutral principal hires a risk averse agent to perform a task, and their relationship is regulated by a contract based on a signal that depends on the agent's unobservable action.[1] In many applications, it is realistic to assume that the principal faces a pool of agents who differ in their wealth. A natural question then is: Does the principal prefer to hire a poorer or a richer agent?

The difficulty in answering this question lies in the way in which agent's wealth impacts the principal's problem. First, an increase in wealth increases the value of the agent's outside option, making it harder for the principal to induce the agent to accept the contract. Second, an increase in wealth affects the agent's attitudes towards risk and thus how costly it is for the principal to induce the agent to bear risk. Third, and more subtly, an increase in agent's wealth increases the risk of the contract that implements any given action. Although the first effect has an unambiguous impact on the principal's expected cost of implementing any action, the last two effects combined have an unclear impact. In a nice paper, Thiele and Wambach (1999) (TW henceforth) proved that if the agent's utility function is additively separable in income and effort, and her utility of income exhibits a coefficient of absolute prudence that is less than three times its coefficient of absolute risk aversion, then the principal prefers a poorer agent. Since many common utility functions satisfy TW's sufficient condition, their result yields an interesting class of problems in which a clear answer to the above question obtains.

☆ We are grateful to an associate editor and two anonymous referees whose excellent suggestions significantly improved the paper. We also thank Eddie Schlee for helpful comments.

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[1] The obvious references are Holmstrom (1979) and Grossman and Hart (1983). For a recent contribution to the development of the principal–agent framework, see Jewitt et al. (2008).

http://dx.doi.org/10.1016/j.geb.2014.02.012
0899-8256/Published by Elsevier Inc.

This note continues the analysis of agency costs driven by wealth effects. We provide answers to the following questions: Can a weaker condition than TW's suffice? Is there an analogous condition under which the principal prefers a richer agent instead? Does the principal prefer a poorer agent in 'extreme' cases, such as when the disutility of effort becomes small or the agent's wealth becomes large?

We first show that TW's condition is *tight*: i.e., if the principal prefers a poorer agent across all principal–agent problems (i.e., for all action sets, probability distribution of the observable outcome, disutility of effort, and wealth levels), then the agent's utility of income *must* satisfy TW's condition. Indeed, if their condition fails for some level of income, then one can construct a robust principal–agent problem where the principal prefers a richer agent. Second, we show that given a principal–agent problem, the principal *always* prefers a poorer agent if the task involved entails a (suitably) small disutility of effort. This result implies that there is no analogous condition to TW's under which the principal prefers a *richer* agent. Third, we show that in an important class of problems, the principal *always* prefers a poorer agent if wealth is large enough. Finally, we discuss how alternative assumptions on the agent's reservation utility affect the principal's preference for a poorer or a wealthier agent.

These results are useful in a variety of applications (see TW for other illustrations). For instance, consider the shareholders/CEO application of the principal–agent model. The above results suggest that it might be a bad idea for a firm to hire a very rich CEO who will be costly to motivate. This important consideration is absent in the executive compensation literature that uses the Holmstrom and Milgrom (1987) model, where wealth effects are irrelevant. Also, knowing the principal's preferences for agent's wealth can serve as a building block in matching models where principals are also heterogeneous along some dimension. Finally, wealth effects are also crucial for understanding dynamic moral hazard problems (e.g., Chiappori et al., 1994; Park, 2004; Spear and Wang, 2005). In all these settings, it is helpful to have simple conditions on primitives that yield an unambiguous impact of agent's wealth on principal's profit. Given how few comparative statics properties are available on the principal–agent problem, we view our results as a useful step in this direction.

As mentioned, this paper complements the results of Thiele and Wambach (1999), and also those of a recent paper by Kadan and Swinkels (2013) that, as an application of their analysis without the first-order approach, generalizes TW's result and provides some results on the case with a final wealth or a final transfer constraint.

Section 2 describes the model. Section 3 contains the main results. Section 4 concludes. The main proofs are in Appendix A, and the rest in the (Online) Appendix B.

2. The model and TW's result

2.1. The model

The set-up is the standard principal–agent problem with moral hazard (e.g., Grossman and Hart, 1983). A principal hires an agent to perform a certain task, but since her effort is unobservable, the contract is based on a stochastic output that depends on her effort. The only difference with the standard model is that we assume that the agent has an observable 'initial wealth,' a positive scalar denoted by θ.

The principal is risk neutral and maximizes expected profits defined as the difference between expected output and expected compensation paid to the agent. The agent is risk averse, with utility function for income-action pairs (I, a) given by $V(I+\theta) - \psi(a)$, where $V : (I_\ell, \infty) \to \mathbb{R}$, $I_\ell \geqslant -\infty$, is three times continuously differentiable, strictly increasing, and strictly concave; i.e., $V'(\cdot) > 0$, and $V''(\cdot) < 0$. Also, $\lim_{I \to I_\ell} V(I) = -\infty$. In turn, $\psi(\cdot)$ is nonnegative for all actions a, and it is strictly increasing in a.

Let $\bar{I}$ be the constant income level the agent could obtain with certainty elsewhere if she did not work for the principal. Then her reservation utility is $V(\bar{I}+\theta)$.[2]

We denote by $R(\cdot) = -V''(\cdot)/V'(\cdot)$ and $P(\cdot) = -V'''(\cdot)/V''(\cdot)$ the coefficients of absolute risk aversion and prudence, respectively, associated with $V(\cdot)$.

Let A be the set of feasible actions (e.g., effort levels) available to the agent. We focus on the two most oft-used cases in applications, namely, A is either a finite set $a_1 < a_2 < \cdots < a_m$, or an interval $[0, \bar{a}]$. Wlog, the lowest action in each case is costless for the agent (i.e., $\psi(a_1) = 0$ and $\psi(0) = 0$).

The observable output is denoted by q, and it assumes values in $Q = \{q_1, \dots, q_n\}$, where wlog we assume that $q_1 < q_2 < \cdots < q_n$. The probability of observing q_i, $i = 1, \dots, n$, when the agent's action is a is denoted by $\pi_i(a)$, and it is positive for all i and a. We denote by $\pi(a)$ the vector $(\pi_1(a), \pi_2(a), \dots, \pi_n(a))$.

When $A = [0, \bar{a}]$, we further assume that $\psi(\cdot)$ and $\pi_i(\cdot)$ are twice continuously differentiable in a (three times in one result in Section 3.3), and that $\psi(\cdot)$ is strictly convex in a, i.e., $\psi''(\cdot) > 0$ for every action a, with $\psi'(0) = 0$.

Since the agent's action is unobservable, the principal offers a compensation contract $(I_1, I_2, \dots, I_n)$ contingent on output and recommends an action a to the agent. Let $B(a) = \sum_{i=1}^{n} \pi_i(a) q_i$ be the expected value of output given action a, and let $C(a, \theta)$ be the minimum cost for the principal of implementing action a if the agent's wealth is θ. As in Grossman and Hart (1983), one can split the analysis of the problem in two steps: first, for each action a, find the contract that minimizes the expected cost to the principal and obtain $C(a, \theta)$; second, find the action that maximizes $B(a) - C(a, \theta)$.

[2] We discuss in Section 3.4 alternative assumptions about the agent's reservation utility.