AGENCY COSTS AND INCOME TAXATION

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Abstract

This paper analyzes agency costs and the moral hazard problem in the presence of income taxation. As basic framework, income taxes are integrated in the hidden action model of agency theory. In the case of symmetric information no agency costs occur, i.e. optimal risk-sharing can be achieved, if and only if the tax is proportional. It is well-known that asymmetric information causes a welfare loss, termed agency costs, even if no taxes are imposed. Introducing a proportional income tax now increases (decreases) these agency costs if the agent exhibits decreasing (increasing) absolute risk aversion. Additionally, we show that non-proportional taxes cause higher (lower) agency costs than a proportional tax if the agent's marginal tax rate exceeds (is smaller than) the marginal tax rate of the principal.

Keywords: Agency Costs, Moral Hazard, Income Taxation

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Introduction

In insurance and welfare economics asymmetric information can cause two major categories of problems, generally referred to as moral hazard and adverse selection, respectively. Both problems can be analyzed in the principal-agent framework which has become a very prominent model in insurance economics, contract theory, political economy, and management science. In a principal-agent relationship the action taken by the agent affects the probability distribution of the principals' payoff. The moral hazard problem arises if the action or effort of the agent is not observable by the principal. In this case the agent's fee has to provide incentives for choosing a satisfactory effort level. If the agent is risk averse, this provision of incentives is in conflict with efficient risk-sharing. Therefore, only a second-best optimum can be obtained which solves the trade-off between efficient risk-sharing and the provision of incentives.

The standard agency model has been extended in several directions, examples are multi-period models [cf. Radner (1985) and Malcomson and Spinnewyn (1988)], models with many agents [cf. Malcomson (1986)], and models assuming non-expected utility preferences [cf. Schmidt (1999)]. As far as we know, the agency model has not yet been analyzed in the presence of income taxation. By integrating income taxes in the model we try to answer the following question: What impact do income taxes have on the welfare loss due to the moral hazard problem? As the reference case we first assume symmetric information and analyze efficient risk-sharing with income taxation. As a straightforward result we show that the tax does not cause a welfare loss if and only if it is proportional. Consequently, when analyzing the moral hazard problem we first consider proportional taxes. It can be shown that proportional taxes increase (decrease) the welfare loss due to moral hazard if the agent exhibits decreasing (increasing) absolute risk aversion. After that, proportional taxes are compared to progressive and regressive taxes with the result that non-proportional taxes cause a higher (lower) welfare loss than proportional ones if the agent's marginal tax rate exceeds (is smaller than) the marginal tax rate of the principal.

The Model

In a principal-agent relationship the agent privately takes an action $a \in \mathcal{A} \subseteq \Re$ where $\mathcal{A}$ is the set of all possible actions. This action has some influence on the monetary payoff $x \in [x^+, x^-]$ of the principal. In earlier versions of the agency model [cf. Ross (1973)] it is assumed that x is a function of a and some random state of the nature θ. This approach has, however, some mathematical problems which are pointed out in Mirrlees (1974). Therefore, we consider the the model initiated by Mirrlees (1974) and further developed by Holmström (1979). Here, x itself is a random variable which is distributed according to the density function $f(x,a)$. A higher value of a shifts the distribution to the right in the sense of first-order stochastic dominance. As usual, we assume that the principal is risk neutral and that the utility function V of the agent is additively separable in her effort and her fee y, i.e. $V(y,a)=v(y)-w(a)$. Moreover, it is assumed that the agent is risk averse (i.e. $v''<0$) because otherwise the first-best solution is always attainable.

The moral hazard problem does not arise if the principal can observe a because in this case, termed symmetric information, a can be fixed by contract at its optimal level. The choice of the agent's fee y is then merely a question of efficient risk-sharing. In the absence of taxation efficient risk-sharing leads to a first-best optimum which is, according to Borch (1962), characterized by the fact that the ratio of marginal utilities is constant for all values of x. Since the principal is risk neutral this means that the agent's fee has to be constant. Suppose now the income of both, agent and principal, is taxed with the tax schedule T. The optimal solution in the case of symmetric information has to maximize the following Lagrangian.

$$\begin{aligned}\mathcal{L} &= \int_{x^-}^{x^+} (x-y(x)-T(x-y(x)))\,f(x,a)dx \\ &\quad +\lambda[\int_{x^-}^{x^+} v(y(x)-T(y(x)))\,f(x,a)dx - w(a)-\bar{V}],\end{aligned} \tag{1}$$

i.e. the expected net payoff of the principal is maximized under the constraint that the agent's expected utility equals at least $\bar{V}$. Pointwise optimization of $\mathcal{L}$ leads to the following first-order condition for the optimal payment y^*.

$$\frac{1-T'(x-y^*(x))}{v'(y^*(x)-T(y^*(x)))(1-T'(y^*(x)))} = \lambda \;\forall x\in[x^-,x^+]. \tag{2}$$

Obviously, the ratio of marginal utilities $(1/v')$ is always constant if and only if T' is constant. Therefore, we get as a first result:

Proposition 1:

In the symmetric information case the introduction of an income tax causes no welfare loss if and only if the tax is proportional.

As in many other situations under risk [see e.g. Grimm and Schmidt (2000) for the case of auctions], also for efficient risk-sharing proportional taxes are neutral whereas progressive and regressive taxes lead to distortions.

Let us now consider the moral hazard problem which results from asymmetric information. Since the principal cannot observe a it cannot be fixed by contract. Consequently, the principal must take into account that the agent chooses for a given payment scheme that value of a which maximizes her own utiltity. Formally, the resulting first-order condition for the agent's optimal choice of a has to be integrated as a second constraint in the maximization problem of the principal. This additional constraint prevents that an efficient risk-sharing arrangement can be realized and, therefore, causes a welfare loss which is sometimes referred to as agency costs. In the following we want to analyze how this welfare loss is affected by the introduction of an income tax. For a proportional tax the following result is obtained.

Proposition 2:

The introduction of a proportional income tax increases (decreases) the welfare loss due to moral hazard if the agent exhibits decreasing (increasing) absolute risk aversion.

Proof:

In the case of a proportional tax we have $T(z)=tz\;\forall z\in\Re$ where t denotes the constant average tax rate. We have the following maximization problem of the principal

$$\begin{aligned}\mathcal{L} &= \int_{x^-}^{x^+} ((1-t)x-y(x))\,f(x,a)dx \\ &\quad +\lambda[\int_{x^-}^{x^+} v((1-t)y(x))\,f(x,a)dx - w(a)-\bar{V}] \\ &\quad +\mu[\int_{x^-}^{x^+} v((1-t)y(x))\,f_a(x,a)dx - w'(a)],\end{aligned} \tag{3}$$

where $f_a(x,a)$ denotes the first derivative of $f(x,a)$ with respect to a. The first two summands in (3) are already familiar from equation (1). The third summand is simply the first-order condition for the agent's optimal choice of a with the multiplier μ. Optimization with respect to y and rearranging yields the following condition for an optimal payment scheme y^0:

$$\frac{1}{v'((1-t)y^0(x))} = \lambda+\mu\frac{f_a(x,a)}{f(x,a)} \;\forall x\in[x^-,x^+]. \tag{4}$$

The corresponding condition for an optimum in the absence of taxation is obtained by setting $t=0$ in (4). Note that the last summand in (4) is not constant in x which shows that the second constraint in (3) prevents the realization of efficient risk-sharing. Obviously, the deviation $\Delta y(x):=y^0(x)-y^*(x)$ of the optimal payment $y^0(x)$ from the optimal payment in the case of efficient risk-sharing $y^*(x)$ is positive (negative) if $f_a(x,a)>(<)\,0$. Comparing (2) with (4) shows that the deviation $\Delta y(x)$ has to solve the following equation

$$\frac{d}{dy^0(x)}\frac{1}{v'((1-t)y^0(x))}\Delta y(x)=\mu\frac{f_a(x,a)}{f(x,a)}\ \forall x\in[x^-,x^+].\ (5)$$

Let us denote the optimal deviation from $y^*(x)$ in the presence of a proportional tax (in the absence of taxation) by $\Delta y_{t>0}(x)(\Delta y_{t=0}(x))$. Note that the agent's utility level is fixed in the sense that it must not change due to the deviation from efficient risk-sharing. This yields

$$\begin{aligned}&\int_{x^-}^{x^+}v'((1-t)y(x))(1-t)\Delta y_{t>0}(x)f(x,a)dx=\\&\int_{x^-}^{x^+}v'(y(x))\Delta y_{t=0}(x)f(x,a)dx=0.\end{aligned}\qquad(6)$$

Since the principal's utility is decreasing in y the introduction of a proportional income tax increases (decreases) the welfare loss due to moral hazard if

$$\int_{x^-}^{x^+}(1-t)\Delta y_{t>0}(x)f(x,a)dx>(<)\int_{x^-}^{x^+}\Delta y_{t=0}(x)f(x,a)dx.\ (7)$$

In view of equation (6) a sufficient condition that (7) holds with $>(<)$ is that

$$v'((1-t)y(x))<(>)\,v'(y(x))\ \forall x\in[x^-,x^+],\qquad(8)$$

which means that, for a given $y(x)$, $v((1-t)y(x))$ is a concave (convex) transformation of $v(y(x))$. According to Pratt (1964), a concave (convex) transformation of the utility function is equivalent to a higher (lower) degree of absolute risk aversion. Since $(1-t)y(x)<y(x)$, the introduction of a proportional income tax, therefore, increases (decreases) the welfare loss due to moral hazard if the agent exhibits decreasing (increasing) absolute risk aversion.

The introduction of a proportional income tax has a negative income effect for the agent. This income effect can change the agent's degree of risk aversion if she does not exhibit constant absolute risk aversion. More precisely, the income reduction increases (decreases) the agent's degree of risk aversion in the case of decreasing (increasing) absolute risk aversion. If the agent becomes more risk averse she demands a higher risk premium for deviations from a constant y. Therefore, a higher (lower) degree of the agent's risk aversion implies generally a higher (lower) welfare loss in the case of moral hazard [cf. Rees (1987)] which makes the result of Proposition 2 comprehensible.

If the tax is not proportional, it causes not only an income effect but also a substitution effect. According to Proposition 1, this substitution effect prevents the realization of a first-best optimum in the case of symmetric information. The following proposition considers progressive and regressive taxes in the case of asymmetric information.

Proposition 3:

The welfare loss in the presence of moral hazard is in the case of a non-proportional income tax higher (lower) than in the case of a proportional income tax if the agent's marginal tax rate exceeds (is smaller than) the marginal tax rate of the principal.

Proof:

Following the argument in the proof of Proposition 2, we can calculate the optimal deviation from $y^*(x)$ in the presence of a proportional tax $(\Delta y_t(x))$ and in the presence of a non-linear (i.e. progressive or regressive) tax $(\Delta y_T(x))$. Recall that the agent's utility must not change due to the deviation from efficient risk-sharing, i.e.

$$\begin{aligned}&\int_{x^-}^{x^+}v'(y(x)-T(y(x)))(1-T'(y(x)))\Delta y_T(x)f(x,a)dx=\\&\int_{x^-}^{x^+}v'(y(x)-T(y(x)))(1-t)\Delta y_t(x)f(x,a)dx=0.\end{aligned}\qquad(9)$$

The welfare loss for the principal is greater (smaller) in the case of a non-proportional tax than in the case of a proportional tax if

$$\begin{aligned}&\int_{x^-}^{x^+}(1-T'(x-y(x)))\Delta y_T(x)f(x,a)dx>(<)\\&\int_{x^-}^{x^+}(1-t)\Delta y_t(x)f(x,a)dx.\end{aligned}\qquad(10)$$

In view of (9), a sufficient condition that (10) holds is

$$\frac{1-T'(y(x))}{1-T'(x-y(x))}<(>)\,1\ \forall x\in[x^-,x^+],\qquad(11)$$

which is equivalent to $T'(y(x))>(<)\,T'(x-y(x))\ \forall x\in[x^-,x^+]$.

The result of Proposition 3 can be explained as follows. The condition $T'(y(x))>(<)\,T'(x-y(x))\ \forall x\in[x^-,x^+]$ is equivalent to the fact that $1-T(y(x))$ is a concave (convex) transformation of $1-T(x-y(x))$. This means that, due to the tax, the agent's degree of risk aversion for gross payments increases (decreases) relatively to that of the principal. Consequently, efficient risk-sharing assigns less (more) risk to the agent which increases (decreases) the costs for the provision of incentives.

Perhaps the most prominent application of agency theory is the relation between the owner and the manager of a firm. In this example it is reasonable to assume that the owner's income always exceeds that of the manager which implies that progressive income taxes reduce the welfare loss due to moral hazard. However, in many countries bigger companies have to pay proportional taxes whereas the managers as individuals are exposed to progressive tax schedules. In this case, the income taxes increase the welfare loss due to moral hazard.

An important result in agency theory is the fact that the moral hazard problem does not occur if the agent is risk neutral. This is because then the principal can assign the whole risk to the agent and, thus, provide the right incentives without having to pay a risk premium. Applying Proposition 3 now immediately shows that this result is no longer true in the presence of non-proportional taxes, i.e. risk neutrality of the agent is in this case not a sufficient condition for the existence of a first-best optimum.

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