E C O N O M I C S   B U L L E T I N

A special case of self−protection: The choice of a lawyer

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Abstract

Considering self−protection, it is a well−known result that an increase in risk aversion does not unambiguously lead to a higher level of effort. In this paper, we consider a particular case of self−protection, the choice of a lawyer, assuming a positive relation between legal expenses and probability of success. In this context, level of effort is strictly monotone in risk aversion. We show that, paradoxically, the level of effort is not systematically higher for an indemnified more risk−averse agent than for a non−indemnified less risk−averse agent.

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1 Introduction

The notion of self-protection was first described in Ehrlich and Becker (1972) as an alternative to the more intuitive concept of self-insurance. Considering two possible outcomes for a risky situation, self-protection can be defined as the possibility to increase the probability of success at a given cost. This concept is adapted not only for insurance problems, as is often studied in the literature, but also in the R&D field or in the juridical framework, as noted by Ehrlich and Becker themselves [1]. We study this case in this paper.

It is extremely important for a legal claimant or defendant to choose his lawyer very carefully. Indeed, the probability of success depends on this choice. In this paper we consider this activity as a pure self-protection activity. As self-protection, choosing a lawyer allows a reduction in the probability of incurring a loss (to lose the trial). Thus, we suppose that the lawyer's cost is proportional to his "expertise" (experience acquired in similar cases, reputation, etc) and that his "expertise" induces an objective reduction in the probability of failure.

But choosing a lawyer is a very special case of self-protection since the lawyer's cost is usually repaid in case of victory[2]. In this situation, we show that the probability distribution is modified in a different manner than in the standard self-protection problem. The distribution shifts to the left only for the low outcomes and not for the high one. This property changes the classical result first provided by Dionne and Eeckhoudt (1985) that a more risk-averse individual would not necessarily invest more in self-protection activities. In our case, the more the agent is risk-averse, the more he invests in the choice of his lawyer. Nevertheless, another counterintuitive result appears if we consider a more risk-averse individual, who will be reimbursed in case of a victory, with a less-risk averse individual, who will not be reimbursed.

This paper is organized as follows. Section 2 presents an overview of the self-protection standard problem and the principal results. Section 3 introduces the specificities of our model with repayment and shows how the results are modified. Section 4 concludes.

[1] '*[...] good lawyers reduce both the probability of conviction and the punishment for crime.*'[p 634] Actually authors use this example to illustrate the case of self-protection and self-insurance at the same time. The latter, denoted *self-insurance-cum-protection*, has been examined in detail by Lee (1998).

[2] For instance, in France, this procedure is examined in Art. 475-1 du Code de Procédure Pénale (CPP) et art. 700 du Nouveau Code de Procédure Civile (NCPC).

2 The standard self-protection problem

2.1 Notations

Consider an individual who has initial wealth W. This wealth is subject to a possible loss L. The individual invests e (the effort) in self-protection[3] that affects the probability of the loss $p(e) \in [0, 1]$, decreasing and convex. This type of activities alters the risk distribution itself as opposed to insurance (or self-insurance), which simply alters the financing of risk's consequences. In this model, final wealth depends on whether or not the loss occurs. Final wealth is B if the loss occurs and A if not:

$$A \equiv W - c(e) \quad ; \quad B \equiv W - L - c(e)$$

where $c(e)$, increasing and convex, denotes the cost of an effort e, and $A > B$ because of the positive loss. The individual's problem is to choose e to maximize his expected utility:

$$Eu = p(e)u(B) + [1 - p(e)]u(A) \tag{1}$$

where u is a classical VNM utility function. When an interior maximum exists, an optimal e for an individual with an utility function u, denoted $e_s \in [0, +\infty[$, satisfies the following first-order condition $\frac{\partial Eu}{\partial e} = 0$, with[4]:

$$\frac{\partial Eu}{\partial e} = -c'[pu'(B) + (1 - p)u'(A)] - p'[u(A) - u(B)] \tag{2}$$

It is assumed that the second-order condition is satisfied[5]. Actually, the sign of the second-order condition depends on features of u and $p(e)$. We hereafter consider that these features are met here. Then the problem becomes concave in e. The unique solution to (2) is denoted e_s.

2.2 Effect of an increase in risk aversion in the standard case

Let us now consider a more risk-averse individual in the Arrow-Pratt sense with a VNM function denoted v . This is equivalent to the existence of a concave function g such that $v = g(u)$. The corresponding first-order-condition for v is:

$$\frac{\partial Ev}{\partial e} = -c'[pg'[u(B)]u'(B) + (1 - p)g'[u(A)]u'(A)] - p'[g[u(A)] - g[u(B)]] = 0 \tag{3}$$

[3]As mentioned by Sweeney and Beard (1992), '*self-protection is also referred as "care" in the legal liability literature, and as "loss prevention" in the insurance context*'(p 301).

[4]For greater convenience, c' refers to $c'(e)$ and p' refers to $p'(e)$.

[5]In the risky choice literature, it is well-known that the second order condition is not naturally satisfied for the preventive choices. For greater precision, see Eeckhoudt *et al.* (2005), chap 9, 141-9.

Evaluated at $e = e_s$, the sign of (3) cannot be determined unambiguously, as shown by Dionne and Eeckhoudt (1985) in particular cases. Thus a more risk-averse individual does not always purchase more self-protection[6]. This result is standard in the risk theory and states the first theorem:

Theorem 1 *A more risk-averse individual may exert a higher or a lower effort in a self-protection activity compared to a less risk-averse individual.*

A didactic demonstration is given in Briys and Schlesinger (1990) with an intuitive exposition in terms of mean-preserving spread and contraction[7]. Let us now consider the particular case of self-protection where the cost of effort provided by the individual (for self-protection) is repaid in case of success.

3 Self-protection with repayment of the effort in case of success

As mentioned in the introduction, some legal law procedures make provisions for repayment of expenditures to the winner (we do not consider here who must pay this amount[8]). Another difference with the standard case is that the individual is not necessarily in a risky situation. Sometimes it can be chosen not to initiate the legal action. In this case the individual prefers a certain loss to an implicit lottery corresponding to the civil proceedings. If the action is initiated, we have: $A \equiv W$ and expected utility is similar to (2):

$$Eu = p(e)u(B) + [1 - p(e)]u(W) \tag{4}$$

The following first-order-condition is then:

$$\frac{\partial Eu}{\partial e} = -c'[pu'(B)] - p'[u(W) - u(B)] = 0 \tag{5}$$

The first issue is to know whether or not the individual will initiate the legal action. In a general framework, it depends on the characteristics of functions $c(e)$, $p(e)$ and u, because we must have: $Eu \geq u(W - L)$ which is equivalent to:

$$p(e) \leq \frac{u(W) - u(W - L)}{u(W) - u(W - L - c(e))}$$

[6] Assuming 'single crossing', we can get a monotone relation between risk aversion and level of self-protection (see Jewitt (1989) or Athey (2001,2002)).

[7] Others similar developments can be found in McGuire *et al.* (1991).

[8] In some cases, the loser must pay. We would then have to consider strategic interactions between opponents, which are studied in the *contest* or *rent-seeking* literature. See Konrad and Schlesinger (1997) or Skaperdas and Gan (1995) for specific papers combining contests and risk preferences and Nitzan (1994) for a more general contribution.

The following condition ensures that legal action will be initiated[9]:

Condition 1: $\lim_{(-\infty)} u'$ *is a finite number, (ii)* $\lim_{(0)} p' = +\infty$*, (iii)* $\lim_{(0)} c' = 0$ *and (iv) p(0)=1.*

Assuming Condition 1 is verified, there must exist e such that $p(e) \leq \phi(e)$, with $\phi(e)$ the right-hand side of the above inequality. Appropriated functions are represented in figures 1 and 2.

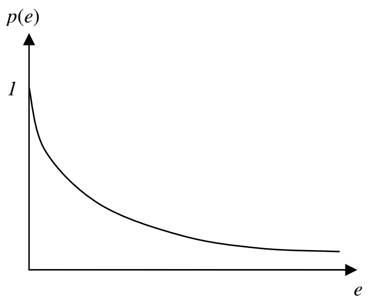

Figure 1
Probability of failure

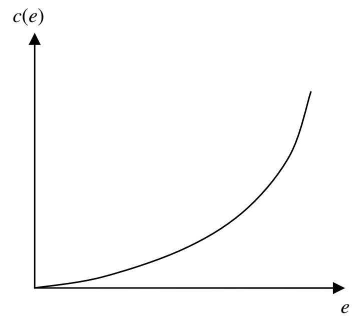

Figure 2
Cost of effort

Assuming these restrictions, the marginal effect of a very little effort is so high compared to the marginal cost of this effort that the individual always has an interest to exert it and then to initiate the legal action. Note that these restrictions are not counterintuitive and allow a consideration of only the risky case, which is obviously a useful simplification.

3.1 Comparison with the standard case

Is repayment a good incentive to invest more in self-protection? In a similar way to the analysis made by Briys and Schlesinger (1990), to look at the difference between standard self-protection and self-protection with repayment from the viewpoint of outcomes, assume the probabilities of endowed outcomes are given by A and B. Standard self-protection (figure 3) by shifting the whole distribution to the left to, say, A' and B', lowers the probability of low outcomes and raises the probability of high ones. Self-protection with repayment (figure 4), on the other hand, by shifting the distribution to the left only for the low outcomes to, say, A and B', lowers the probability of low outcomes and raises the probability of high ones without change the high outcomes.

We show that self-protection with repayment leads to a higher level of effort.

Proposition 1 *A risk-averse individual will unambiguously purchase more self-protection if the cost of self-protection is repaid in case of success.*

[9]Condition 1 is a weaker version of condition C1 in Jullien *et al.* (1998, p 23). Concavity of the program is satisfied given concavity of u and Condition 1. We implicitly assume $c(0) = 0$. In other words, the cost of a zero-effort is a zero-cost (no fixed cost).

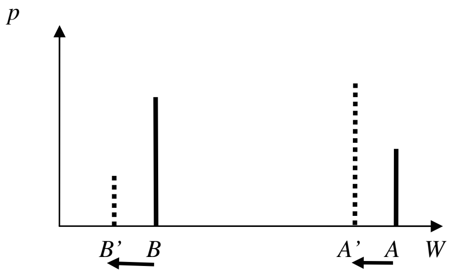

Figure 3
Self-protection standard case

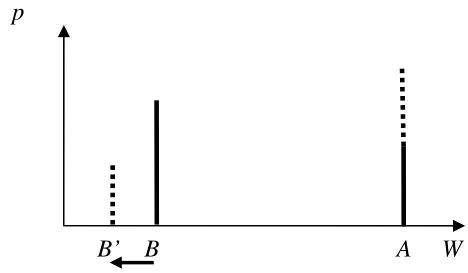

Figure 4
Self-protection with repayment if success

Proof 1 *We evaluate $\partial Eu/\partial e$ (equation (5)) at $e = e_s$ (equation 2)). This yields:* $\frac{\partial Ev}{\partial e}|_{e=e_s} = -p'[u(W) - u(A)] + c'[(1-p)u'(A)]$ *which is positive.*$\square$

Reimbursement being a sufficient incentive to invest more in self-protection, a first conclusion is that reimbursement is also a sufficient condition for a higher total amount of legal expenditures.

3.2 Effect of an increase in risk aversion

A well-known counterintuitive result concerning self-protection is that the effort is not a monotone function of the level of risk aversion. How is this result in our framework modified? As in the standard case, we derive the first-order-condition corresponding to a more-risk averse individual in the Arrow-Pratt sense, by introducing a concave function g:

$$\frac{\partial Ev}{\partial e} = -c'[pg'[u(B)]u'(B)] - p'[g[u(W)] - g[u(B)]] \tag{6}$$

Proposition 2 *With repayment, effort unambiguously declines when risk-aversion increases.*

Proof 2 *In a manner similar to [3], we assume $g[u(W)] = u(W)$ and $g[u(B)] = u(B)$. This is possible without any particular restriction on u. An increase in risk aversion means $g'[u(B)] > 1$. Whereas the second term in right-hand side is maintained constant between (5) and (6), the first term is increasing. Then* $\frac{\partial Ev}{\partial e}|_{e=e^*} < 0.\square$

If this result appears counterintuitive at the first sight, this might be due to a misinterpretation of the risk aversion notion. If we do not consider a more pronounced aversion for loss[10] or prudence[11], risk aversion *per se* does not lead to a higher level of investment in self-protection. Actually, as the self-protection damages the low outcome, we

[10]See Menezes *et al.* (1980).

[11]See Kimball(1990) for the concept of prudence and Chiu (2000) or Eeckhoudt and Gollier (2005) for the impact of prudence on optimal prevention.

may suppose that a more risk-averse individual will choose to minimize this effort of self-protection from fear of undergoing a heavier loss in case of trial failure.

3.3 Joint-effect of repayment and increase in risk aversion

The two first propositions state that repayment leads to a higher effort, whereas an increase in risk aversion entails a lower effort. In other terms, a given individual invests more in self-protection if he is likely to be repaid (*reimbursement effect*) and if we compare two individuals with different preferences, the more risk-averse will invest less in self-protection (*risk aversion effect*). Both these conflicting effects are present if we consider the case of a non-repaid less risk-averse individual compared to a repaid more risk-averse one. The question is then: is it possible to assess the behaviour of a more risk-averse individual with a possibility of reimbursement, compared to a less risk-averse individual without reimbursement? The result is as follows:

Proposition 3 *A more risk-averse individual, who may benefit from an indemnity, will not unambiguously exert a higher effort than a less risk-averse individual with no indemnity.*

Proof 3 *We thus evaluate* $\frac{\partial Ev}{\partial e}$ *at* $e = e^s$*. It is equivalent to insert* $\frac{\partial Eu_s}{\partial e}$ *in the FOC (equation 6), which yields:* $\frac{\partial Ev}{\partial e} = c'[p[1 - g'(u(B))u'(B)] + c'(1-p)u'(A) + p'[u(A) - g(u(W)) - u(B) + g(u(B))]$*. The expression cannot be signed without ambiguity. To show this we can here assume without loss of generality that* $g[u(A)] = u(A)$ *and* $g[u(B)] = u(B)$*. Because* g *is increasing,* $g(u(W)) > u(A)$ *and the third right-hand side term is positive. Inversely the second term is negative because* $p < 1$ *and assuming* $g'(u(B)) > 1$ *(see [3]), we have the first term negative without ambiguity.* □

The proposition states that neither the *reimbursement effect*, nor the *risk aversion effect* systematically prevails. In other words, for any given cost of effort, which may be repaid, there always exists a sufficient increase in risk aversion leading to a lower effort. The intuition of this result follows Eeckhoudt and Gollier (2005, p 990). Suppose the probability of loss is initially high. In such a situation, a higher effort (meaning a lower probability of loss) induces a higher level of risk (higher variance in the distribution), which may not be profitable for risk-averse individuals despite reimbursement. In addition, the higher the probability, the lower the reimbursement. Assuming that the initial probability is low leads to the opposite effect. Thus, an increase in risk aversion has an ambiguous effect on the optimal level of effort.

4 Conclusion

Examining a particular case of self-protection through the choice of a lawyer, we observe that the counterintuitive result about self-protection and risk aversion does not hold with repayment in case of success. Nevertheless, an ambiguous result appears if we mix the possibility of reimbursement with an increase in risk aversion. This result is perhaps even more counterintuitive than the standard self-protection result. In addition, if individuals are more easily convinced through repayment to initiate the trial, it does not lead a more risk-averse individual to a higher level of effort, even compared to the standard case.

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