

Seminar V

Problem 1. (continuation of problem 1 in Seminar IV)

Paul finds out that the liquidity problem raised by the prospects of a cost over-run could be mitigated if there would be a way to secure short-term returns from the project, which could be used to cover in part the cost over-run. In particular, he could sell part of the property before completion of the project, providing verifiable short-term returns rI , where again I is the initial investment, and the distribution of r is subject to a second moral-hazard problem, in addition to the one affecting the success probability of the completed project: If Paul works hard on getting high short-term returns, he would suffer a loss B_0I and r would be distributed according to the probability distribution $G(r)$, with density $g(r)$. If not, then r is distributed according to the probability distribution $\tilde{G}(r)$, with density $\tilde{g}(r)$. Assume that the likelihood ratio, $l(r) = [g(r) - \tilde{g}(r)]/g(r)$, is (weakly) increasing in r . Define a contract as a pair of functions $\{\rho^*(r), \Delta(r)\}$, where $\rho^*(r)$ is the cutoff reinvestment need when short-term returns are r , such that the project is abandoned if $\rho > \rho^*(r)$, and $\Delta(r)$ is Paul's per-unit-of-investment extra rent, for each realization of r , over and above what is required by the other moral-hazard problem if the project is completed, and a per-unit-of-investment cash compensation if it is abandoned.

- i. Explain the meaning of $l'(r) \geq 0$. Also, explain why we need the restriction $\Delta(r) \geq 0$.
- ii. Explain why the equilibrium contract has the property that $\rho^*(r)$ is (weakly) increasing in r , and discuss features of the project that determine whether the variation in the cutoff ρ^* , as the level of short-term return r varies, is large or small.
- iii. In cases where r is low, the cutoff ρ^* may be so low that a credibility problem arises, leading to a scope for renegotiation of the initial contract. This is called the problem of the *soft budget constraint*.

Explain the nature of the problem and discuss how the contract needs to be amended in order to cope with this problem.

Problem 2. (exam 2012)

Consider an entrepreneur who needs funding for an investment project that will give revenue at two future dates. The early revenue and the late revenue are statistically independent. For each of them, there is a moral-hazard problem in that the entrepreneur can influence, at a cost, the probability of a high outcome. But whereas the two revenues are observable to outsiders, the associated efforts are not. There is also uncertainty about the need to provide the project with further funding before it can be completed. Suppose that any need for further funding arises after the early revenue is realized and that it is verifiable. Suppose further that, in the initial contract signed between the entrepreneur and his outside investors, there is a stipulation of how small this extra funding need has to be in order for the project to be continued to its completion.

- (i) Discuss – verbally, graphically, formally, or in any combination of the three – features of the initial contract between the entrepreneur and his outside investors. In particular, put emphasis on how the abovementioned cut-off value of the extra funding will vary with the (observable) early revenue.
- (ii) If, for low values of the early revenue, the solution in (i) involves a very low cut-off value for the extra funding need, the so-called soft budget constraint problem may arise. Explain how this problem is related to the contracting parties' inability to commit to the initial contract. If they cannot commit, then how should the initial contract be altered to accommodate this problem?

Problem 3

Review Problem 6, parts (i) and (ii), in Tirole, p. 629.