Lecture 6:
The loan contract, continued
Credit rationing

We didn't get into the discussion of collateral as I had expected. The initial part was covered in the last handout, and therefore we proceed here directly to the BTU model of moral hazard where collateral matters.

In this model, there are two types of borrowers, namely (1) good investors having a high probability of success even when doing very little, and (2) bad investors who will have a small probability of success unless they put up considerable effort. Notice that *types are observable* to the lender, what is hidden is their subsequent effort on the project. (We shall later consider a model, also with two types of borrowers, where the lender cannot observe the type, this gives rise to different – though with some similarities – contract structures.)

It is assumed in the model that effort is costly, and the cost is such that from the point of view of society, it is best if good investors do not use much of the costly effort while bad investors should use it. The question for us is now whether this optimal allocation (of effort) is sustainable by a system of financial intermediation. If we try it out in terms of fixing a repayment rate (for the specific type, remember that we can distinguish them), then the repayment for the bad investors, who should put up high effort, will induce moral hazard in the sense that low effort gives a higher expected payoff to the investor. Fixing the repayment assuming low effort is no better in this respect, so we have a problem.

Not very surprising given the context we find that collateral can solve the problem. Since the good investor should choose low effort anyway, there is no need for collateral here. But the bad investor must post a collateral, since – combined with a suitably low repayment rate – this will induce the choice of high effort, the investor is hurt now by loss of the collateral in the case of failure, and this will align the private assessment with that of society. You don't need to work through the computation of collateral and repayment in this case, but it is useful to have a close look at the result to see exactly how it improves the incentives.

The final section in this chapter is not part of our curriculum. However, the model is nice, so here is a brief outline which may be skipped at will:

The model considered, which deals with the phenomenon of *microfinance,* is due to Stiglitz, who at that time held a position in the World Bank. Microfinance was a very popular topic in the beginning of the 00es, and the founder of one of these banks, offering small-scale loans to communities in

developing countries and having a fine record of repayments of debts, was awarded the Nobel Peace Prize. Over the years, the initial enthusiasm has faded somewhat, microfinance did not turn out to be the solution to the problems of economic under-development. But the idea of using joint responsibility for debt is certainly interesting.

The model (for which, by the way, you will not be held responsible at exam), uses the by now wellknown moral hazard model with two different investment technologies G and B, now extended slightly since the technologies can be applied on smaller or larger scale depending on an input variable L. As always, too high repayment rates will lead to B being chosen, due to the presence of L the border between G and B becomes slightly more complicated.

Having done with Chapter 5, we move to the next chapter dealing with the credit rationing problem. Formulated in a simplistic way, the problem arises when looking at the credit market, which according to our textbook knowledge of economics should be balanced by the price mechanism, that is by the interest rate, or as we put it, the repayment rate. But it is wellknown that there are numerous cases where borrowers agree to pay a very high interest rate but still cannot get a loan, and why can it be so?

Basically, we know very well that exactly those borrowers agreeing to pay whatever we demand are those that we should avoid in any case since we would probably never see any repayment. The reason why we use some time on the problem is that we get several useful byproducts, as we shall see in the following lectures.

Assuming normal supply and demand functions for loans as depending on the repayment rate, we would expect that equilibrium should occur at some suitable repayment rate. Since this does not happen, either demand or supply must be out of the normal, and we take a closer look at the supply.

An obvious way of introducing disequilibrium is assuming that supply is backward-bended. But this immediately leads us to the question of what makes supply look this way, at again a straightforward explanation would be that supply is increasing as a function of *expected repayment*, but expected payment depends on *nominal repayment* in a less simple way, decreasing when nominal repayment becomes sufficiently large.

We must then search for an explanation of backward-bended relationship between nominal and expected repayment, we go on with the models, namely

(1) adverse selection (the Stiglitz-Weiss model),

(2) costly monitoring,

(3) moral hazard.

Each of the three give the explanation we are looking for, and there may be others as well.

The Stiglitz-Weiss model is one of adverse selection. All investors have projects which give the same mean but they differ in riskiness, it is assumed that they are ordered according to second-order stochastic dominance (one prospect dominates another if every risk averse investor would prefer it to the other one). In this setup, increasing interest rates give rise to adverse selection in the sense that the less risky prospects are not taken up, only the risky remain, which in its course may lead

to a decrease in expected repayment. The S-W model does not say that backward bending supply occurs always, only that it can occur. The Stiglitz-Weiss model is fairly intuitive: the repayment rate restricts the demand for credits to projects which are sufficiently risky (the entrepreneur keeps the gains when it goes well and doesn't pay when it goes wrong, and consequently higher repayment rate increases the risk and eventually reduces expected repayment. The formalism behind the intuition may be somewhat demanding, and you don't need to memorize it, but it may be reassuring to see that the intuitive ideas can be formulated in a precise way.

We skip subsection 6.2.2, which shows that the repayment must increase again at high levels of R, this is mainly for nerds.

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We read:

Chapter 5, Section 4. Chapter 6, Sections 1 and 2.1.