

Problem Set 5 Solutions

Economic Development

October 9, 2008

1 Problem 1 (Chapter 13, #7)

1.1 Part a)

If n is the number of rich people and x is the number of unemployed low-income individuals, then $5000-n-x$ is the number of employed low-income individuals. If the maximum number of people are employed, then all the food will be eaten. So

$$250n + 200(5000 - n - x) + 100x = 1,000,000$$

Now we can solve for x as a function of n as the problem asks:

$$50n - 100x + 1,000,000 = 1,000,000$$

which gives:

$$x = \frac{1}{2}n$$

The minimum number of unemployed low-income people thus goes up when the number of rich people goes up. This happens because a greater number of rich people requires more food, leaving less to feed the low-income people. Therefore, it is only possible to support a smaller number of employed low-income workers and their food requirements.

Notice that this is the minimum number of unemployed low-income individuals. The actual number of unemployed individuals could be more than this.

1.2 Part b)

Suppose we start with the minimum number of unemployed low-income workers. If we employ some of the unemployed workers, demand for food becomes larger than the supply of food. This will push the price of food up. The workers will no longer be able to afford the 200 kg of food that they need to work. Therefore, the economy will return to its previous equilibrium where demand and supply of food are equal at 1,000,000 kg. Other workers will have to be fired until the amount of employed workers is low enough that the price of food makes it possible for the employed workers to purchase the food they need to remain productive.

1.3 Part c)

The only way to possibly reduce unemployment in this economy is to:

- 1) provide more food to the city so that more employed workers can be fed.
- 2) turn the rich people into low-income people so that they demand less food

Assume 2) is not desirable. One policy to decrease the unemployment rate is to subsidize agricultural production. This will lead to higher food production. Note that this has two effects on the industrial unemployment rate. One is that this will cause some migration back to agriculture since wages will be higher, reducing the size of the low-income labor force. The other is that more food will be produced. Each of these effects will push down the unemployment rate in the city.

2 Problem 2

Look at each case one at a time. Suppose the lender offers the \$500 loan. Denote by R_{500} the amount that the lender demands as repayment. To ensure that the farmer does not shirk, it must be the case that

$$2(1000 - R_{500}) \geq 1000 + 50$$

This says that what the farmer gets from adhering to the agreement has to be at least as large as what she gets from cheating the lender. If she cheats, she gets the \$1000 net profit from the project this period and the \$50 from working without capital next period. So, if the \$500 loan is given, the repayment the lender asks for is

$$R_{500} = \$475$$

This is the largest repayment the lender can demand without having the borrower cheat. This gives the lender a loss of \$25 each period.

Now suppose that the lender gives the \$100 loan. Denote by R_{100} the amount that the lender demands as repayment in this case. To ensure that the farmer does not shirk, it must be the case that

$$2(300 - R_{100}) \geq 300 + 50$$

If she cheats, she gets the \$300 profit from the project this period and the \$50 from working without capital next period. So, if the \$100 loan is given, the repayment the lender asks for is

$$R_{100} = \$125$$

This is the largest repayment the lender can demand without having the borrower cheat. This gives the lender a profit of \$25 each period.

The lender will not choose the \$500 loan, since she cannot achieve a positive profit. So she chooses the \$100 loan, achieves a profit of \$25 (an effective interest rate of 25%) and the farmer achieves an income of \$175 (the \$300 in output minus the \$125 loan repayment).

So the answer is

\$100 loan is chosen

Borrower gets: $\$300 - \$125 = \$175$

Lender gets: $\$125 - \$100 = \$25$

What would happen if the farmer had \$400 in collateral to seize in case of default?

Look at each case one at a time. Suppose the lender offers the \$500 loan. Denote by R_{500} the amount that the lender demands as repayment. To ensure that the farmer does not shirk, it must be the case that

$$2(1000 - R_{500}) \geq 600 + 50$$

This says that what the farmer gets from adhering to the agreement has to be at least as large as what she gets from cheating the lender. If she cheats, she gets the \$500 profit from the project this period and the \$50 from working without capital next period. So, if the \$500 loan is given, the repayment the lender asks for is

$$R_{500} = \$675$$

This is the largest repayment the lender can demand without having the borrower cheat. This gives the lender a profit of \$175 each period.

Now suppose that the lender gives the \$100 loan. Denote by R_{100} the amount that the lender demands as repayment in this case. To ensure that the farmer does not shirk, it must be the case that

$$2(300 - R_{100}) \geq -100 + 50$$

But notice that the lender cannot make the farmer's income fall below \$50 in any period. If that was the case, the farmer would do better by simply farming on her own and not using capital. So the correct condition is:

$$2(300 - R_{100}) \geq 50 + 50$$

This says that the farmer has to be no worse off than from farming on her own without capital in each period. So, if the \$100 loan is given, the repayment the lender asks for is

$$R_{100} = \$250$$

This is the largest repayment the lender can demand without having the borrower cheat. This gives the lender a profit of \$150 each period.

The lender will choose the \$500 loan, since she achieves a higher profit. So the answer is

\$500 loan is chosen

Borrower gets: $\$1000 - \$675 = \$325$

Lender gets: $\$675 - \$500 = \$175$

So both the borrower and lender are better off than in the case without collateral. The fact that the lender can seize the borrower's collateral makes even the borrower better off because the incentives for the borrower to steal the larger loan are reduced and the lender now finds it in her interest to give that loan.