Econ 344 Public Finance
Spring 2005

Midterm Exam 2 Name_____________________________________

- The duration of the exam is 1 hour 20 minutes.
- The exam consists of 8 problems and it is worth 100 points. The extra credit problem will only be counted if you lose points on other problems.
- Please write in the space provided. If necessary, write on the back of the page.
- Please ask me if you have any questions.
- To receive full credit you have to carefully explain all your answers and show all your work.

General advice: *If you get stuck in the early parts of a problem, do not stop there. You can receive substantial partial credit by explaining how you would solve the rest of problem if you had the necessary answers from its previous parts.*

1. (15 points) Determine whether each of the statements is true or false:
   a. Moral Hazard leads the insured to consume less than efficient amount of health care.

   False. Moral Hazard leads the insured to consume *more* than efficient amount of health care because they face greatly reduced price of medical services.

   b. The cost-benefit analysis of a new construction project should take into account the benefits to local economy due to increased employment.

   False. Increased employment should be counted as a part of costs (labor costs) and not benefits.

   c. Younger generations generally gain less from Social Security System than older generations.

   True. Generally the social security wealth (present discounted value of all benefits and tax payments) falls with time. It was much bigger for an average retiree 30 years ago than it is now.

   d. The current early retirement age in the United States is 62 years.

   True.

   e. Government should provide education because it increases the productivity of those who gets education.

False. The increase in productivity of those who gets education is reflected in their increased wages, and, therefore, should not warrant government intervention (no externality). Government probably should provide some education, just not for the reason given above.

2. (5 points) What are the two possible explanations of the fact that college graduates make substantially more than people with just high-school education?

(1) Human capital theory – higher wages reflect the increased productivity gained in college.
(2) Screening – with imperfect information about who is relatively more productive and who is relatively less productive, the former individuals may choose to enroll in college to signal their high ability (assuming that it is easier to get through college for high ability individuals as compared to low ability individuals). These high ability (=high productivity) individuals do not gain any knowledge in college; they enroll to partly solve the informational asymmetry between them and employers (employers do not have any other way to distinguish between high and low ability individuals).

3. (5 points) It is a well-known fact that Microsoft's Bill Gates chose to drop out from Harvard University. Clearly, his current wage rate is among the highest in the world. Which theory do you think his example is more consistent with? Explain.

Clearly, he couldn't have learned much in college because he didn't stick around for long enough. His innate ability must be the primary reason for his success (in general, entrepreneurial skills are probably very difficult to teach). Yet, assuming that Bill Gates would have been able to get through college and chose to drop out because he wanted to start working right away (i.e., he could have been easily observed as a Harvard graduate), we can argue that his example lends more to the screening theory.

4. (30 points) Suppose that there are 200 people that are considering whether to buy auto insurance from an insurance company. These people have identical incomes and preferences – each has $I=\$10000$ of income and the preferences are given by $U(I)=log(I)$. The potential loss is \$1000 if a driver gets into an accident. Suppose that 100 people are 'safe drivers' with probability of an accident equal to 0.01 (1%). The 'risky drivers' get into accidents with probability 0.1 (10%).
    a. What is an actuarially fair premium (in dollar terms) for 'safe drivers' and 'risky drivers'?

    The actuarially fair premium is equal to expected costs (=expected loss) which are calculated as =(probability of loss)*(loss of income if sick)

    Safe drivers: premium=0.01*\$1000=\$10.
    Risky drivers: premium=0.1*\$1000=\$100.

b. Suppose that insurance company can tell which drivers are ‘safe’ and which are ‘risky’ and it charges each person fair premium. Are these people going to insure themselves? (you’ll have to calculate utility with and without insurance and compare them for both types)

Safe drivers:
Expected utility if uninsured:
EU(uninsured)=p*U(income if accident)+(1-p)U(income if no accident)=
= 0.01*log(10000-1000)+0.99log(10000)=9.20928
Expected utility if insured:
EU(insured)=p*U(income if accident but insured)+(1-p)U(income if no accident but insured)=0.01*log(10000-1000+1000-10)+0.99log(10000-10)=9.20934.
So safe drivers will choose to insure because EU(insured)=9.20934> EU(uninsured)=9.20928.

Risky drivers:
Expected utility if uninsured:
EU(uninsured)=p*U(income if accident)+(1-p)U(income if no accident)=
= 0.1*log(10000-1000)+0.9log(10000)=9.1998
Expected utility if insured:
EU(insured)=p*U(income if accident but insured)+(1-p)U(income if no accident but insured)=0.1*log(10000-1000+1000-100)+0.9log(10000-100)=9.2003.
So risky drivers will choose to insure because EU(insured)= 9.2003> EU(uninsured)= 9.1998.

c. Suppose that an insurance company has no way of differentiating among people of different types so that it has to charge the same premium to everyone – average of the insurance premiums for two types of drivers. Would a ‘risky’ person decide to buy this insurance? What about ‘safe’ person? (If you were unable to answer part (a) assume that the common premium is equal to $60).

The average premium = (10+100)/2=$55.

Safe drivers:
Expected utility if insured:
EU(insured)=p*U(income if accident but insured)+(1-p)U(income if no accident but insured)=0.01*log(10000-1000+1000-55)+0.99log(10000-55)=9.2048.
So safe drivers will choose not to insure because EU(insured)= 9.2048 < EU(uninsured)=9.20928.

Risky drivers:
Expected utility if insured:

EU(insured)=p*U(income if accident but insured)+(1-p)U(income if no accident but insured)=0.1*log(10000-1000+1000-55)+0.9log(10000-55)= 9.2048.
So risky drivers will choose to insure because EU(insured)= 9.2048> EU(uninsured)= 9.1998.

d. Explain the concept of adverse selection using the answers in part (b).

Adverse selection exists because there is informational asymmetry between insurance company and individuals. Since there is no way for insurance company to differentiate between the two types of drivers, it offers the average premium to everyone. As a result, only bad risks select into insurance pool, while good risks select not to join ("selection" part). It is inefficient to have all good risks uninsured (because we showed that good risks would prefer insurance to no insurance) – "adverse" part.

5. (10 points) Name at least two arguments in favor of educational vouchers and at least three arguments against school vouchers.

Pros:
- **Gives people choice (and choice is good);**
- **Promotes competition among schools, thus increasing quality.**

Cons:
- **Excessive school specialization;**
- **May lead to increased segregation (by race, ability, etc);**
- **Are "unfair" because they would redistribute income from poor to rich.**

6. (10 points) Suppose that a project yields annual benefit of \$100 a year starting next year and continuing forever. The project costs \$500 now and \$200 next year. The relevant interest rate is 5%. Should this project be undertaken? (hint: the infinite sum can be calculated as $r+r^2+r^3+\ldots=r/(1-r)$).

The present discounted value of the stream of benefits is:
$B=100/(1+0.05)+ 100/(1+0.05)^2+100/(1+0.05)^3+\ldots=$
$= 100(1/(1.05)+ 1/(1.05)^2+1/(1.05)^3+\ldots) =$
$= 100[\{1/(1.05)\}/\{1-1/(1.05)\}]= 100/0.05=2000.$

The present discounted value of the stream of costs is:
C=500+200/1.05=690.

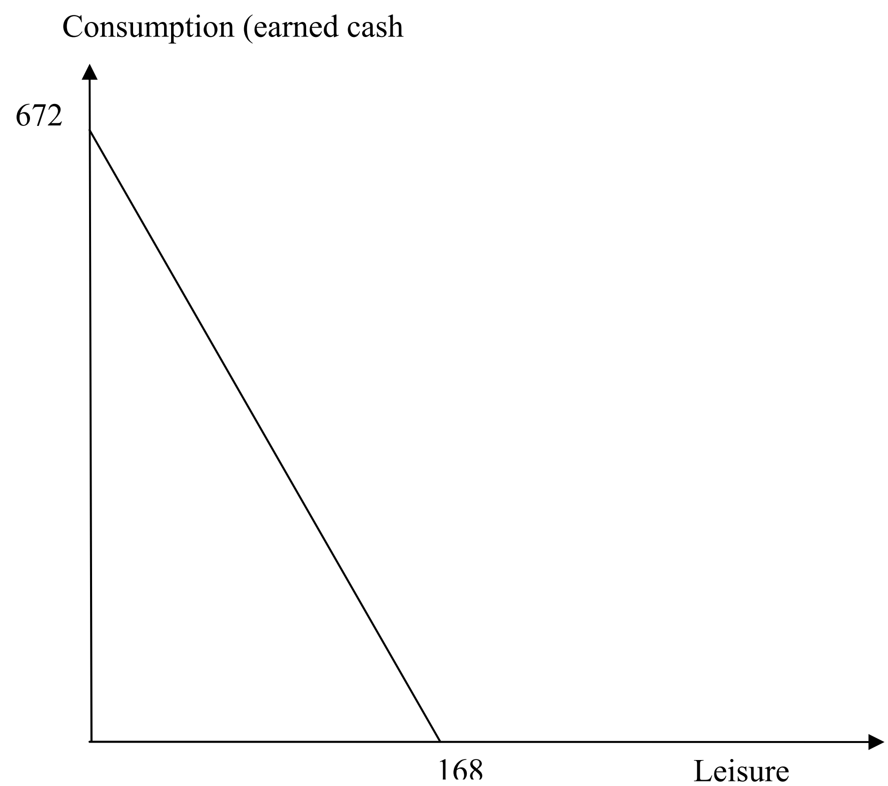
The net present value is equal to:
NPV=B-C=2000-690=1310>0. So the project should be undertaken.

7. (20 points + 5 extra credit) Dave is maximizing his utility by choosing how many hours to work a week. Dave's labor supply *LS* can be calculated by deducting his

leisure consumption *L* from total number of hours available to him in a week: *LS=7*24-L=168-L*. His wage rate is $4/hour.

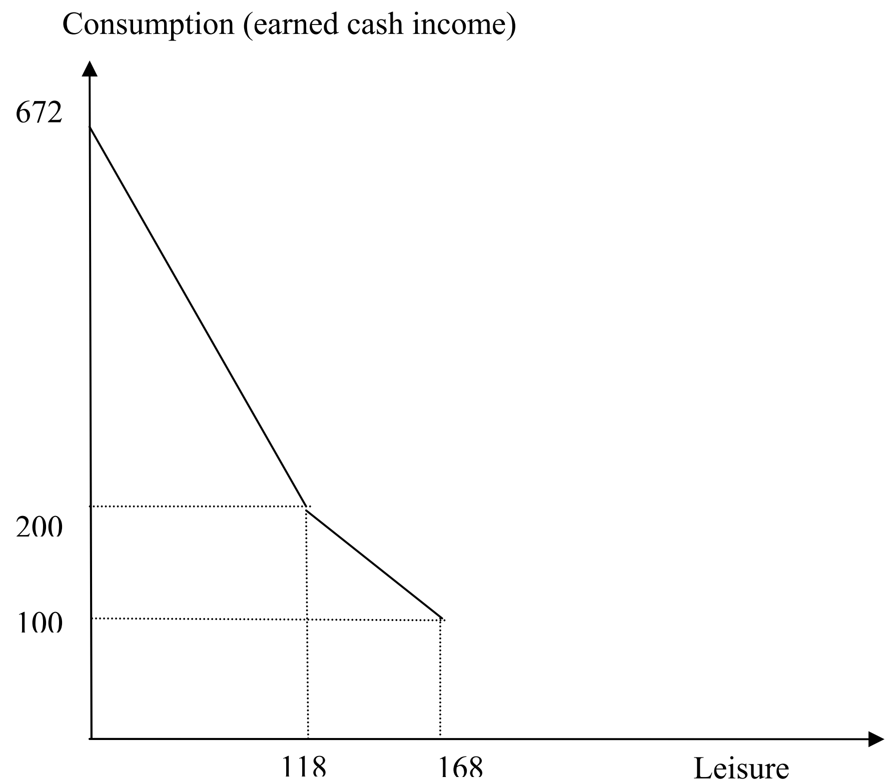
a. Sketch Dave's budget line. Make sure you label the axes and the points where the budget intersects axes. What is the slope of the budget line?

The slope of the budget line is equal to the negative of the wage rate -4.



b. Now suppose that government introduces a welfare program, which has the following benefit level *B=G-t*w*LS*; where *B* is the benefit level, *G* is the basic grant equal to $100, *t* is the benefit reduction rate equal to 0.5, and *w* is the wage rate, and *LS* is the labor supply. How many hours Dave has to work to reduce his benefit to zero and how much money would he earn in this case? What is the slope of the budget line? Sketch Dave's new budget, labeling all points.

To reduce the benefit to zero, i.e. *0=B=G-t*w*LS=100-2*LS,* Dave has to work *LS=50*. This corresponds to the consumption level (earned cash income) *C=50*4=$200* and leisure *L=168-50=118*. The slope of this new segment of the budget line is equal to negative wage net of tax *-(1-t)w=-(1-0.5)4=-2*.



c. Do you think that this program introduces disincentives to work for Dave? If so, name at least two ways to deal with this problem.

Generally speaking, this program would provide disincentives to work for Dave (although to know for sure, we would have to know his preferences). It is likely that he'll enroll in the program. Once enrolled, Dave will work less than before. There are a few ways that may reduce disincentive problem for people like Dave:

(1) Use categorical welfare payments – payments targeted towards certain population groups (single mothers, disabled). These groups would face a lot less incentive problem because they are not likely to work anyway, so discouraging work would do little to affect their behavior.
(2) Use of the so-called "ordeal mechanisms" – make it difficult to enroll and those who are truly able to work (like Dave) won't go through the ordeal of application process.
(3) Simply require beneficiaries to work certain number of hours a week.
(4) Untie other welfare programs (Medicaid) from it.

d. (5 points – extra credit) Assume that Dave's preferences for leisure L and consumption of all other goods C are given by $U= C^{1/2}L^{1/2}$. The price of consumption of other goods P_C is $1. Dave's optimal consumption of leisure can be computed according to the following demand function $L^*=(1/2)(I/w)$, where I is his income. Dave's consumption C is equal to $C^*=(1/2)(I/P_C)$. Is Dave going to enroll in this welfare program? Show all your work.

Dave's income without program is equal to $I=168*w=168*4=\$672$.
His optimal consumption of leisure is $L^*=(1/2)(I/w)=0.5*672/4=84$. The consumption of all other goods is $C^*=(1/2)(I/P_C)=0.5*672/1=336$. His utility at this allocation is equal to $U= C^{1/2}L^{1/2}= (336)^{1/2}(84)^{1/2}=168$.

At this point it should be clear that Dave won't enroll in the program because his optimal choice of leisure (84) is way below what he would need to qualify for the program (at least 118). To prove this we can calculate his optimal allocation assuming he's facing the budget associated with being enrolled.

Dave's income with program is equal to I=100+(1-t)*w*168=100+336=436.
His optimal consumption of leisure is $L^*=(1/2)(I/w)=0.5*436/4=54.5$. The consumption of all other goods is $C^*=(1/2)(I/P_C)=0.5*436/1=218$. His utility at this allocation is equal to $U= C^{1/2}L^{1/2}= (218)^{1/2}(54.5)^{1/2}=109$..The resulting utility is clearly lower than utility without enrollment. It is also worth noting that in reality Dave's consumption would be higher than 218 if he worked 168-54.5=113.5 because his benefit won't become negative (it'll just stay at zero after he worked 50 hours). So he'd be located on the portion of the budget with original slope $-w$.

8. (5 points) Explain why the first generation to receive Social Security benefits in the United States gained the most from it.

With the pay-as-you-go system current generation of workers (young people) pay taxes, which are used to pay benefits to current generation of retirees (old people). Now at the time the system was introduced in 1935 the generation of then-near-olds (pre-retirement age) didn't generally pay much into the system and they kept receiving benefits until they died. The effective rate of return for many of them was expressed in thousands of percent.