UNIVERSITY OF TORONTO
DEPARTMENT OF ECONOMICS

ECONOMICS 381H5S – SUMMER 2009

MANAGERIAL ECONOMICS II: PERSONNEL ECONOMICS

Midterm 1 – SOLUTIONS

Instructions

The test is 50 minutes long. Non-programmable calculators are allowed. The test consists of four questions, each worth 5 points. Show all your work in the space provided below the question. If you need additional space, you may write on the back of the page.

LAST NAME ____

FIRST NAME ____

STUDENT NUMBER ____

GOOD LUCK!

Question 1	Question 2	Question 3	Question 4	Total
/5	/5	/5	/5	/20

1. Mike Holmes, a Canadian professional contractor, wishes to hire a door installer for his TV show *Holmes on Homes*. The installer can install q doors per day according to q=10e+u, where e is installer's effort that can be observed by Mike and u is a random variable with a mean of zero. The value of each installed door is p=$50. The cost of effort to the installer is c(e)= $5e^2$ and his outside option is R=$500. The installer and Mike are risk-neutral. Design an optimal salary contract for the door installer.

- The problem is to choose effort e and salary s to maximize Mike' expected profits $E[\prod]=pE[q]-s=50\times 10e-s$, subject to the participation constraint that the installer is willing to accept the contract: $E[U]=s-c(e)=s-5e^2\geq R=500$.
- The efficient level of effort e* satisfies the MB(e*)=MC(e*) condition. Here, $MB=50\times 10$ and MC=10e. Therefore, e*=50.
- The minimum salary acceptable to the installer s* is such that U=s*-c(e*)=R, which implies that $s^*=R+c(e^*)=500+5e^{*2}= 500+5\times 50^2=13{,}000$.
- This contract is also attractive to Mike, since $E[\prod]=50\times 10(50)-13{,}000=12{,}000>0$.
- Therefore, the optimal salary contract is [s*,e*]=[$13,000,50]

2. Diamond Taxi Association Ltd. wishes to employ a new taxi driver. The number of rides per day q is given by q=20e+u, where e is driver's effort and u is a random variable with a mean of zero. Each ride is worth p=$5. The driver's cost of effort is given by c(e)= $e^2/2$ and his outside option is 50n, where n is driver's ability. The driver and Diamond Taxi are risk-neutral. Assuming that Diamond Taxi cannot observe driver's effort, what is an optimal piece rate contract for a driver of ability n=40?

- When the agent is risk-neutral, the optimal piece rate b* is always 1.
- This piece rate induces the efficient level of effort e* that satisfies the MB(e*)=MC(e*) condition. Here, $MB=20\times 5$ and MC=e. Therefore, e*=100.
- To find the base payment a*, use the participation constraint: E[U]=a+bpE[q]-c(e)=R. This implies that $a=R+c(e)-pbE[q]=50n+e^2/2-5\times b\times 20e$. Given that n=40, b*=1, and a*=100, this simplifies to $a=2{,}000+100^2/2-100(100)=-3{,}000$.

- This contract is also acceptable to Diamond Taxi since $E[\Pi]=pE[q]-a-bpE[q]=5(20\times 100)+3{,}000-1\times 5(20\times 100)=3{,}000>0$.
- Therefore, the optimal piece rate contract for a driver of ability 40 is to pay 3,000 to Diamond Taxi for renting the car (a*=-$3,000) and keep all fares (b*=1).

3. A patient health outcome y depends on whether a hospital receives wait time funding. Specifically, $y^1=5+\beta+u$ if the hospital receives the funding and $y^0=5+u$ if it doesn't, where u is a variable that varies across hospitals. The observed patient outcome is 8 in hospitals that received the funding. In addition, the average value of u is

1 for hospitals that received the funding and 3 for other hospitals. What is the difference in the observed patient outcome between hospitals who received the wait time funding and those that didn't? How much of this difference is due to the treatment effect, and how much is due to the selection effect?

- The observed outcome for hospitals that received the funding is $E[y^1|\text{received funding}]=8$.

- The observed actual outcome for hospitals that did not receive the funding is $y^0=5+E[u|\text{did not receive funding}]=5+3=8$.

- Therefore, the observed difference between the two types of hospitals is 0.
- The selection effect is given by the average difference in u between hospitals that received the funding and those that didn't: $E[u|\text{received funding}]- E[u|\text{did not receive funding}]=1-3=-2$.

- The treatment effect can be found by using the identity that the observed outcome is the sum of treatment and selection effects, or 0=-2+treatment effect. Therefore, the treatment effect is 2.

4. Allen-Edmonds Shoe Company is a manufacturer of high-priced shoes. For years, it paid its factory employees based on individual output through a piece rate system. In 1990, following the advice of quality gurus, the company abandoned the piece-rate system and started paying employees fixed hourly wages. After the policy change, the average productivity of employees decreased by 10 percent. Discuss whether this result is consistent with economic theory and empirical evidence from Shearer (2002).

- This result is consistent with the economic theory of piece rates when the agent's effort cannot be observed and both parties are risk-neutral.
- Specifically, the piece rate pay induces the efficient level of effort by effectively renting the job to the worker and letting the worker keep the value of his output. When effort is not observed, the salary contract will elicit less than the optimal level of effort.
- The direction of the change is consistent with Shearer (2002) who showed that the tree planters in B.C. who are paid based on the number of planted trees are more productive than the planters paid by the hourly wage.
- However, Shearer estimates the difference in productivity of about 20 percent, which is more than double what is observed for the case of Allen-Edmonds Shoe Company.
- The difference in the magnitude can perhaps be explained by the selection effect. For example, some productive workers may not have left the company after the salary system was implemented for reasons other than the change in how the workers are paid.