14.03 Fall 1999 Exam 2 Solutions

Part I.

1. False. Since quantity demanded at every price doubles, the new demand function is $Q_N(P) = 2Q_O(P)$. The price elasticity of Q_N is
$$\frac{\partial Q_N(P)}{\partial P}\frac{P}{Q_N(P)} = \frac{\partial 2Q_O(P)}{\partial P}\frac{P}{2Q_O(P)} = \frac{\partial Q_O(P)}{\partial P}\frac{P}{Q_O(P)}.$$
Thus the elasticity does not change.

2. False. Risk averse consumers will always buy full insurance if the price is actuarially fair *and* their utility is state independent. As we saw in Problem Set 5, this is not the case if utility is state dependent. (Remember the question on PS#5 about insuring for loss of kids. A person whose marginal utility of wealth depends heavily on his kids' well being will not want to insure against their loss because the monetary compensation is worth less in expected utility value than the premium).

3. False. The pooling equilibrium *never* exists in the R-S model: at any potential pooling equilibrium there exists another insurance contract that would skim off the low-risk consumers and earn a positive profit.

4. False. Shephard's Lemma tells us that the *net* substitute definition is symmetric. The gross substitute definition includes income effects and is not necessarily symmetric.

5. False. In order for GED holders to be paid $1,500 more than non-GED holders of the same ability (as TMW find), then it must be the case that GED holders as a group (i.e., on average) are more productive than non-GED holders. Hence the finding that GED holders are on average more productive does not contradict the TMW results.

6. True. In Kane and Staiger's analysis, decreases in the cost of abortion increase the abortion rate and also increase the pregnancy rate, so the effect on the birth rate is theoretically ambiguous. Empirically they find that the second effect dominates, so that decreases in the cost of abortion increase the birth rate. In this question we are given a scenario in which a decrease in the cost of abortion decreases the birth rate, which would appear to be inconsistent with Kane and Staiger. However, since the birth rate is measured seven months after the announcement of the policy change, any changes in the birth rate reflect changes in the abortion rate, not changes in the pregnancy rate. Hence the finding that a decrease in the cost of abortion decreases the birth rate is consistent with Kane and Staiger's analysis.

Part II.

1. Both of the risky choices (B and D) have higher expected values than the certain choices (A and C). If Bill were risk neutral or risk loving, he would prefer B to A and D to C. The fact that he is indifferent between them implies that he is risk averse.

The expected utility of F is

$EU(F) = .25u(400) + .25u(900) + .25u(800) + .25u(1500)$

$EU(F) = .5(.5u(400) + .5u(900)) + .5(.5u(800) + .5u(1500))$

$EU(F) = .5EU(D) + .5EU(B) = .5EU(C) + .5EU(A)$

$EU(F) = .5U(1{,}000) + .5U(500)$

Then note that a 50/50 gamble over C and A has expected value \$750. Since Bill is risk averse he will prefer \$750 with certainty to a gamble with expected monetary value of \$750. Hence he prefers E to F.

2. $Q(P) = 10{,}000P^{-0.5}$

   $\ln Q(P) = \ln(10{,}000) - 0.5\ln(P)$

   $\frac{\partial \ln Q(P)}{\partial \ln P} = -0.5$

   The price elasticity of demand for RAM is –0.5.

   Since demand is inelastic, we know that revenue must increase due to the disaster. Let Q_I denote industry capacity and Q_S denote Samsung's capacity before the disaster. Then Samsung's revenue is $Q_S P(Q_I) = Q_S(10{,}000/Q_I)^2$. After the disaster, Samsung's revenue is

   $(Q_S/2)P(Q_I/2) = (Q_S/2)(10{,}000/(Q_I/2))^2 = 2Q_S(10{,}000/Q_I)^2$.

   So Samsung's revenue increases by 100%.

Part III.

1. First diagram: home output = A, factory output = $1.75A$
   Second diagram: average ability = $0.5A_{max}$, factory wage = $0.875A_{max}$

2. Let A_{max} be the most able worker at the factory. In order for this worker to be willing to work at the factory, the factory wage for this worker ($=0.875A_{max}$) must be greater than or equal to the wage he can get by working at home ($=A_{max}$). This condition holds only at $A_{max}=0$, so nobody works in the factory. Total output is 5 ft per person.

3. Only workers with $A \geq 0.5$ are able to earn a degree. Ability for degree holders is uniformly distributed on [0.5,1], so average ability is 0.75 and the wage the factory offers for workers with a degree is 1.75(0.75)=1.3125. The participation constraint is that the wages from going to school for two days and working at the factory for the remaining eight days are greater than or equal to the wages from working at home for the entire ten days: $8(1.3125) \geq 10A$ for all $A \in [0.5,1]$. Since 10.5 > 10, the participation constraint is satisfied.

4. Average ability of those working at home is 0.25, so output at home is 2.5 ft per person. Output at the factory is 8(1.75)(0.75) = 10.5 ft per person. Since half of the

town works at home at half of the town works in the factory, total output is 6.5 ft per person.

5. The economist's interpretation is incorrect, because education does not increase productivity. Instead, productivity goes up because education serves as a signal that mitigates the lemons problem. When the school opens, the factory can identify the bad weavers and hence offer a wage that good weavers will accept. Since weavers at the factory are more productive, output goes up.

   Hence, in this problem, the 'lemons' problem is (partially) solved by the 'signaling' mechanism. This is an unexpected outcome because we normally believe that 'signaling' equilibria are inefficient inasmuch people pay to acquire a signal that in itself does not improve productivity (i.e., the 'weaving school' does not actually teach weaving). In this example, however, the MW degree allows the factory to distinguish high from low productivity workers (i.e., whether or not A is above or below 0.5). By requiring an MW degree, the factory can offer a wage that attracts high quality workers to the factory without also attracting 'lemons' (low quality workers). Since workers are more productive at the factory, output goes up.

   Note that this signaling equilibrium is still not an optimal solution since low productivity workers are also more productive at the factory yet they continue to work at home. An optimal solution would require the factory to be able to observe the individual productivity, A, for each person. In this case, each person would be paid according to her true productivity rather than according to average productivity. And since every person is more productive at the factory than at home, this mechanism would increase total output far more than would the imperfect signaling mechanism outlined in the problem.