## 14.03 Fall 1999 Exam 3 Solutions

Part I

1. True, but misleading. A dominant strategy is a strategy that is optimal regardless of *correct* what the other player is playing. *Can also accepted "false" if you gave correct explanation*

2. False. Risk aversion did not play a role in the technology adoption model presented in class. The potential inefficiency resulted from a combination of three factors: network externalities, switching costs, and uncertainty about the other player's preferences.

3. False. A tariff increases the price and reduces the surplus of domestic consumers.

4. False. If a country does not have a comparative advantage in anything, then the world price ratio equals the domestic price ratio. No trade will occur, and utility with free trade will be the same as utility under autarky (see Problem Set 9, 1f).

5. True.
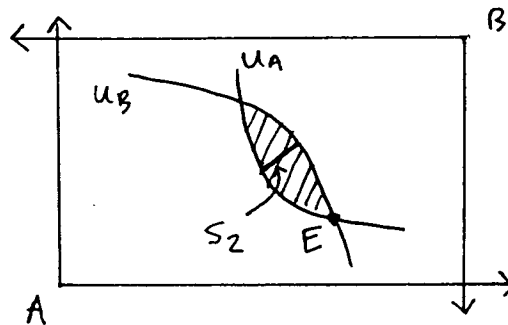
S_2: part of contract curve in S_1

S_1: ▨ (lens-shaped region between indifference curves)

6. False. At an interior solution, the marginal rate of substitution for each consumer must be equal to the common price ratio.

Part II

1. Since transferring fat from Jack to Ms. Sprat benefits Ms. Sprat without harming Jack, and transferring lean from Ms. Sprat to Jack benefits Jack without harming Jack, the only Pareto optimal allocation is the allocation in which Jack gets all the lean and Ms. Sprat gets all the fat. Since there is only one Pareto efficient allocation, by the First Welfare Theorem we know that this must also be the competitive equilibrium allocation.
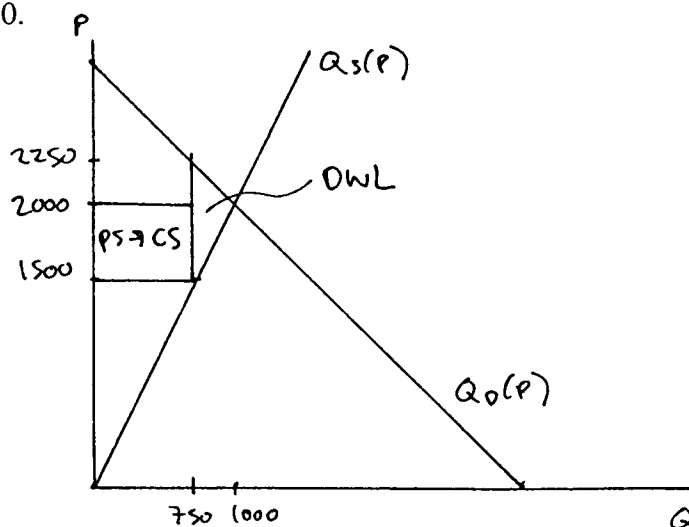

Pareto efficient point = competitive equilibrium allocation
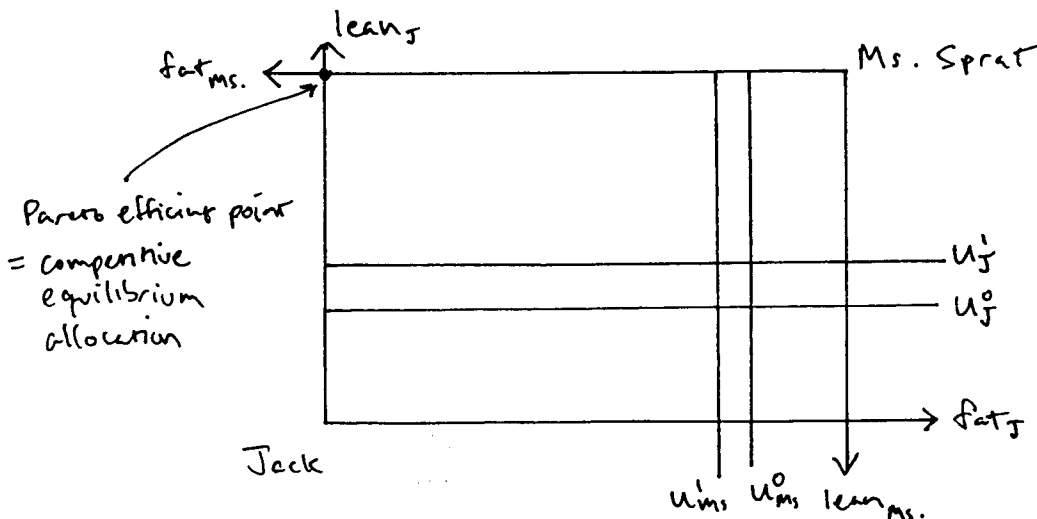
2. Supply and demand for apartments in Cambridge:
   A. $P^* = 2000, Q^* = 1000$
   B. $P_R = 1500, Q_R = \min\{Q_S(P_R), Q_D(P_R)\} = 750$. Since demand at this price is 1500 and supply at this price is 750, 750 renters are unable to find an apartment.
   C. Transfer from producers to consumers = 375,000.
      DWL = 93,750.

   D. $Q_D(P_D) = Q_S(P_D - T) \Rightarrow 3000 - P_D = (P_D - T)/2$
      $\Rightarrow P_D = 2000 + T/3, P_S = P_D - T = 2000 - 2T/3$
      $\Rightarrow$ Landlords pay 2/3 of the tax, renters pay 1/3.

Part III

   $$TY(B) = B(360 - B)$$

A. $dTY/dB = 360 - 2B = 0 \Rightarrow B = 180$

   $TY(180) = 32,400$

B. $TY_N(B_N, B_S) = B_N(360 - B_N - B_S)$

   $dTY_N/dB_N = 360 - 2B_N - B_S = 0$

   Symmetry $\Rightarrow B_N = B_S = B^{NC}$

   $360 - 3B^{NC} = 0 \Rightarrow B^{NC} = 120$

   $TY_N(120,120) = 14,400$

C. If the game is repeated three times, the subgame perfect equilibrium is for each country to send 120 boats in each year.

D. The treaty specifies that the countries will use a grim trigger strategy: play 90 boats each as long as nobody has cheated in the past, but play 120 boats each forever as soon as someone cheats.

Solving for the optimal deviation when your opponent sends 90 boats:

$TY_N(B_N,90) = B_N(360 - B_N - 90)$

$dTY_N / dB_N = 270 - 2B_N = 0 \Rightarrow B_N = 135$

$TY_N(135,90) = 18,225$

$PDV(\text{cheating}) = 18,225 + 14,400\delta /(1 - \delta)$

$PDV(\text{cooperating}) = 16,200/(1 - \delta)$

The treaty will hold if $PDV(\text{cooperating}) \geq PDV(\text{cheating}) \Leftrightarrow \delta \geq 9/17$.

E. If South sends the Super Trawler, North's payoff is

$TY_N(B_N,150) = B_N(360 - B_N - 150)$. Maximizing this with respect to B_N tells us that North's best response is to send 105 boats. If South does not fish, North's best response is to send 180 boats.

If South sends the Super Trawler, North's best response is to send 105 boats. If North sends 105 boats, South gets 15,750 by sending the Super Trawler, and nothing if it does not fish. Hence sending the Super Trawler is a best response to 105, and we have shown that (South sends Super Trawler, North sends 105 boats) is a Nash equilibrium.

You also need to check that there is not a NE in which South does not fish (although this may seem obvious, note that it would not be true if the Super Trawler were equal to 180 boats). If South does not fish, North's best response is to send 180 boats. If North sends 180 boats, South gets 4,500 by sending the Super Trawler, and nothing if it does not fish. Hence not fishing is not a best response to 180, so this is not a Nash equilibrium.

South sends more boats and gets more fish in this equilibrium than in Part B, while North sends fewer boats and gets fewer fish. By building the Super Trawler and burning its regular fleet, South has made a credible commitment to send more boats.