



Problem Set #5: Due end of class December 7, 2017.
[Updated 11/30/2017]

*You may discuss this problem set with your classmates, but everything you turn in must be your own work.
Please read the “problem set guidelines” on the course web page before beginning.*

1. The United States taxes U.S. firms on a residence basis. Canada taxes U.S. firms on a source basis. The U.S. corporate tax rate is 40 percent and the Canadian corporate tax rate is 26 percent. Monsanto, a U.S. multinational corporation, earned \$500 in the U.S. market and \$100 in the Canadian market.
 - a. Suppose the United States did not offer foreign tax credits. How much tax does Monsanto owe the U.S. government? How much tax does it owe the Canadian government? Compute Monsanto's total tax rate (the total tax rate is $\tau = (T^H + T^F)/(\pi^H + \pi^F)$).
 - b. Assume the U.S. government offers foreign tax credits to Monsanto. How much tax does Monsanto owe the U.S. government? How much tax does it owe the Canadian government? Compute Monsanto's total tax rate
 - c. How do Monsanto's incentives to invest in other countries differ across the tax systems in parts a. and b.?

2. Consider a final good firm that owns the final good technology $q = Am^\alpha$. The final good sells for price p . If the final good firm chooses to make the intermediate good m , it pays a fixed cost f^I and it costs $p_m\gamma$ per unit. A specialized supplier can produce the intermediate good for price p_m per unit.
 - a. The intermediate good can only be used by the final good firm. It has no value to an outside company. It is also very difficult for someone outside of the relationship to judge the quality of the intermediate good. How do these two properties of the intermediate good lead to the possibility that the final good firm can “hold up” the intermediate good firm?
 - b. If $\alpha = 0.8$, $A = 1.5$, $p_m = 1$, $p = 2$, $\beta = 0.5$, $\gamma = 1.25$, and $f^I = 0.4$, what are the profits of the final good firm if it produces the intermediate good in-house?
 - c. If $\alpha = 0.8$, $A = 1.5$, $p_m = 1$, $p = 2$, $\beta = 0.5$, $\gamma = 1.25$, and $f^I = 0.4$, what are the profits of the final good firm if it outsources to the supplier firm and the two firms bargain after production of the intermediate good? Assume that the supplier has bargaining power β and the final good firm has bargaining power $1 - \beta$.
 - d. Should the final good firm produce the final good itself, or purchase it from a supplier? Why?

3. Consider the licensing model that we developed in class. The license agreement has the supplier pay L_t and L_{t+1} to the firm in order to use the firm's technology. If the supplier creates one unit of the intermediate good at cost p_m , the technology generates revenue R . In the second period the supplier can defect from the license agreement and produce on its own. If it does so, $L_{t+1} = 0$, but the supplier must pay f^S to maintain the technology.
 - a. Assume $R = 6$, $p_m = 1$, $f^S = 1.3$, and the supplier's discount rate is $r^S = 0.04$. What is L_{t+1} ? Why?
 - b. Assume $R = 6$, $p_m = 1$, $f^S = 1.3$, and the supplier's interest rate is $r^S = 0.04$. If there are a large number of potential licensees, the final good firm can drive the first license payment L_t up to the point that the licensee breaks even, $\pi_S = 0$. What is L_t ?
 - c. Explain why $L_t > L_{t+1}$.

True/False-Explain. Respond to the following statements by *explaining why they are true or false*. No partial credit will be awarded for stating TRUE or FALSE without explanation.

4. Transfer pricing takes place when a multinational firm moves its intellectual property assets to a low-tax country. This allows the firm to pay less tax.
5. In the ex post bargaining scenario of the hold-up model we developed in class, the parameter β represents the bargaining power of the supplier. The final good firm earns the most profit when β is very close to zero and the supplier has little bargaining power.

Bonus question!

6. Log on to Canvas and complete the Student Rating of Teaching Effectiveness (SRTE). You will (or already have) receive an email with a reminder and a link to the SRTE website as well. I think the link is <https://rateteaching.psu.edu>. The SRTE is one of the ways that the University evaluates my performance, and I use your responses to improve my teaching. Thank you for SRTEing!