

**PRACTICE FINAL EXAM**

Solutions will be provided in class on Monday, December 12, 2016.

**Instructions: Please read carefully.**

- You have 70 minutes to complete this exam.
- This is a closed book/notes exam. You may not use a calculator.
- There will be partial credit awarded if part of your work is correct. To receive partial credit, you must show your work in the space provided after each question.
- Write legibly and only in the space provided. Mentioning extra things that are wrong can hurt your score. Part of the challenge here is to provide a short, precise answer. Good luck!

**QUESTION 1 [30 points]**

Consider the Romer (1990) model with expanding varieties.

- a) [15 points] Derive the “inverse demand” equation that intermediate goods producers use to solve their profit maximization. Write down all key equations and show all the steps in your derivation.

- b) [15 points] Show that the maximized profit of a given intermediate goods firm can be written as:  $\pi = \alpha(1 - \alpha)\frac{Y}{A}$ , where Y is output and A is the number of varieties (also TFP in this model).
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**QUESTION 2 [20 points]**

In the expanding varieties model of Romer (1990), how is the price of a patent determined along the balanced growth path? Write down the key equation(s) and show step by step how you obtain the formula for price. Does the price of a given patent change over time? If it does, what determines whether it increases or decreases over time? [Please define all the notation you use to answer the question.]

**QUESTION 3 [40 points]**

	Steel	Lumber	Labor
US	X	40	100
Bangladesh	10	Y	100

Consider the table given above. Answer the following questions.

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- a) [10 points] Suppose that  $X=10$  and the two countries are in a free trade regime. For what value(s) of  $Y$  would the US try to specialize in the production of steel? [Hint: there may be more than one such value, in which case you should indicate the range of  $Y$  values].
- b) [10 points] Assign one value to  $X$  and one value to  $Y$  such that the US has comparative advantage in lumber production but no absolute advantage. [Hint: There are many values of  $X$  and  $Y$  that correctly answers this question. You just need to provide one case that works.]
- c) [10 points] Provide the  $(X,Y)$  combination such that  $X$  is the largest value possible and  $Y$  is the smallest value possible *such that*  $(X,Y)$  together give Bangladesh absolute advantage in production. [Assume that  $X$  and  $Y$  are both integer values.]

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- d) [10 points] Suppose that  $X=5$  and  $Y=10$  and the two countries are open to trade. What is the *range* of possible equilibrium price ratios ( $P_{lumber} / P_{steel}$ ) in the world trade equilibrium? Justify your answer.

**QUESTION 4 [30 points]**

We continue from the previous question. Assume that the productivities of US and Canada are as they are given in the table in Question 2. The utility function is Cobb-Douglas:  $C=(\text{steel}^{0.25})(\text{lumber}^{0.75})$ , where  $C$  is aggregate consumption.

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	<b>Free Trade</b>	<b>No Trade</b>
	<b>US</b>	<b>Canada</b>
<b>Price of steel (<math>p_s</math>)</b>		
<b>Price of lumber (<math>p_l</math>)</b>		
<b>Wage (<math>w</math>)</b>	1	1 (US dollar)
<b>Consumption of steel (<math>s</math>)</b>		
<b>Consumption of lumber (<math>l</math>)</b>		
	<b>US</b>	<b>Canada</b>
<b>Price of steel (<math>p_s</math>)</b>		
<b>Price of lumber (<math>p_l</math>)</b>		
<b>Wage (<math>w</math>)</b>		1 (Canadian dollar)
<b>Consumption of steel (<math>s</math>)</b>		
<b>Consumption of lumber (<math>l</math>)</b>		

- (a) [12 points] Consider the case with no trade in the right column. Fill in all the blank spaces in this column and explain how you obtained each number briefly.

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(b) [23 points] Now consider free trade in the middle column. We will conjecture an equilibrium and see if we can verify it. As a conjecture take the price of steel relative to lumber ( $p_s/p_l$ ) to be  $4/3$  and conjecture also that the US completely specializes in lumber production and Canada specializes in steel production. Solve for all the variables in the table and check if they constitute an equilibrium. Explain.