

SIMON FRASER UNIVERSITY
Department of Economics

Econ 305
Intermediate Macroeconomic Theory

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PROBLEM SET 1
(Due February 1)

1. (10 points). When NAFTA (North American Free Trade Agreement) was being negotiated, a common argument was that it would be good for Canada, since it would open US markets to Canadian exporters and generate a trade surplus. Others argued that it would be bad for Canada, since US capital would flood into Canada. Using your knowledge of Balance of Payments accounting, explain why both arguments cannot be correct. (For simplicity, assume that Canada and the USA are the only two countries in the world).

The first argument implies NAFTA will produce a Current Account surplus, and therefore a Financial Account deficit. The second argument implies NAFTA will produce a Financial Account surplus, and therefore a Current Account deficit. They cannot both be correct.

2. (20 points). Suppose household preferences are described by the utility function

$$U(C, \ell) = C + \alpha \ln(\ell)$$

where C stands for consumption of market goods and ℓ stands for leisure. For simplicity, assume there is no government in this economy.

- (a) Assuming the market (real) wage is w and the total amount of time available is h , derive expressions for the household's consumption and labor supply decisions as a function of w and h . (For simplicity, assume the household has no nonmarket income). Does the income effect ever dominate the substitution effect? How does labor supply depend on income and consumption? Explain intuitively.

The household's optimality condition is:

$$\frac{U_\ell}{U_C} = w \quad \Rightarrow \quad \ell = \frac{\alpha}{w}$$

The household's time constraint is $N^s + \ell = h$, where N^s denotes labor supply. Substituting in the above expression for ℓ gives us the following labor supply curve:

$$N^s = h - \frac{\alpha}{w}$$

This implies that labor supply always increases when wages increase. That is, the substitution effect always dominates the income effect. We can learn more about

the income effect by solving for consumption. The household's budget constraint is:

$$C + w \cdot \ell = w \cdot h$$

Substituting in for ℓ gives the following expression for consumption:

$$C = w \cdot h - \alpha$$

Notice that when wages rise, the household spends all the extra money on consumption. Leisure doesn't change at all! This happens because the utility function is linear in consumption. (These kinds of preferences are sometimes called 'quasi-linear'). Because the marginal utility of consumption is constant, the household optimally decides to spend all extra income on consumption. The income effect leisure is zero. Not surprisingly then, the substitution effect always dominates.

- (b) Now suppose output, Y , is produced by competitive firms with technology $Y = zN$ where N denotes labor inputs, and z is an index of productivity. Derive an expression of the firm's labor demand, and illustrate it with a graph.

The firm's profit maximization condition is:

$$MPL = w \quad \Rightarrow \quad z = w$$

If $w > z$, then costs exceed revenue, and the firm will shut down, i.e., its labor demand is zero. If $w < z$, then revenues exceed costs, and the firm will want to hire an infinite amount of labor. Thus, the labor demand schedule is a flat line at z (assuming w is on the vertical axis). If $w = z$ the firm is happy to hire any amount of labor.

- (c) Using your answers to parts (a) and (b), derive an expression for the market-clearing wage rate. How does the equilibrium wage change when z increases? How does the equilibrium wage change when α increases? Use a Labor Supply/Labor Demand graph to illustrate these changes.

From the answer to part (b), we know that the equilibrium wage must be z . If we substitute this into the household's labor supply curve we find that the equilibrium level of employment is $N = h - \alpha/z$. This can be visualized as the intersection of a flat Labor Demand curve and an upward sloping Labor supply curve. If z increases the Labor demand curve shifts vertically upward by the same amount. Wages and employment both increase. An increase in α means that the household values leisure more relative to consumption. The Labor Supply curve shifts up and to the left. Wages are obviously unchanged (since z has not changed), and equilibrium employment falls.

3. (20 points). Suppose we think of the internet as increasing the productivity of the job matching function. Using the the DMP model discussed in Chapter 6, determine the effect of the internet on the unemployment rate, the vacancy rate, the labor force, output, and labor market 'tightness'. Use diagrams to illustrate your answer, and explain the results intuitively.

This is straight from the book (albeit with a sign change, since the book analyzes a decrease in match efficiency). (See pages 189-191). The increase in e shifts out the

zero profit line for the firm. With given values of k , a , z and b the firm is now making profits, since its search costs go down. More firms start to enter, which causes labor market tightness to increase. Labor market tightness increases up until the point that firms' search costs rise enough to offset the increase in match efficiency, and the zero profit condition is restored. At the same time, the expected return to job search increases since, all else equal, the rise in e makes it more likely that the worker will find a job. The increase in labor market tightness (i.e., the rise in j) reinforces this effect, so that the labor force, Q , rises unambiguously. Next, since $u = 1 - e \cdot m(j)$, and e and j both rise, we know that unemployment must fall in response to an increase in match efficiency. At the same time, since $v = 1 - e \cdot m(j^{-1})$, it would appear that the effects on v are ambiguous, since e rises while $m(j^{-1})$ falls. However, the zero profit condition is

$$e \cdot m(j^{-1}) = \frac{k}{(1-a)(z-b)}$$

Since the right-hand side doesn't change, we know the two effects must exactly offset each other, so that the vacancy rate remains constant. Finally, since $j = A/Q$, and we know j and Q both increase, it must be the case that A (the number of firms) increases, and so as a result, equilibrium output must increase, since $Y = e \cdot M(Q, A)$.