KEY

Intermediate Macroeconomic Theory
Economics 317: Section A & B
First Quiz: Fall 201~~2~~

Directions: ***Please answer all questions. Your answers should be as thorough and as precise as possible. If necessary you may continue your answer to any question at the back of the page.***

1. Assume an economy in which there are no opportunities for trade (i.e. both intra- and intertemporal trade) and in which the typical household has production opportunities summarized by the production function $y_t = f(l_t)$ where y_t is number of units of a commodity produced in period t and l_t represents work effort in period t. Assume that the marginal product of labor is positive and that the production function is characterized by diminishing marginal productivity of labor. The typical household seeks to maximize utility in any given period t and its prefernces in (c, l) space are summarized by the utility function: $u_t = u(c_t, l_t)$. Where c_t is number of units of the commodity produced in period t and l_t is as defined above. Assume that the marginal utility associated with consumption of the commodity is positive and that there is disutility associated with work.

(a) Specify the representative household's economic problem and use whatever combination of graphical, algebraic, and written exposition you deem appropriate to demonstrate how the household will solve the economic problem you specified. (15 points)

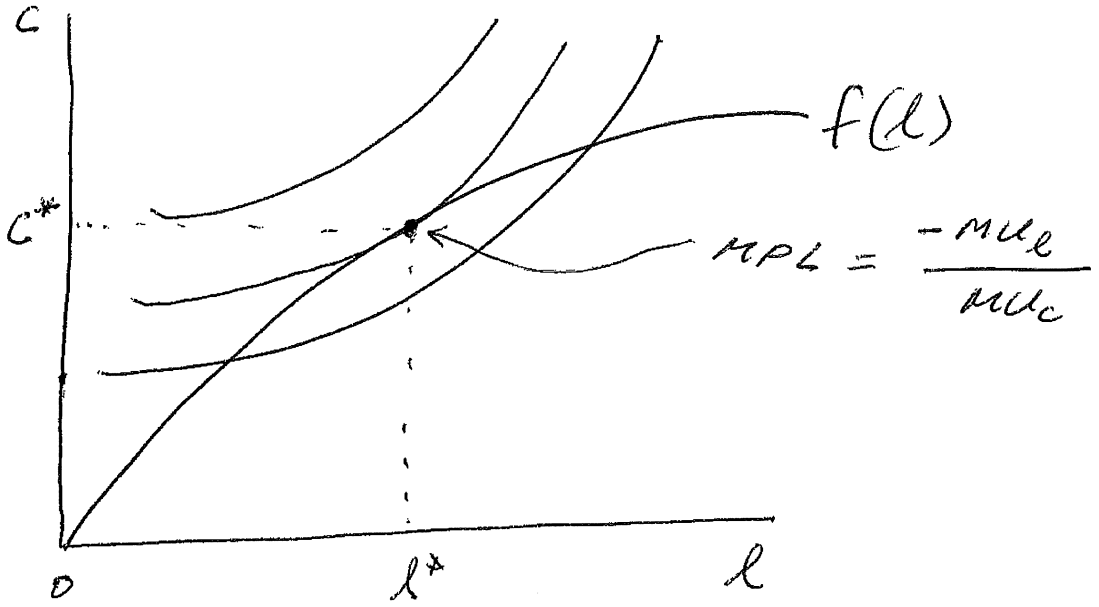
The household's economic problem is to pick the combination of work effort and consumption that maximizes its utility subject to the constraints and opportunities implicit in its economic environment.

The household solves this economic problem by picking the combination of c and l that puts it on the highest possible indifference curve. This ~~occurs~~ combination is the combination @ a point of tangency (not intersection) btwn the production function and an indifference curve. At this point of tangency the slopes are equal.

(a) cont'd

The slope of the production function at any given level of work-effort is interpreted as the ~~slope of the~~ marginal product of labor (i.e. MP_L). The slope of the indifference curve is the marginal rate of substitution of consumption of goods for consumption of leisure. It can be shown that this is equal to $-MU_\ell / MU_c$. Consequently, when the hh has chosen optimally the follow condition holds.

$$MP_L = \frac{-MU_\ell}{MU_c}.$$ Graphically,



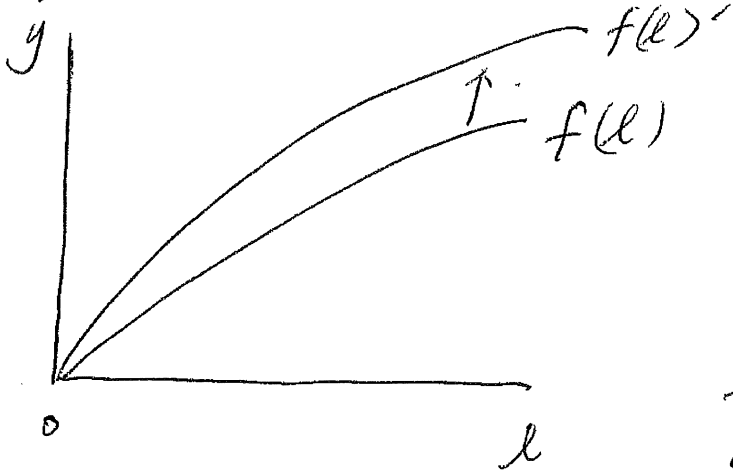
$$MP_L = \frac{-MU_\ell}{MU_c} \iff -MU_\ell = MP_L(MU_c)$$

$-MU_\ell$ is the utility cost of ↑ work-effort as such it is the MC. $MP_L(MU_c)$ is the marginal utility gain or marginal benefit. Therefore, the hh chooses the (c,ℓ) combination @ which MB = MC.

(b) Suppose the representative household's intratemporal allocation of its resources is optimal. Use whatever combination of graphical, algebraic, and written exposition you deem appropriate to rigorously demonstrate that the representative optimizing household's response to an improvement in technology will be consistent with the following fundamental principle. (20 points)

In the absence of changes in preferences, any given change in the economic environment will induce optimizing households to alter their resource allocation plans if and only if the change in the economic environment changes pertinent relative prices (or opportunity costs) and or wealth.

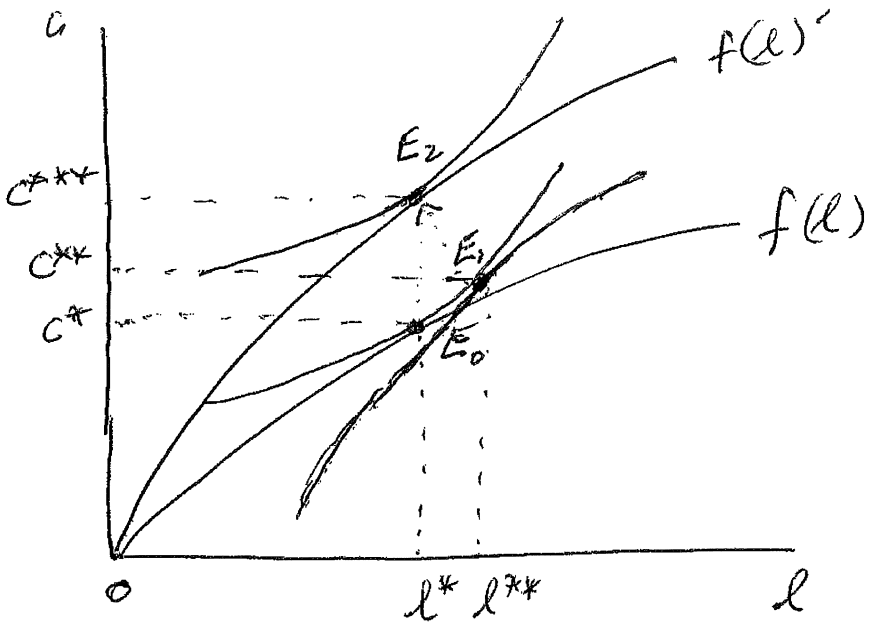
An improvement in technology will lead to a proportional upward shift in the production function as illustrated below. This proportional shift incorporates two consequential ses. First, there is an ↑ in the scale of opportunities that allows hhs to produce more @ the initial level of work-effort. This is tantamount to an ↑ in wealth.



Second, the slope of the prodn fnc is higher at every possible level of work. As such the MPL (or the opportunity cost of leisure) ~~which~~ is higher at each and every level of work effort. Consequently, the improvement in technology changes both wealth and a pertinent opp costs (i.e. rel price). The stated principle suggests that the hh should alter its resource allocation plans. In what follows I show that the hh will alter it resource alloc plans.

~~Cont'd~~ Cont'd.

(b) cont'd



⇒ Given the increase in the MPL or the opp cost of leisure, hh react by ~~cut~~ reducing leisure. This means that they are working more which allows them to consume more goods. As such the hhs ~~are~~ is substituting consumption of goods for consumption of leisure. This is the substitution effect (illustrated as E_0 to E_1 in the diagram). It is the hh's response to the Δ in the MPL.

⇒ In response to the increase in wealth the hh increases its consumption activities. (i.e. cons of goods and cons of leisure). This is illustrated as the movement from E_1 to E_2. Overall, consumption of goods increases since both the subs and wealth effects predict the c will ↑. However since the subs effect predicts and increase in l and the wealth effect says l will fall, the net effect depends on which effect is dominant.