Labor Supply: First Lecture

LABOR ECONOMICS (ECON 385)

BEN VAN KAMMEN, PHD

Households

Households supply labor to firms in exchange for wages. More literally individuals within the household supply labor. The distinction seems trivial, but an individual's objective is not always identical that of the household to which he belongs (unless he's a real hermit). And the objective of the supplier of labor has significant implications.

- The model espoused in your textbook is a neoclassical version in which an individual decides how to allocate his time (between working and an alternative use).
- A more general version—outlined by Gary Becker*—considers the set of household members' choices about time allocation. Furthermore this model unifies the consumption and labor supply decisions by considering all consumption costs in terms of the necessary time required—either to produce them in the household ("home production") or to purchase them with earnings from the labor market.
- The former is a somewhat simpler model to analyze and will receive the majority of attention here, but Becker's model can explain observed behavior that the textbook version does not. Its intuition can be understood from the paper.

*Becker, Gary. "ATheory of the Allocation of Time," Economic Journal, Vol. 75 (1965): 493-517.

Utility maximization

The objective that an individual attempts to accomplish is maximization of his utility (modeled as a function).

- What gives an individual utility? Just like production, many goods enter the utility function: consumption goods, future consumption, the utility of other people, or the time spent enjoying leisure activities. Again the more of these possibilities we include, the less tractable the model becomes. All that is necessary to show the essence of labor supply is a two good model, showing the trade-off between supplying labor and an alternative use of time.
- The alternative use can be thought of as “leisure” or as “home production” with similar consequences for labor supply.

Utility functions

Notation for the utility function typically looks like the following

$$U = f(C, L)$$

where,

U is the utility level,

L is the number of hours of leisure, and

C is the number of units of consumption.

- The function, "*f*", determines the utility level, given the values of L and K. This means: "you tell me how much consumption and leisure you have, and the function will tell you how much utility you have."

Utility functions (continued)

Further assumptions that should be fairly uncontroversial are as follow.

- "More of a given good, *ceteris paribus*, will result in more utility".
- "If you continue increasing one good, *ceteris paribus*, the increased utility that results will get smaller and smaller".
- The preceding statements can be translated into *economics* terminology as: a) positive marginal utility, and b) diminishing marginal utility.

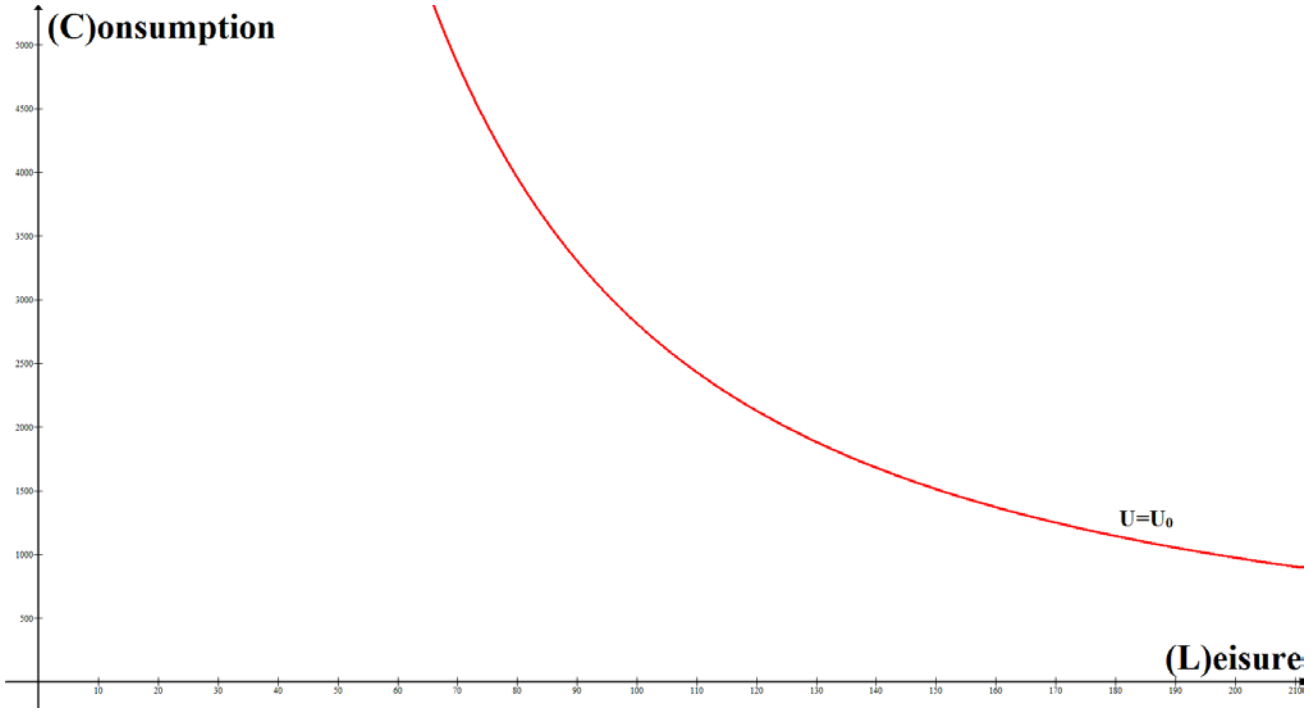
Utility functions (concluded)

- In mathematical notation, the properties are espoused as follows.

$$\text{Positive Marginal Utility} \rightarrow \frac{\partial f}{\partial L} \equiv MU_L > 0 \text{ and } \frac{\partial f}{\partial C} \equiv MU_C > 0$$

$$\text{Diminishing Marginal Utility} \rightarrow \frac{\partial MU_L}{\partial L} < 0 \text{ and } \frac{\partial MU_C}{\partial C} < 0$$

Indifference curves



- A utility function of 2 goods can be graphed in 2 dimensional space if the functional value (*U*) is held constant.
  - The utility function graphed in this space takes the form of indifference curves. Each line consists of the set of bundles of goods that yield the consumer identical utility, e.g., all the combinations that give $U = U_0$.

Indifference curves (continued)

- The further from the origin an indifference curve lies, the higher the utility level it represents.
- Indifference curves slope downward for a graph with two goods.
- Indifference curves do not intersect.
- Indifference curves are convex—they are "bowed" in toward the origin.
- The slope of an indifference curve is called marginal rate of substitution ("MRS"). Its absolute value is the ratio of the two goods' marginal utilities.

$$MRS = \frac{MU_L}{MU_C} = \frac{\frac{\partial f}{\partial L}}{\frac{\partial f}{\partial C}}$$

  - The reason for the convexity of the indifference curves is that, as you move down the curve, you consume more *L* and less *C*. Marginal utility of *L* declines and the marginal utility of *C* increases as you do this. So the absolute value of the MRS decreases as you move down the curve, and the curve becomes flatter.

The budget constraint

Individuals' utilities are constrained by a budget set. It is related to how he transforms wages into consumption. Namely,

$$C = V + w(T - L)$$

where,

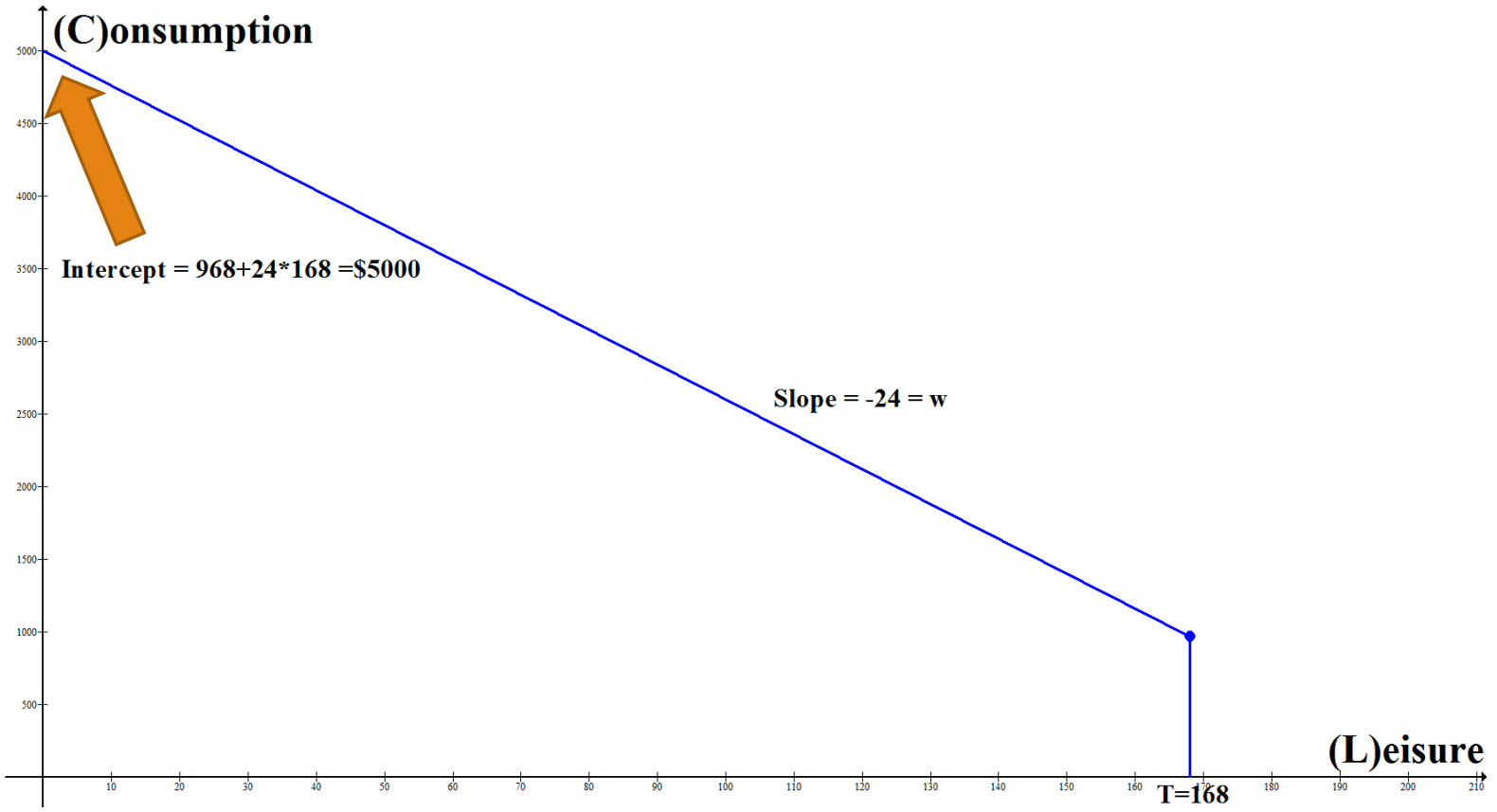
V is non-labor income,

w is the wage rate, and

T is the hours of time available per period, e.g., 168 hours per week.

- This function describes the outer boundary of the budget set—bundles of *C* and *L* an individual can attain, given a limited amount of *T*. The slope of the budget constraint—which can be graphed in *L*, *C* space like an indifference curve—is $(-w)$. And its intercept is $(V + wT)$.

The budget constraint (continued)



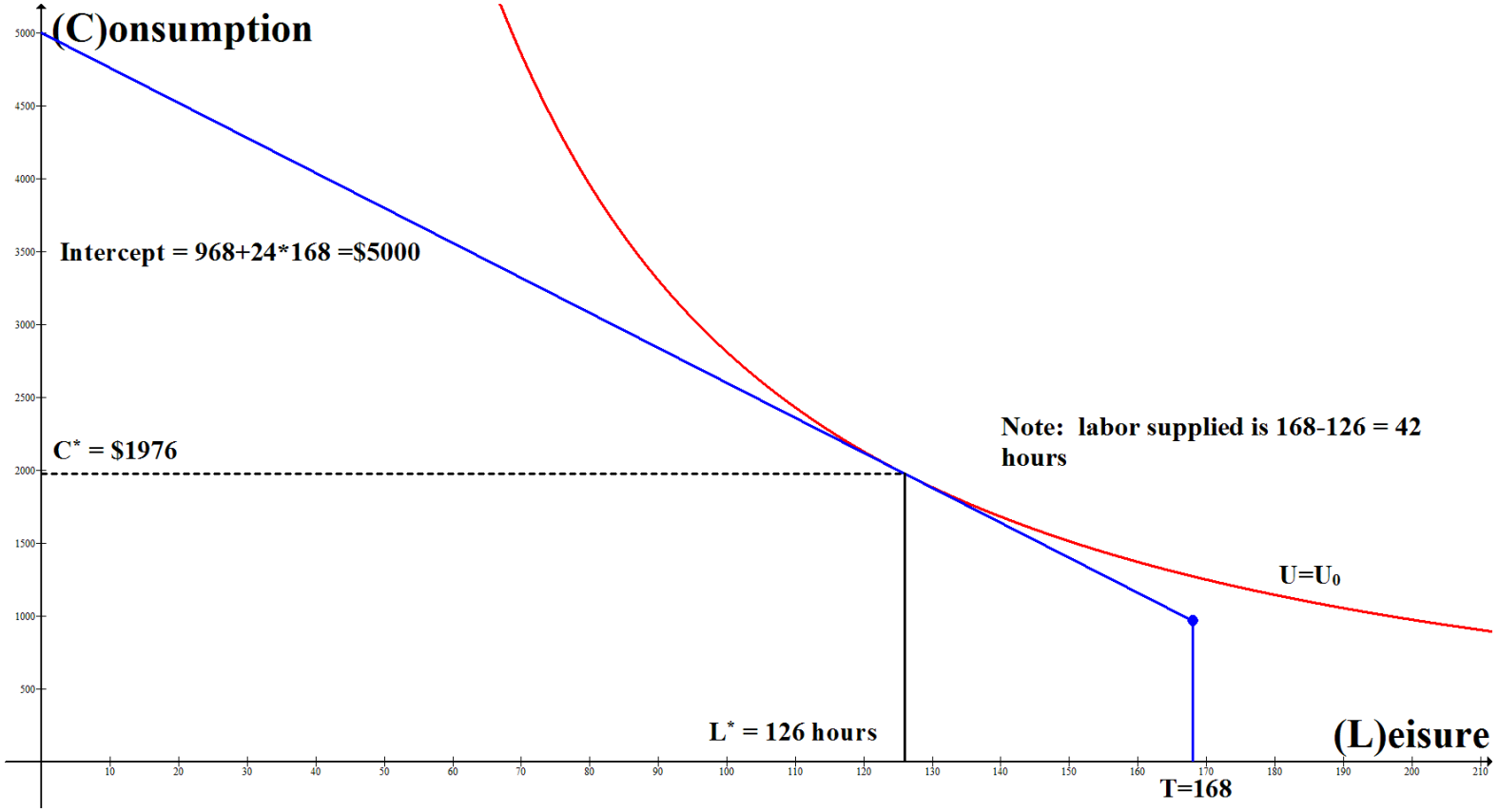
Optimal labor-leisure choice

An individual who supplies labor will choose to consume leisure and consumption such that utility is maximized subject to the budget constraint. This occurs where the budget constraint is tangent to an indifference curve:

$$MRS = w \Leftrightarrow \frac{MU_L}{MU_C} = w.$$

The agent consumes L^* hours of leisure and $T - L^*$ hours of labor supply. He consumes C^* units of consumption goods.

Optimal labor-leisure choice (continued)



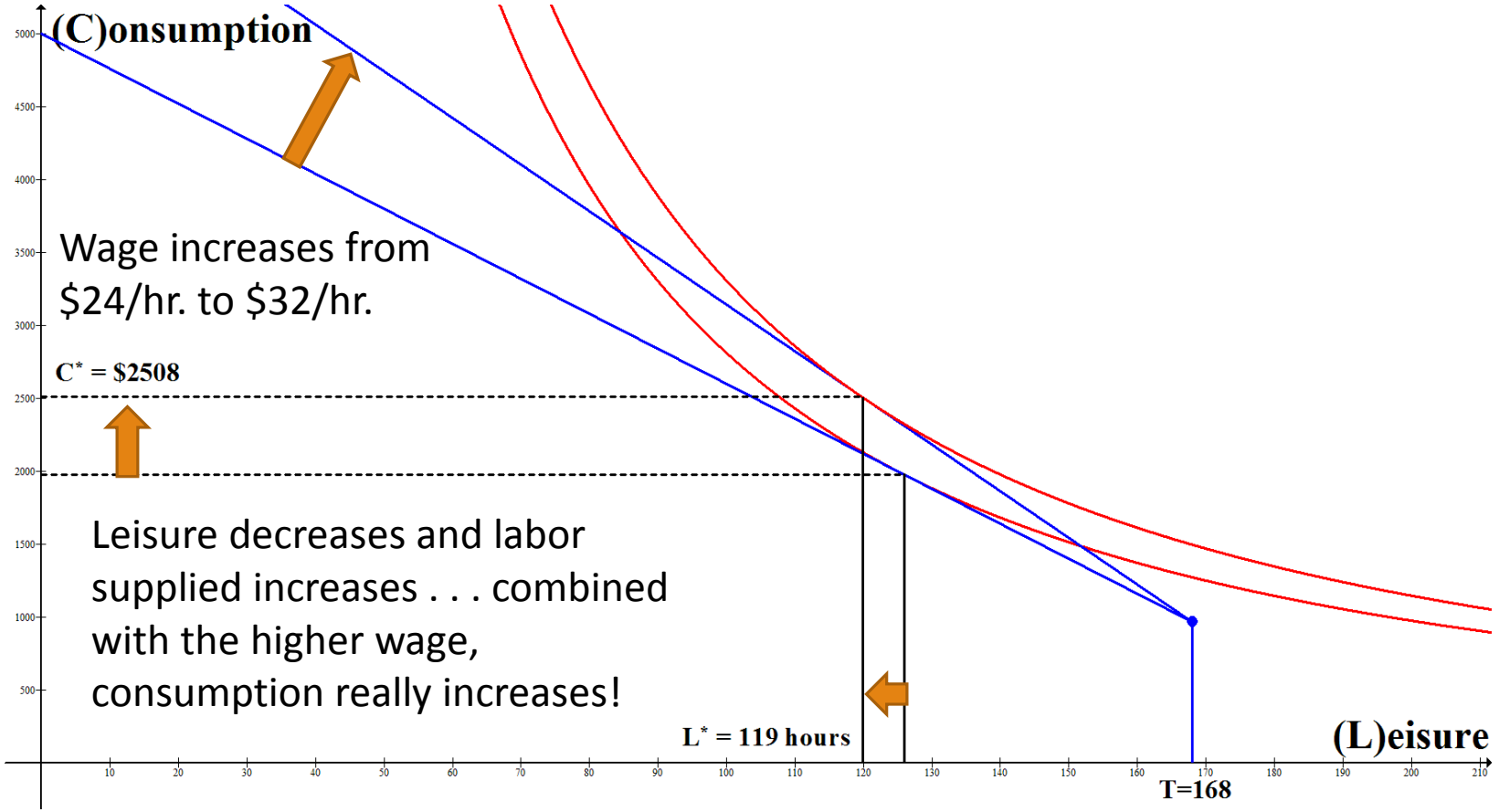
Labor supply

Labor supply changes when the wage changes.

In order to see his supply response, allow the wage rate to vary. Higher wage increases the intercept and (absolute value of the) slope of the budget constraint.

- With a new budget, the agent "re-optimizes" by finding a new point of tangency. With a higher wage, the consumer supplies more labor and does less leisure.
- The higher wage induces the agent to supply more labor, making some "marginal" leisure activities unnecessary. This positive relationship between wage rate and labor supply holds over *most of* the range of w.
- Using the lingo of microeconomic theory, the price of leisure (w) is going up, leisure is a normal good, and that leads the consumer to consume less of it.

Labor supply (continued)



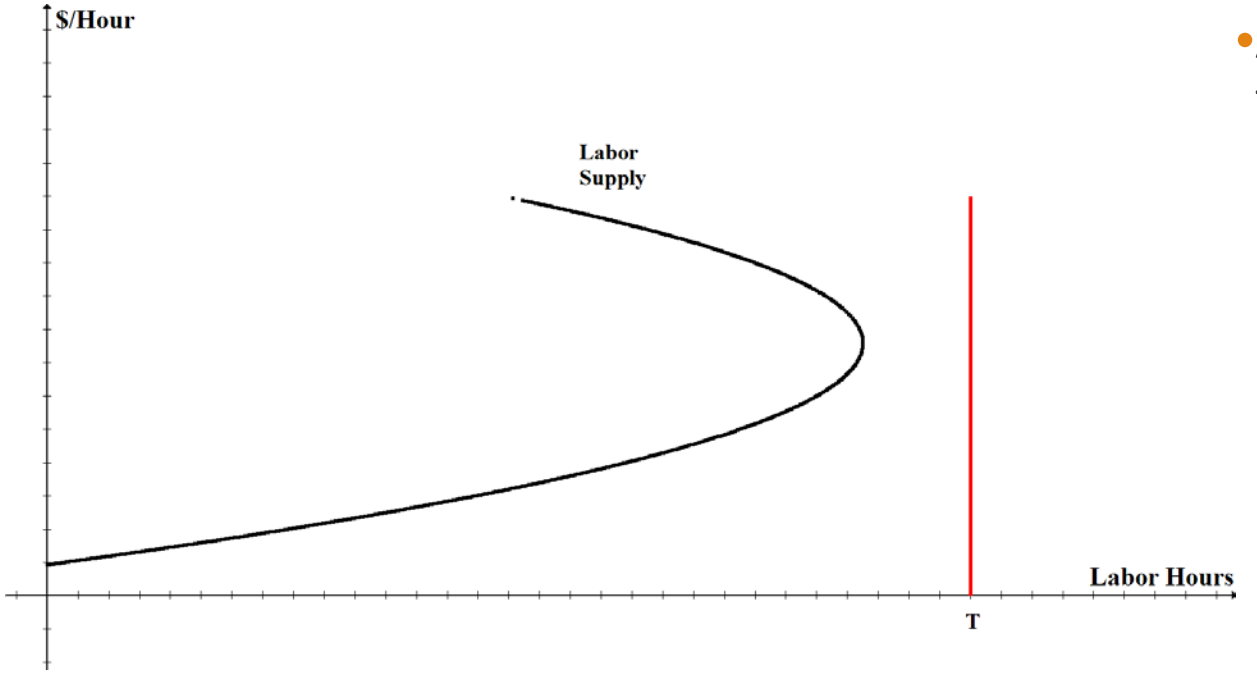
Labor supply (continued)

Is leisure guaranteed to go down when the wage increases? We know that a consumption change can be decomposed into a substitution effect and an income effect.

Regardless of what types of goods we have, the substitution effect is the opposite sign of the price change. When prices change, however, they also affect the size of the budget set—increasing or decreasing purchasing power.

- We have tacitly assumed that both consumption and leisure are normal goods.
  - Consumer buys more when income goes up.
- As such, when the wage increases, the substitution effect increases the optimal quantity of labor supply (decreases leisure) and the income effect decreases the optimal labor supply (increases leisure).
  - The question is whether the substitution effect or the income effect dominates.

Backward bending labor supply?



- A dominant income effect is presumed to occur at high wage levels—at which an agent can get all his important ("highest marginal utility") consumption by just working a few hours.
  - Thus a further increase in the agent's wage will lead him to cut back on labor supply (more leisure), despite the higher opportunity cost of leisure.
  - This possibility gives the labor supply curve a "backward-bending" shape at high levels of *w*.

Labor supply at the extensive and intensive margins

This analysis of the worker's hours decision assumed that he supplied a strictly positive (non-zero) number of hours. Equivalently he "participated" in the labor market. It is also conceivable that the agent finds it optimal not to participate by supplying zero hours. The next lecture analyzes this participation decision, which is relatively simple to show.

- This lecture and the next contrast the extensive margin (the "extent" to which you work at all: the participation decision) with the intensive margin (the "intensity" of how much work you: the hours decision).