Labour-Leisure Choice for a consumer.

Idea: Labour: time consumer decides to work (L)
Leisure: time spend for himself/herself (l)

Total time available (T) $\Rightarrow$ $L + l \leq T$ --- Time constraint

$L \uparrow \Rightarrow$ Income $\Rightarrow$ Consumption (desirable).

$L \downarrow \Rightarrow l \uparrow$ (desirable)

(i) Consumption (desirable) for which $L \uparrow$
(ii) Leisure (desirable) for which $L \downarrow$

$\Rightarrow$ How much 'L' should be optimally decided.

Define $u = u(c, l)$, $\frac{\partial u}{\partial c} > 0$, $\frac{\partial u}{\partial l} > 0$.

Let, P: mkt price w = wage rate

$$\underbrace{P.c}_{\text{expenditure that the consumer wants to make}} = \underbrace{wL}_{\text{Income }(y)}$$

Monetary constraint: $P.C = wL$
Time constraint: $l + L = T$
$L = (T - l)$

$\Rightarrow$ Combining:
$P.C = w(T - l)$.

$\therefore$ $\max\limits_{\{c, l\}} u = u(c, l)$ s.t $P.C = w(T - l)$ $\Rightarrow$ Labour-Leisure choice

variables: c, l.
Parameters: P, w, T

$\Rightarrow$ on solving:
$c^* = c^*(P, w, T)$
$l^* = l^*(P, w, T)$

... P, w, T }

$$c^* = c^*(P, w, T)$$
$$l^* = l^*(P, w, T)$$

$$L^* = T - l^* = L^*(P, w, T).$$

Note: $\boxed{L^* = L^*(w)}$ $\Rightarrow$ For a given w, how many hours is the consumer willing to work.

↳ Labour supply function ✓

Q. Suppose the consumer has a choice b/w Labour & Leisure. Utility fn: $u(c, l) = c^{2/3} l^{1/3}$. Let w = wage rate, P = mkt price. Find the Labour-supply fn. [Assume that total time available = 24].

$$u(c, l) = c^{2/3} l^{1/3}.$$

Time constraint: $l + L = 24 \Rightarrow l = (24 - L)$

Monetary constraint: $P \cdot c = w \cdot L \Rightarrow c = \frac{w}{P} L$.

$$u = \left\{\frac{w}{P} L\right\}^{2/3} (24 - L)^{1/3} = u(L)$$

Find level of L that max U.

$$u' = \ln u = \frac{2}{3} \ln\left\{\frac{w}{P} L\right\} + \frac{1}{3} \ln(24 - L)$$

↳ [Monotonic transformation]

For max: $\frac{\partial u'}{\partial L} = 0 \Rightarrow \frac{2}{3} \cdot \frac{1}{\left(\cancel{\frac{w}{P}}\right) L} \cdot \left(\cancel{\frac{w}{P}}\right) - \frac{1}{3} \cdot \frac{1}{(24 - L)} = 0.$

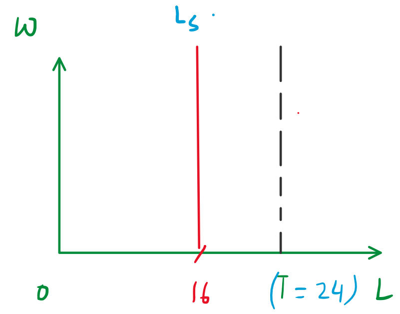
$$\Rightarrow \frac{2}{\cancel{3}} \cdot \frac{1}{L} = \frac{1}{\cancel{3}} \cdot \frac{1}{(24 - L)}$$

$$\Rightarrow 2(24 - L) = L.$$

$$\Rightarrow 48 - 2L = L$$

$$\Rightarrow 48 = 3L$$

$$\Rightarrow L^* = \frac{48}{3} = 16.$$



Q. Consider a individual having a choice b/w hours of work (L) & leisure(l). He earns an income of 'y' at the wage rate w. Utility fn: $u(y, l) = 48l + ly - l^2$.

(i) Derive the labour supply fn of the individual, if total time available is $T \geq 0$.

(ii) Plot the labour-supply fn with $T = 24$. [w = vertical axis, L = horizontal axis].

$$u(y, l) = 48l + ly - l^2$$

Time constraint: $l + L = T \Rightarrow l = (T - L)$

Monetary constraint: $P \cdot C = wL \Rightarrow y = wL$.

$$u = 48(T-L) + (T-L) \cdot wL - (T-L)^2 = u(L).$$

For max:

$$\frac{du}{dL} = 0 \Rightarrow -48 + \overbrace{Tw - 2wL} + 2(T-L) = 0$$

$$Tw - 2wL + 2(T-L) = 48$$

$$-2wL - 2L = 48 - Tw - 2T$$

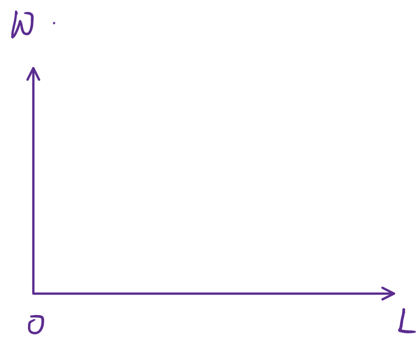
$$-2L(w+1) = 48 - Tw - 2T$$

$$L = \frac{48 - Tw - 2T}{-2(w+1)}$$

$$L = \frac{2T + Tw - 48}{2(w+1)} \Rightarrow \text{Labour supply fn.}$$

(ii) $T = 24$

HW. $L = \dfrac{12w}{w+1}$

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