

Substitution and Income Effect when  $P_y$  changes

$P_x = 2$   
 $P_y = 4$   
 Budget = 120

$P_y$  decreases to 3

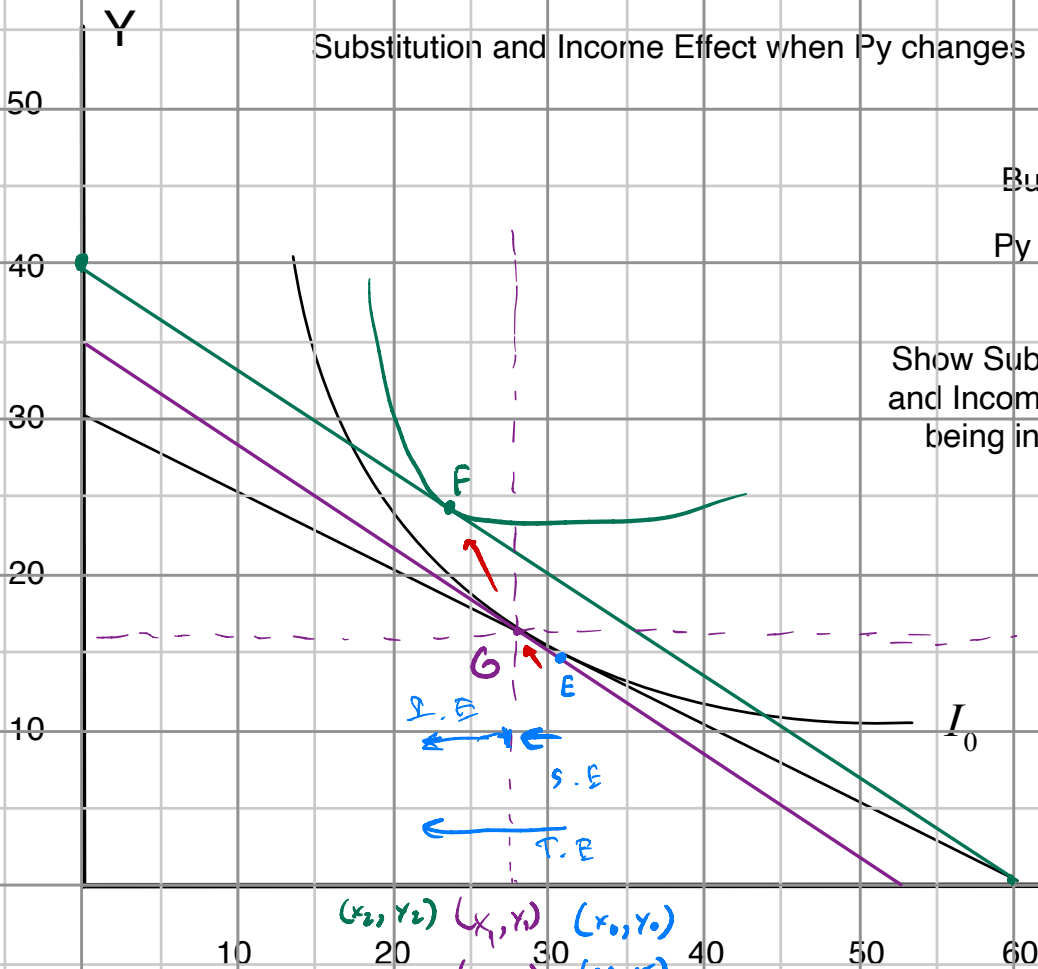
Show Substitution Effect and Income Effect with X being inferior goods

$$2x + 4y = 120$$

$$x + 2y = 60$$

$$2y = 60 - x$$

$$y = 30 - 0.5x$$

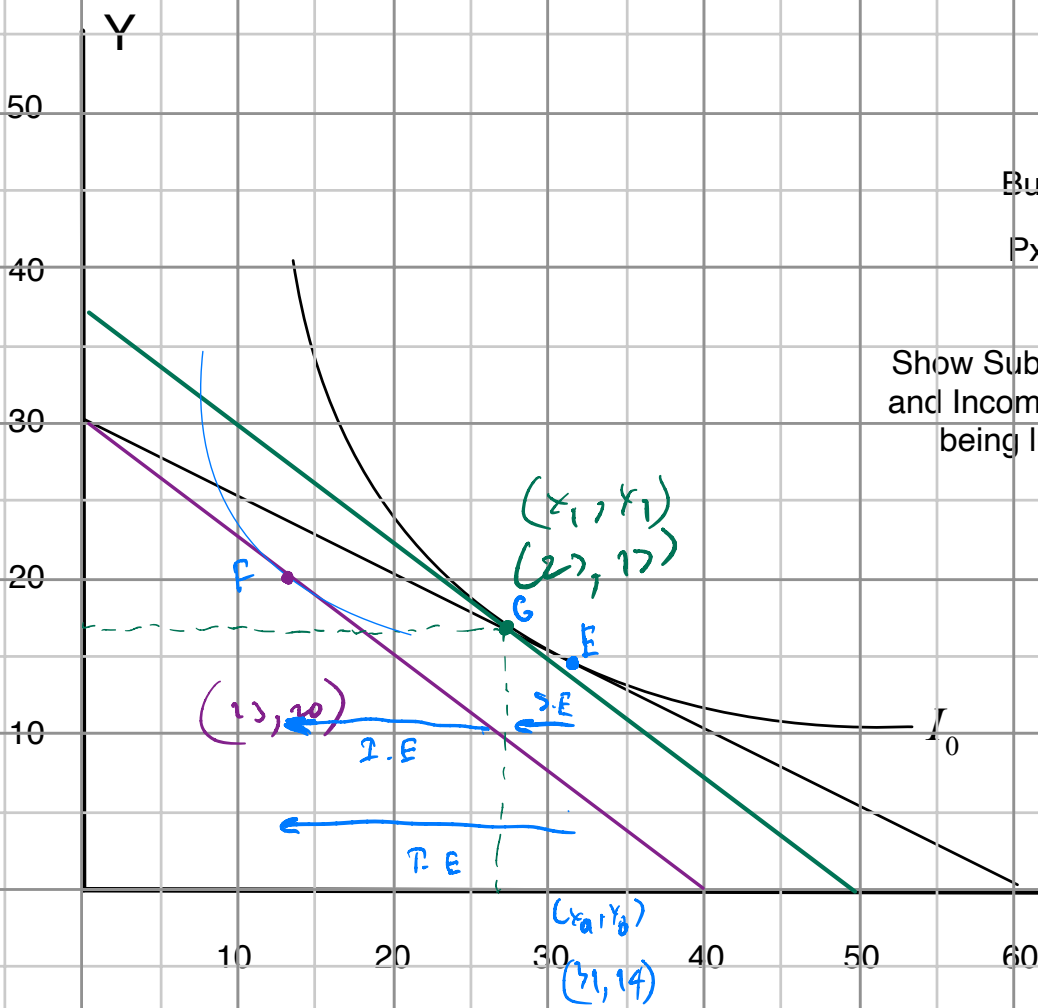


$(x_2, y_2)$   $(x_1, y_1)$   $(x_0, y_0)$   
 $(23, 24)$   $(27, 18)$   $(31, 15)$

$$2x + 3y = 120$$

$$3y = 120 - 2x$$

$$y = 40 - \frac{2}{3}x$$



$(x_1, y_1)$   $(27, 17)$

$(13, 20)$

$(x_0, y_0)$   $(31, 14)$

$$1.) \underline{\text{old}} \quad xP_x + yP_y = B$$

$$2x + 4y = 120$$

$$4y = -2x + 120$$

$$y = -\frac{1}{2}x + 30$$

$$\underline{\text{new}} \quad xP_x + yP_y = B$$

$$2x + 3y = 120$$

$$3y = -2x + 120$$

$$y = -\frac{2}{3}x + 40$$

$$y \text{ int } (x=0) = 40$$

$$x \text{ int } (y=0) = 60$$

### Step by Step

- Equilibrium change from E to F,  $p_y$  decrease  $\Rightarrow$  consume less  $x$  and more  $y \Rightarrow x$  and  $y$  are substitute products.
- relative price (slope) changes from  $-\frac{1}{2}$  to  $-\frac{2}{3}$
- so we draw imaginary budget line on same IC

$$S.E. = \begin{cases} \Delta x = x_1 - x_0 = 27 - 31 = -4 < 0 \\ \Delta y = y_1 - y_0 = 18 - 15 = 3 > 0 \end{cases}$$

- move new imaginary budget line up, draw new IC

$$I.E. = \begin{cases} \Delta x = x_2 - x_1 = 23 - 27 = -4 < 0 \\ \Delta y = y_2 - y_1 = 24 - 18 = 6 > 0 \end{cases}$$

} more real income

$\Rightarrow$  consume less  $x$ , more  $y$

$\Rightarrow x$  is inferior,  $y$  is luxury

- Total Effect = S.E. + I.E.

$$T.E. = \Delta x = x_2 - x_0 = 23 - 31 = -8$$

$$\Delta y = y_2 - y_0 = 24 - 15 = 9$$

$$2.) \quad \underline{\text{old}} \quad x P_x + y P_y = B$$

$$2x + 4y = 120$$

$$4y = -2x + 120$$

$$y = -\frac{1}{2}x + 30$$

$$\underline{\text{new}} \quad x P_x + y P_y = B$$

$$3x + 4y = 120$$

$$4y = -3x + 120$$

$$y = -\frac{3x}{4} + 30$$

$$y^{\text{int}} = 30$$

$$x^{\text{int}} = 40$$

Step by step.

- Equilibrium change from E to F,  $p_x$  increase  $\Rightarrow$  consume less  $x$  and more  $y \Rightarrow x$  and  $y$  are substitute product.
- relative price (slope) changes from  $-\frac{1}{2}$  to  $-\frac{3}{4}$
- so we draw imaginary budget line on same IC

$$\text{S.E.} = \begin{cases} \Delta x = x_1 - x_0 = 27 - 31 = -4 < 0 \\ \Delta y = y_1 - y_0 = 17 - 14 = 3 > 0 \end{cases}$$

- move new imaginary budget line down, draw new IC
- $$\text{I.E.} = \begin{cases} \Delta x = x_2 - x_1 = 13 - 27 = -14 < 0 \\ \Delta y = y_2 - y_1 = 20 - 17 = 3 > 0 \end{cases}$$
- } less real income  
 $\Rightarrow$  consume less  $x$ , more  $y$   
 $\Rightarrow x$  is luxury  
 $y$  is inferior.

- Total Effect = S.E. + I.E.

$$\text{T.E.} = \Delta x = x_2 - x_0 = 13 - 31 = -18$$

$$\Delta y = y_2 - y_0 = 20 - 14 = 6$$