Conflict and Growth

People can be producers or predaters.

Predaters steal from producers

Producers allocate their resources between production & protection (defense)

Producers have 1 unit of resources

They devote f to protection

They produce $1-f$

A fraction L of $1-f$ is taken away by predaters

$L(f, R)$

R - number of predaters / number of people

$L(f, 0) = 0 \quad L_f \leq 0 \quad L_R \geq 0$

$L_{ff} \geq 0 \quad L_{fR} \leq 0$

Producers get $-\left[1 - L(f,R)\right](1-f)$

Predators get $-(1-R)(1-f)L(f,R)/R$

* Assume this is decreasing in R for fixed f.

$$\max_f \left[1 - L(f,R)\right](1-f)$$

$$-\left[1 - L(f,R)\right] - (1-f)L_f(f,R) = 0$$

How does this depend on R?

$$L_f \frac{df}{dR} + L_R - (1-f)\left(L_{ff}\frac{df}{dR} + L_{fR}\right)$$

$$+ L_f \frac{df}{dR} = 0$$

$$\frac{df}{dR} = \frac{L_R - (1-f)L_{fR}}{(1-f)L_{ff} - 2L_f} \geq 0$$

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$f(R)$ with $f'(R) \geq 0$

To be a producer or a predator?

At equilibrium

Producers income

$$[1 - L(f(R), R)][1 - f(R)] =$$

$$\frac{1-R}{R}[1 - f(R)]L(f(R), R)$$

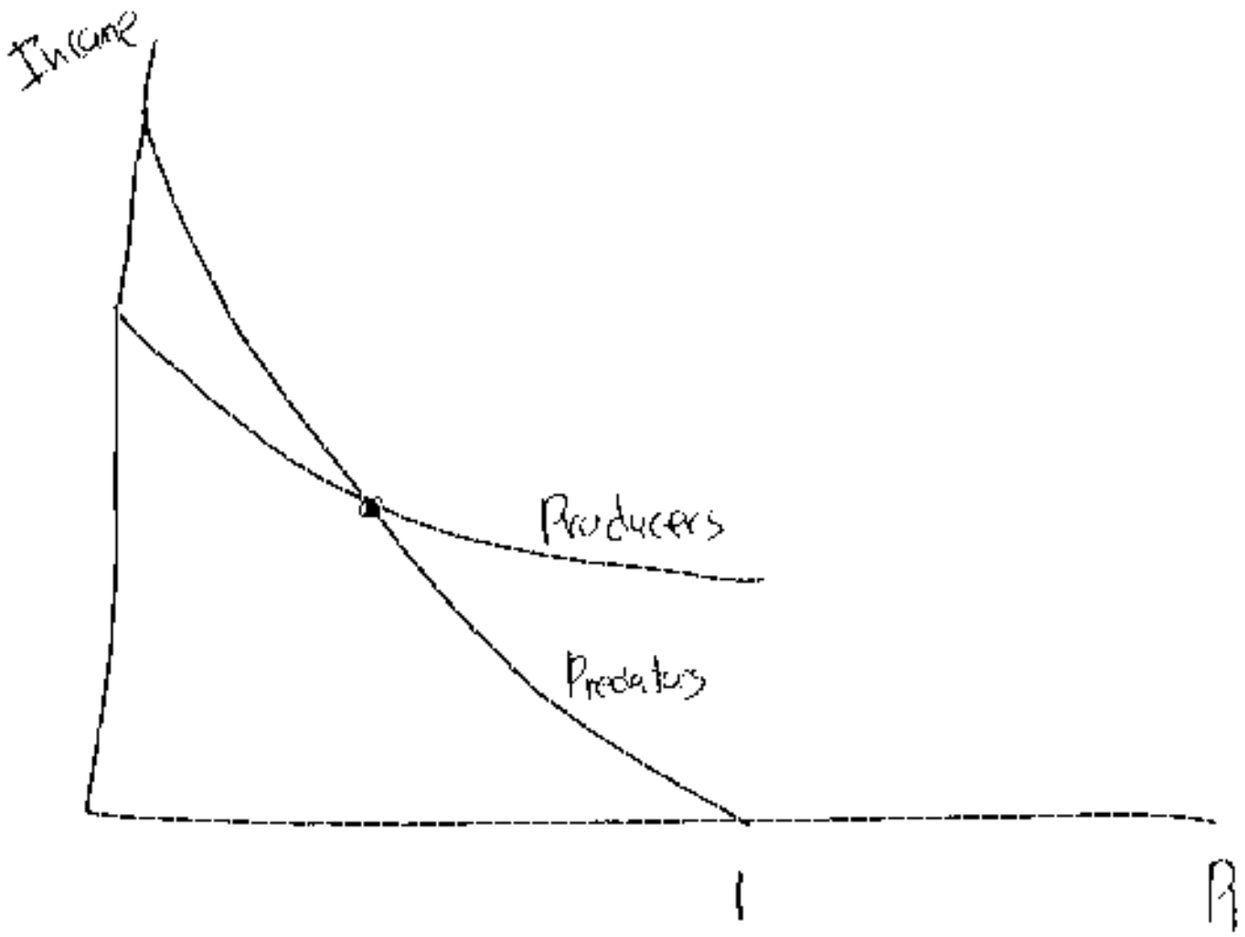
Predators Income

→ Decreasing in R from $L_R \geq 0$ & the envelope theorem

→ Decreasing in R, by assumption for fixed f & even more so with varying f

$R = 1$ $\Rightarrow$ predator income $= 0$ (no producers)

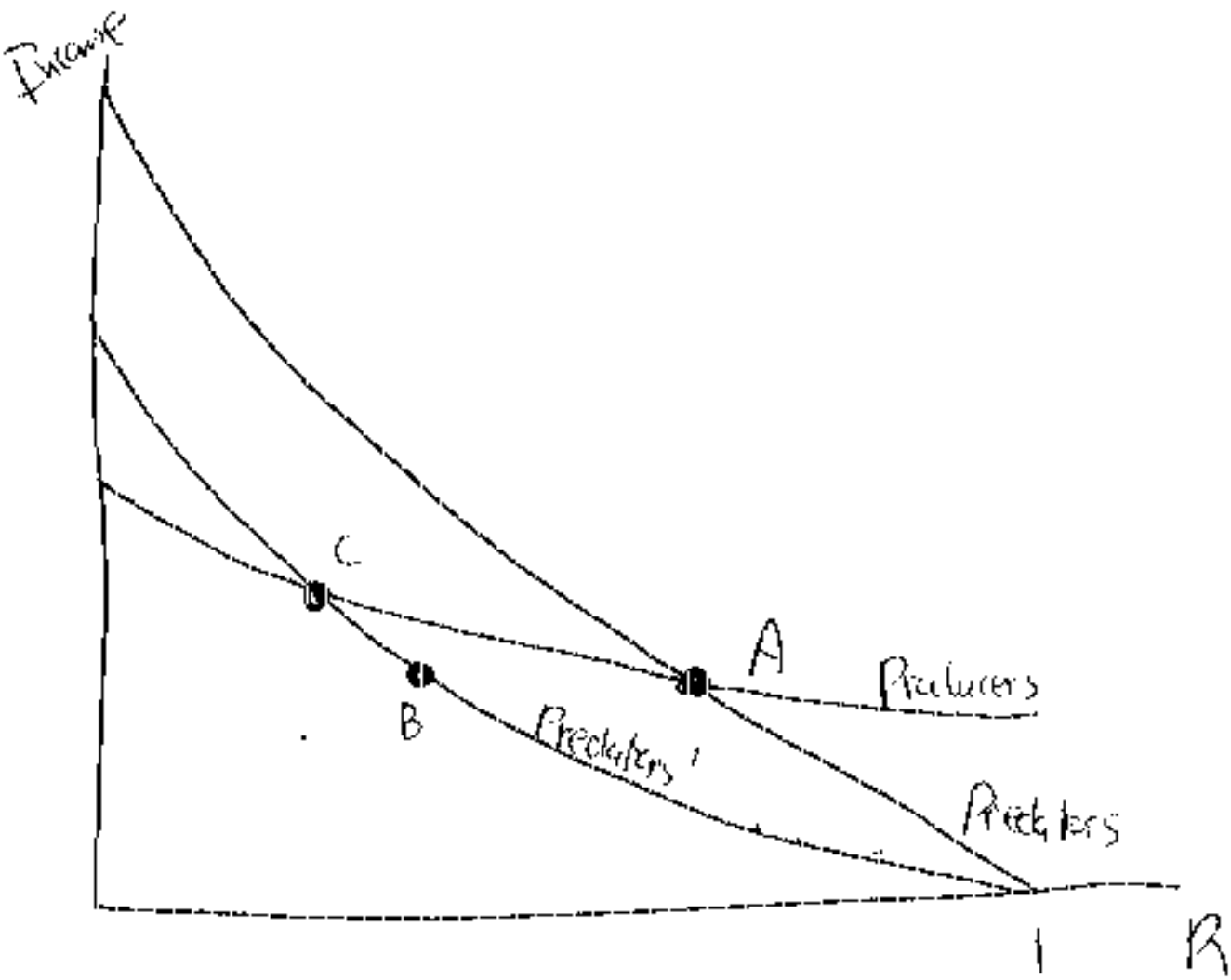
$R = 0$ - income of the marginal predator very high



This is just one case. They could cross multiple times.

Output is below potential because:

1) Not everyone produces
2) Producers spend money on defense



Fall in technology of predation ⇒ fewer predators.

Predator incomes are equal at A & B but producer incomes are higher so the number of predators falls further