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Profits, rents and resource rents

North American Association of Fisheries Economists
Biannual Conference, 2017

La Paz, Mexico
March 22-24, 2017

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Why consider rents?

- Much employed in natural resource economics
  - Land rents, mining rents, fisheries rents, location rents etc
- Often loosely employed
  - Typically no definition offered
  - Often used as synonymous with profits
  - Tenuous relationship with the theoretical (classical and neoclassical) concept

My claim

1. Rents can be precisely and usefully defined

2. Rents ≠ profits [The classical & neo-classical view]
   - Rents are greater <u>or</u> less than profits

3. Rents in resource use are <u>not</u> resource rents!
   - In the sense that the resource generates (is the source of) the rents

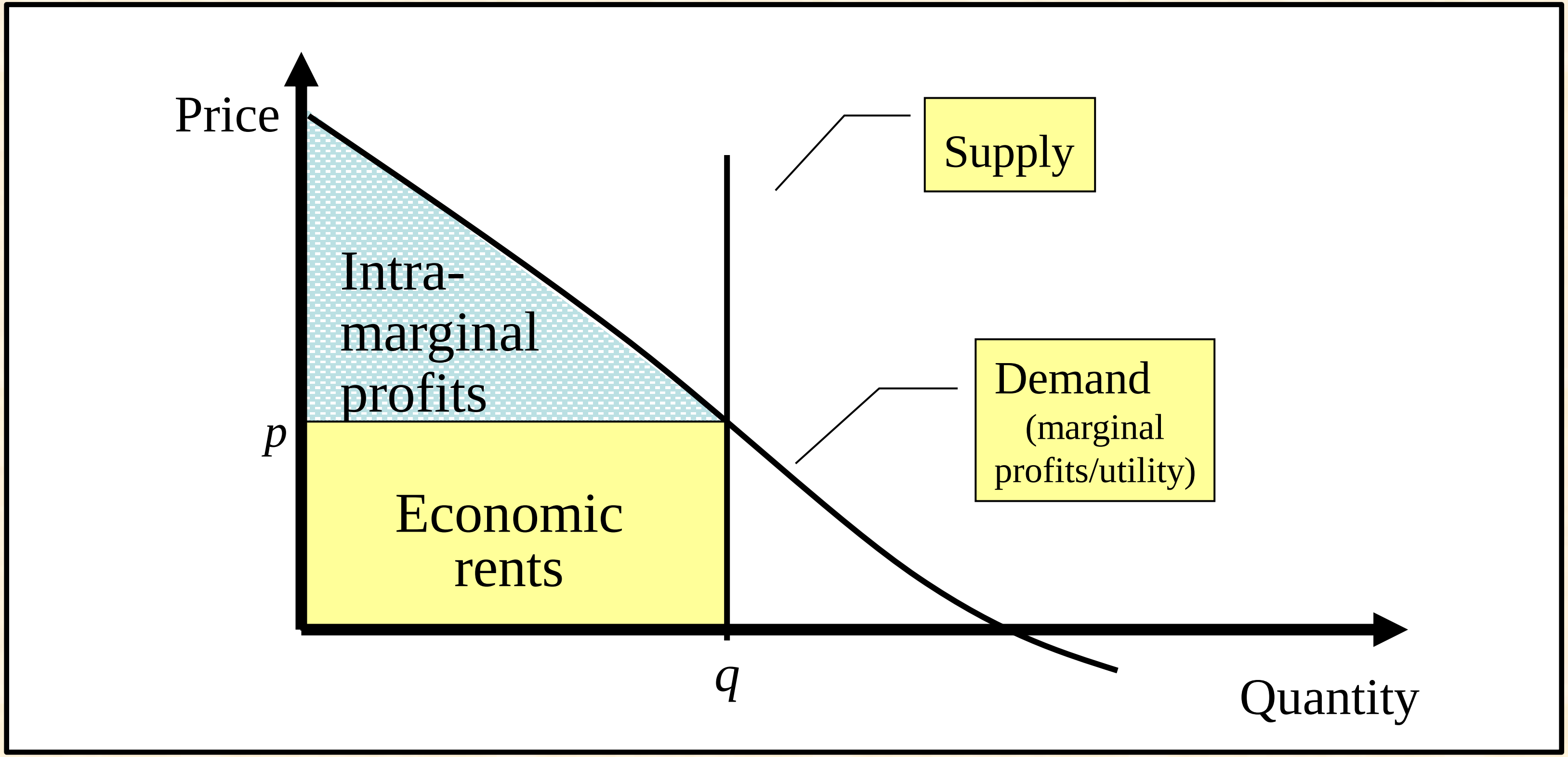
Modern Definition of Economic Rents

Alchien (New Palgrave 1987)

Economic rents are
"payments to a factor in fixed supply"

Neo-classical mainstream (e.g. Marshall and others)

Illustration (Alchian 1987)



A closer look

- Fixed supply is not convincing
  - Especially not in the long run
  - Definitely not for natural resources, ..even in the short run.
- What is analytically crucial is:
  - Limited (not fixed) supply (at a point of time)
  - Supply price above marginal cost
- It doesn't matter how or why supply is limited!
- A "factor" is an unnecessary restriction

Economic rents: Generalized definition

Economic rents are
"payments to a variable above
the marginal cost of supplying it"

Generalization:

1. Factor → variable (either input or output)
2. Fixed supply → payment above marginal cost of supply

Note 1. Includes Alchian´s definition as a special case
Note 2. Fits with Dasgupta & Heal's (1979) & Hanley et al.'s (1997) definitions
Note 3 Includes rents in resource use, monopoly rents and other types of rents

Useful expressions

Profits: $\Pi(q) = D(q)\cdot q - C(q)$

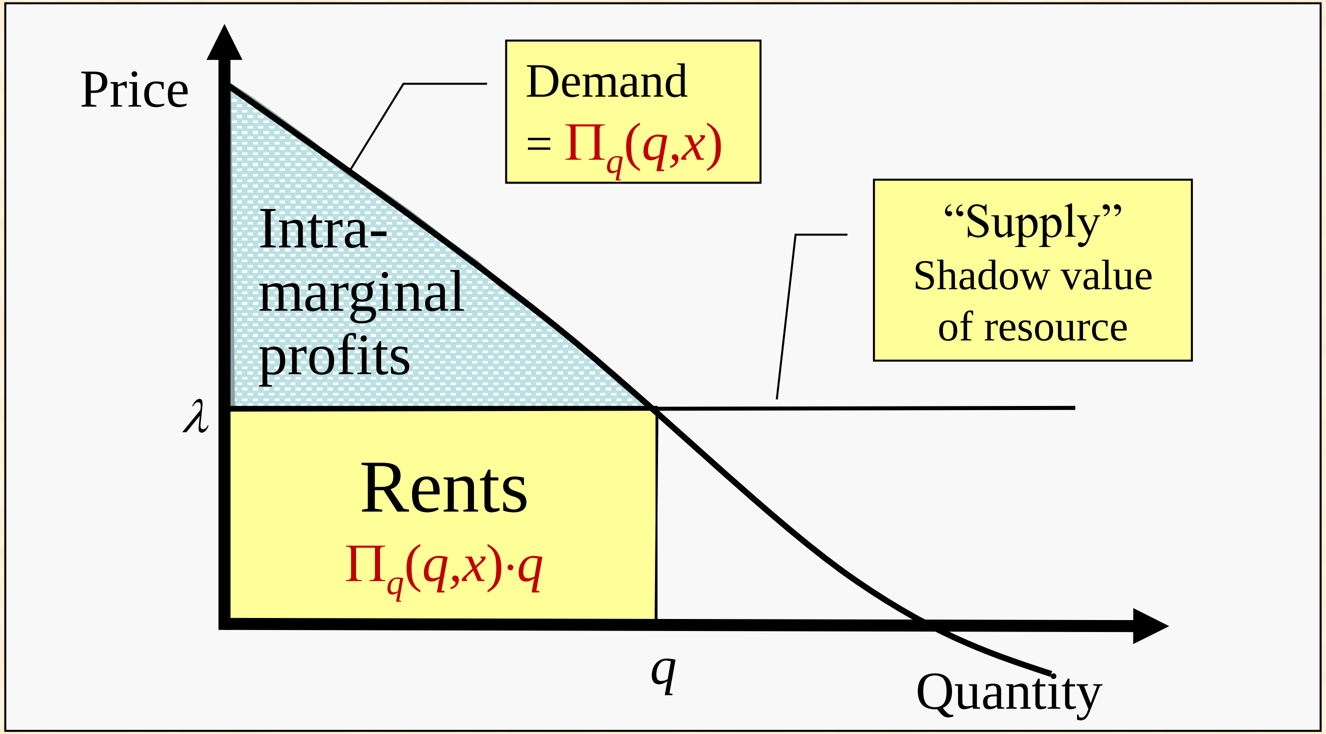
Rents: $R(q)=\Pi_q(q)\cdot q = (D_q(q)\cdot q + D(q) - C_q(q))\cdot q$

Rents in production : $R(q) = \Pi_q(q)\cdot q$

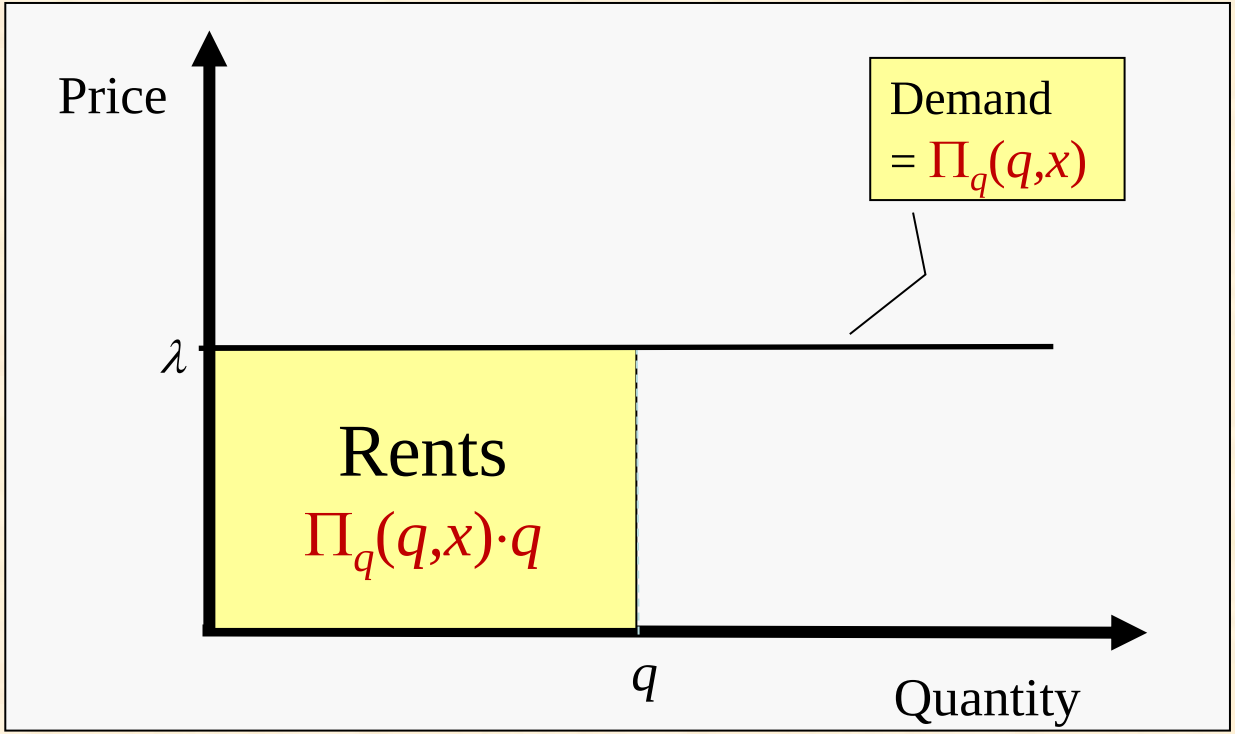
Rents in consumption: $R(q) \propto (U_q(q)-p)\cdot q$

Rents in natural resource use

Benefit (profit) function: $\Pi(q,x)$

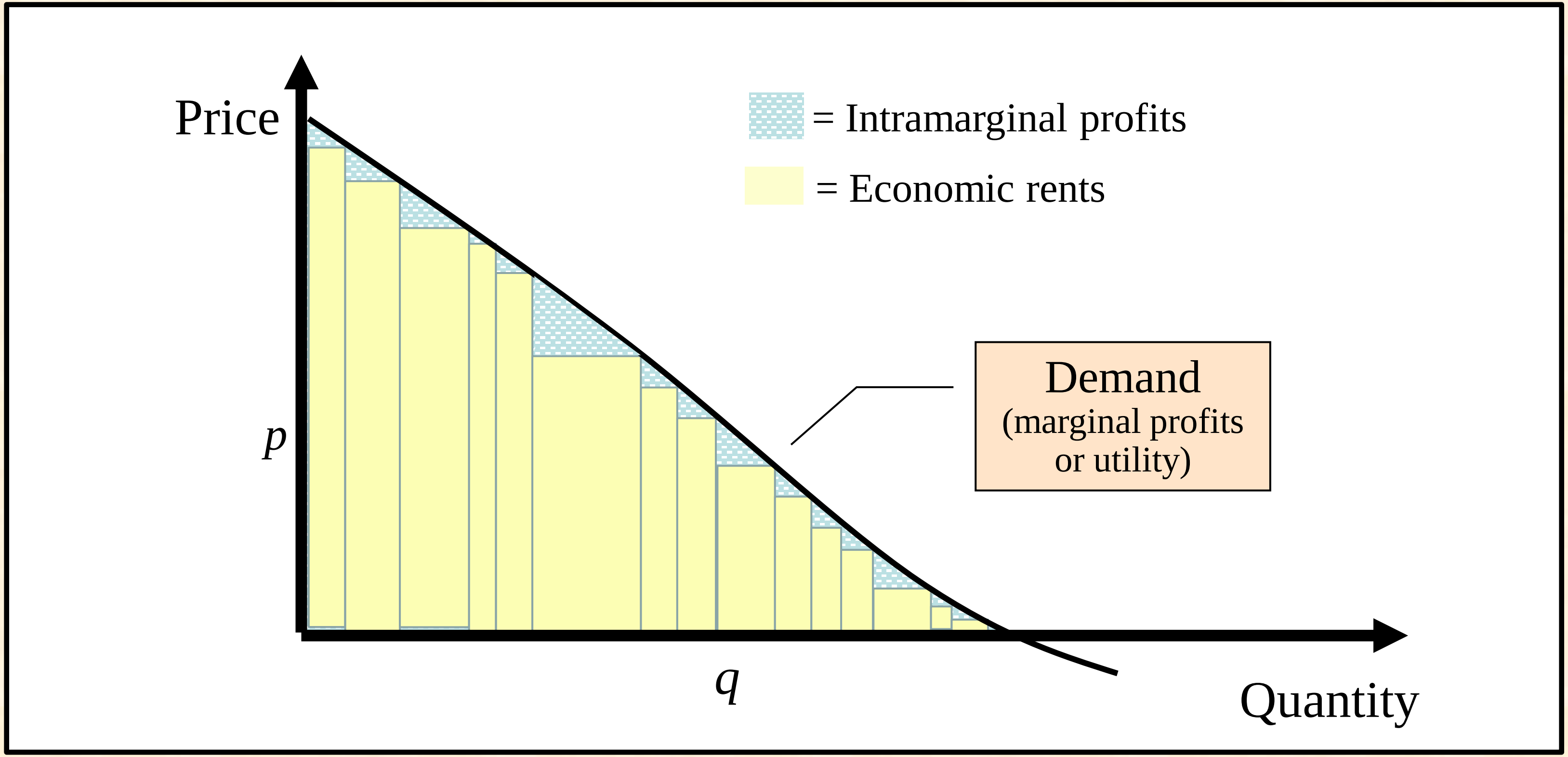


If linear profit function



Many heterogeneous units

(E.g. land rents)



Calculating rents in natural resource use

Rents: Formal expression

$$R(q,x) = \Pi_q(q,x) \cdot q = \lambda \cdot q$$

So, to calculate rents only need to know:

(1) Level of resource extraction (use), q

(2) Marginal profits at this level of extraction

Rents and Profits

Exact Taylor expansion of profit function:

$$\Pi(q) = \Pi(0) + \Pi_q(q) \cdot q - \Pi_{qq}(q)$$

$\Rightarrow$ No determinate quantitative relationship!

Relationship between profits and rents		
	Profit function	
Fixed costs	Linear, $\Pi_{qq} = 0$	Strictly concave, $\Pi_{qq} < 0$
Positive ($\Pi(0) < 0$)	$\Pi(q) < \Pi_q(q) \cdot q$	?
Zero ($\Pi(0) = 0$)	$\Pi(q) = \Pi_q(q) \cdot q$	$\Pi(q) > \Pi_q(q) \cdot q$

Rents and resource rents

- Rents: $R(q,x) = \Pi_q(q,x)\cdot q = \lambda\cdot q$
- Profits depend on many variables
  - Prices, technology, management, enterprise, transaction costs, infrastructure, organization and resources

$\Rightarrow$ $\Pi_q(q,x)\cdot q \rightarrow \Pi_q(q,x,\mathbf{z})\cdot q$, $\mathbf{z}$ long vector

$\Rightarrow$ Cannot attribute profits to just one of these variables.

$\Rightarrow$ Meaningless (even misleading) to do so

END

Historical background

- Physiocrats (18th century). Only true net product
- Smith (1776). Rents ≠ profits; unproduced profits
- Malthus (1814, ´15). Corn laws
- Ricardo (1817). Theory of land rents

Common thread

- A component of profits.
- Profits without production [⇒ unearned (Henry George)]
- Price at which the “good” could be rented out

Historical background (…cont.)

Major role in classical economics

Ricardo-Mill-Marx: Increasing land rents $\Rightarrow$ falling profits

Schumpeter:

Classical economics hopelessly confused about rents

Neo-classical (marginal) economics clarified the concept

The concept of rents

- Initiated by A. Smith (1776) – [rents ≠ profits]
  - An occasional component of profits, stemming from specially advantageous positions
  - Little or nothing to do with enterprise or initiative
- Further developed by Ricardo (1817) – [land rents]
- Important role in classical economics (Ricardo-Mill-Marx; [increasing land rents ⇒ falling profits in manufacture]

Historical roots

- Physiocrats (18th century). Only true net product
- Smith (1776). Rents≠profits, rents⊆profits.
- Malthus (1814,’15). Corn laws
- Ricardo (1817). Theory of land rents

Common thread

Component of profits. Profits without production => unearned (Henry George)

Major role in classical economics

Ricardo-Mill-Marx: Increasing land rents=> falling profits

Natural Resource Rents
Some useful results

(1) Theory independent of management!

(not just optimal extraction)

(2) Natural resource rents generally depend on

(i) extraction rates

(ii) stock levels

(iii) other variables (prices, technology, expectations etc.

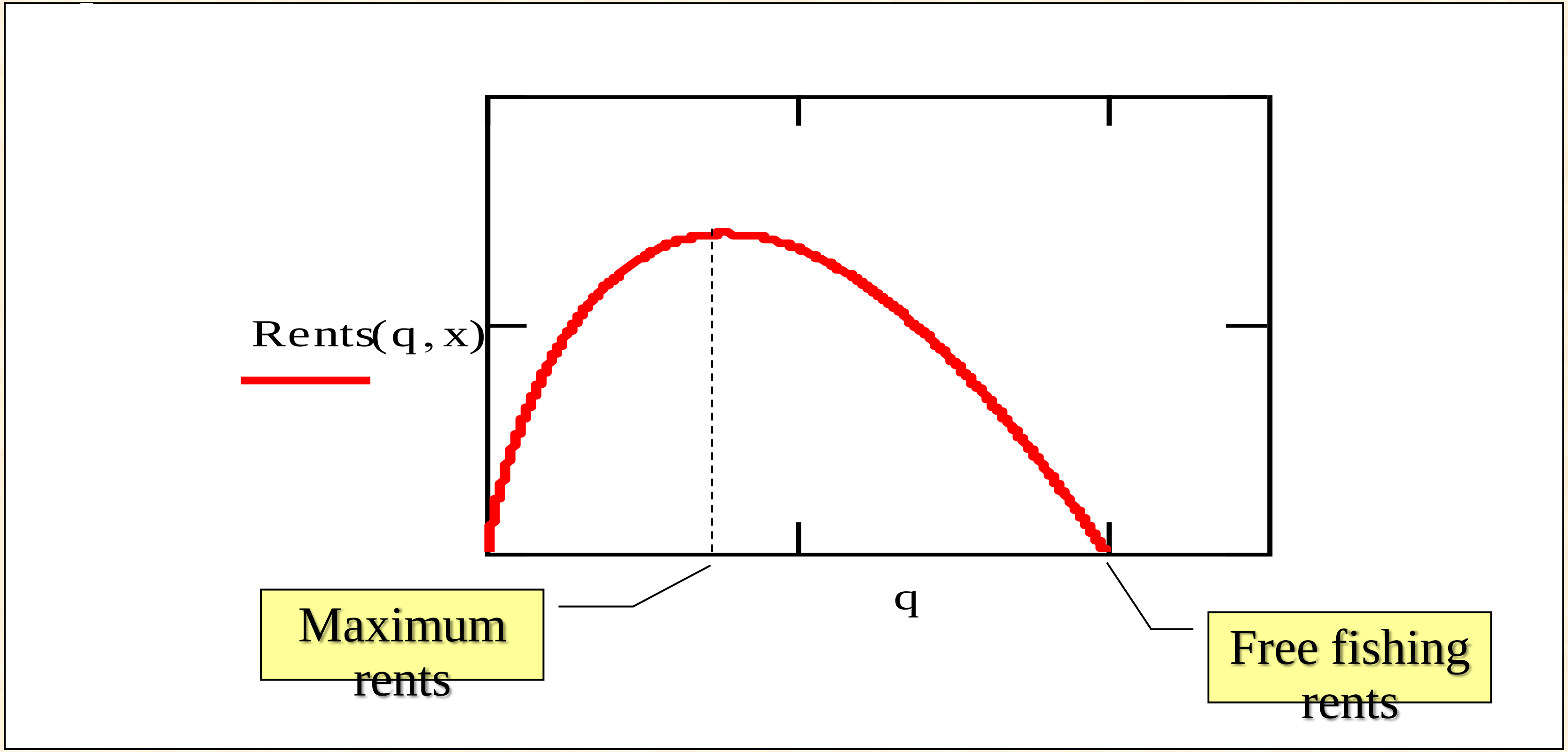
(3) If extraction is profitable $\Rightarrow$ maximum rents>0

Shape of Fisheries Rents Function

- Rents increase with extraction if elasticity of demand ($E(p,q)$) is sufficiently high (> -1)
- Rents are maximized where $E(p,q)$= -1
- Rents increase in biomass iff $\Pi_{qx}>0$

Fisheries Rents Function: An Example

$(\Pi(q,x) = p \cdot q - c \cdot q^b / x)$



Natural Resource Rents

Model

Profit function: $\Pi(q,x)$

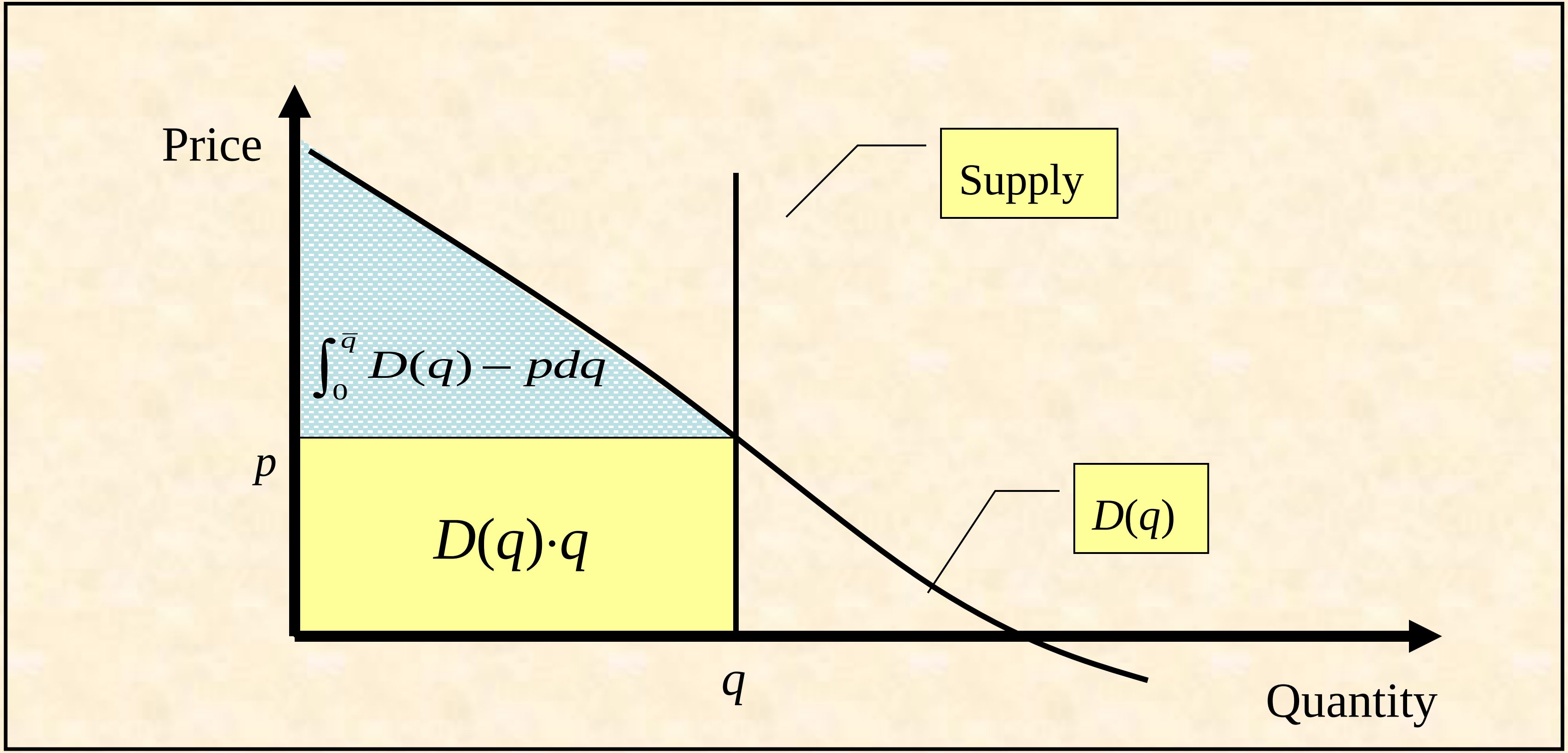
Resource evolution: $\dot{x} = G(x) - q$

$\Rightarrow$ Demand (optimal): $\Pi_q(q,x) = \lambda$

Supply (optimal): $\dot{\lambda} - r \cdot \lambda = -\Pi_x - \lambda \cdot G_x$

$\dot{x} = G(x) - q$

Economic rents



Useful Relationships

Inverse demand: $p = D(q)$

If production : $D(q) = MP(q) \equiv \Pi_q(q)$

If consumption: $D(q) \propto MU(q) \equiv U_q(q)$

$\Rightarrow$ Rents: $R(q) = D(q) \cdot q$

If production : $R(q) = \Pi_q(q) \cdot q$

If consumption: $R(q) \propto U_q(q) \cdot q$

An Example
Global Fisheries Rents Loss

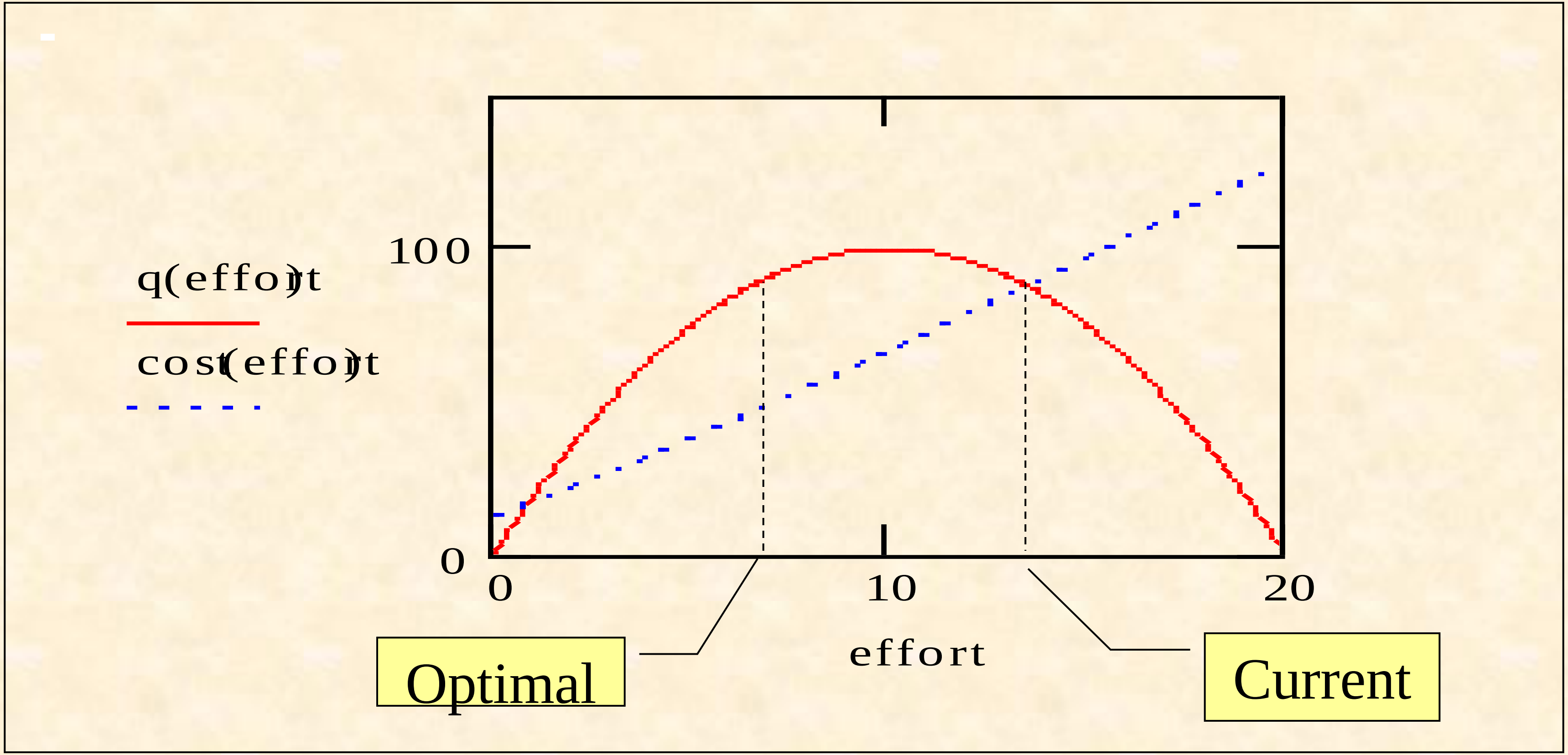
Model

Harvesting function: $Y(e,x)=\varepsilon \cdot e \cdot x$

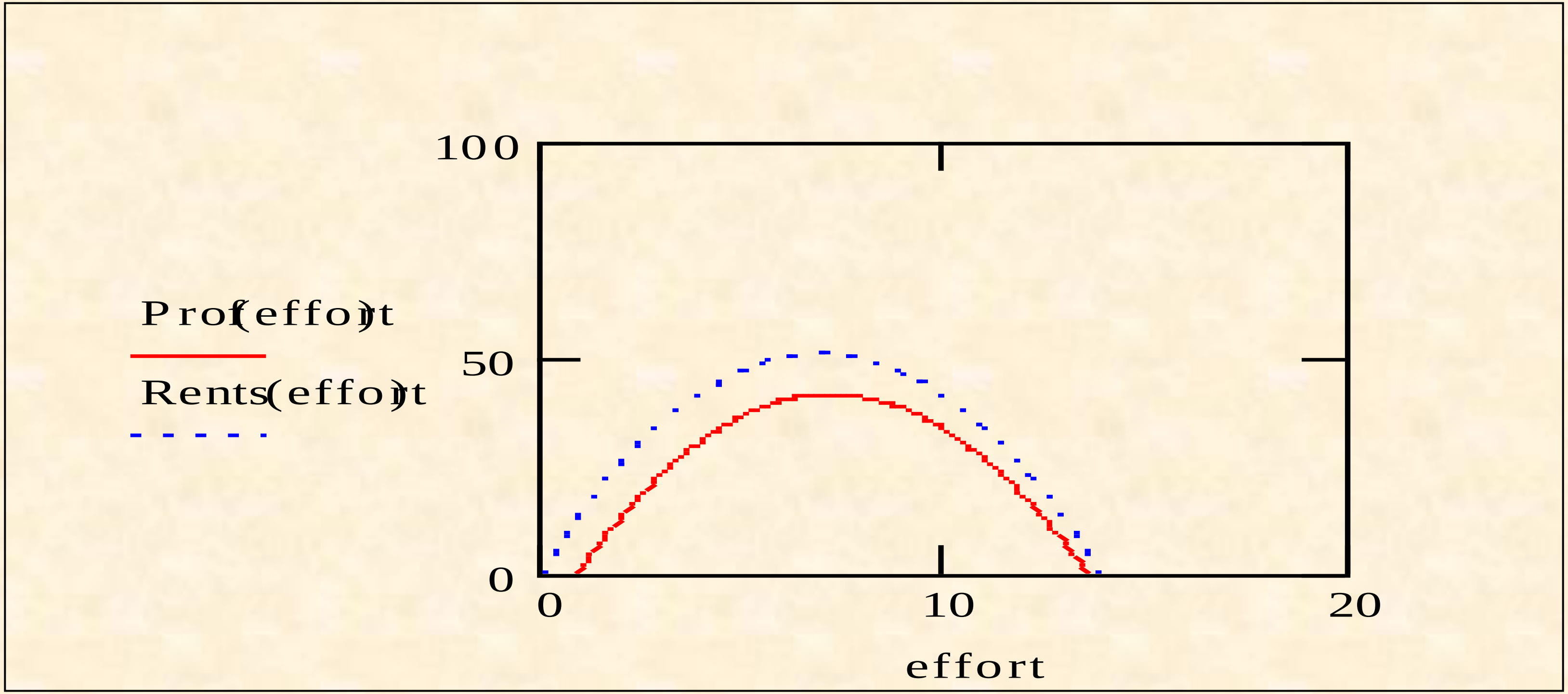
Resource evolution: $\dot{x} = a \cdot x - b \cdot x^2 - \varepsilon \cdot e \cdot x$

Harvesting costs: $C(e)=c \cdot e^f + fk$

Global fishery: Illustration



Global Fishery:
Rents and Profit Functions



Global Fisheries Rents Loss

Sustainable global fishery: Current and profit maximizing outcomes			
	Current	Profit maximization	Difference (optimal –current)
Fishing effort	13.9 m. GRT	7.3 m. GRT	-6.6 m. GRT
Harvest	85 m. mt	93 m. mt.	+8 m. mt.
Biomass	123 m. mt	254 m. mt.	+131 m.mt.
Profits	-5.3 b. USD	41.6. b.USD	46.9 b.USD
Rents	0 b. USD	50.8 b. USD	50.8 b. USD

Global fishery: Stylized description

Stylized description of the global ocean fishery		
A1	Maximum sustainable yield (MSY)	100 million metric tonnes/year
A2	Maximum biomass (utilized species)	400 million metric tonnes
A3	Current catch per unit effort (cpue)	6.0 metric tonnes/GRT
A4	Average landings price per metric tonne, *p*	1 USD/kg
A5	Elasticity of variable costs, *f*	1.1
A6	The global fishery is currently:	Close to sustainability
A7	Current competitive profits (excl. subsidies)	-5 b. USD/year
A8	Global fishery	Close to economic equilibrium
A9	Global fish harvest is currently	85 m. metric tonnes

Global fishery: Implied model parameters

Model parameters		
Parameters	**Values**	**Units**
a	1.0	Time^{-1}
b	0.0025	$(\text{Metric tonnes}\cdot\text{time})^{-1}$
ε	0.05	GRT^{-1}
p	1	USD/kg.
c	4.3	USD/GRT
f	1.1	No units
fk	13	Billion USD/year