Fishery Management Council Member Training

Economic Analysis of Regulatory Actions

Michael Travis
Office of Sustainable Fisheries
Silver Spring, MD
Mike.Travis@noaa.gov

Overview

- Central Questions:

  What are the economic effects and impacts of each management alternative?

  What are the distributional effects (i.e., who wins / who loses)?
- Mandates
  - Focus on mandates that “shape” analyses
- Two Types of Models
  - Cost-Benefit (Net benefits) vs. Input-Output (Economic Impacts)
- Apply to Current Management Issue
  - Allocation

Primary Purpose of Economic Analyses

- What are the economic effects/impacts of proposed management alternatives on fishing businesses, individual fishermen, and other affected entities (input suppliers, dealers, processors, communities)?
- Who is affected, how, and by how much?
- Provides opportunity to **systematically and objectively** assess the economic consequences of management alternatives
- PROVIDES OPPORTUNITY FOR FISHERY PARTICIPANTS TO HAVE THE REGULATORY PROCESS FOCUS ON THEM

KEY MANDATES

- MSA

301 – National Standards

303(a)(9) - Fishery Impact Statement

303(a)(13) - Fishery Description

303(a)(14) – Allocate rebuilding restrictions and benefits

303(b)(6) – Limited Access Systems

- E.O. 12866: Regulatory Impact Review (RIR): maximize net benefits
- Regulatory Flexibility Act (RFA) and E.O. 13272 : “small” entities (e.g., businesses) / “substantial” economic impact
- NEPA (direct vs indirect effects, cumulative effects)
- ESA (designation of critical habitat)

E.O. 12866

- Regulate only when market failure requires it
- Consider <u>all</u> benefits and costs broadly defined (quantitative and qualitative), accounting for:
  - Economic, Environmental, Health, and Safety
  - Distribution
  - Equity
- Choose alternative that maximizes <u>net</u> benefits, unless a statute requires otherwise (e.g., ESA). May be “no action” alternative (status quo).
- Determine whether action is significant based on 4 criteria. Economically significant when annual effect on economy > $100 million. OMB review.

Regulatory Flexibility Act

- Purpose is to encourage agencies to fit regulatory requirements to the scale of entities **subject to regulation** (i.e., **directly regulated**).
- Will action have **significant** economic effect on a **substantial** number of small entities (e.g., businesses)?
  - **"Small"** is defined by SBA (recent changes)
  - **Significance** based on **effects on profitability** and magnitude of **disproportional effects on small vs large entities**
  - **Substantial** number is relative to the universe of entities in the "fishery" (subjective).
  - If yes, seek alternatives to minimize burden on small
  - No requirement to choose any particular alternative

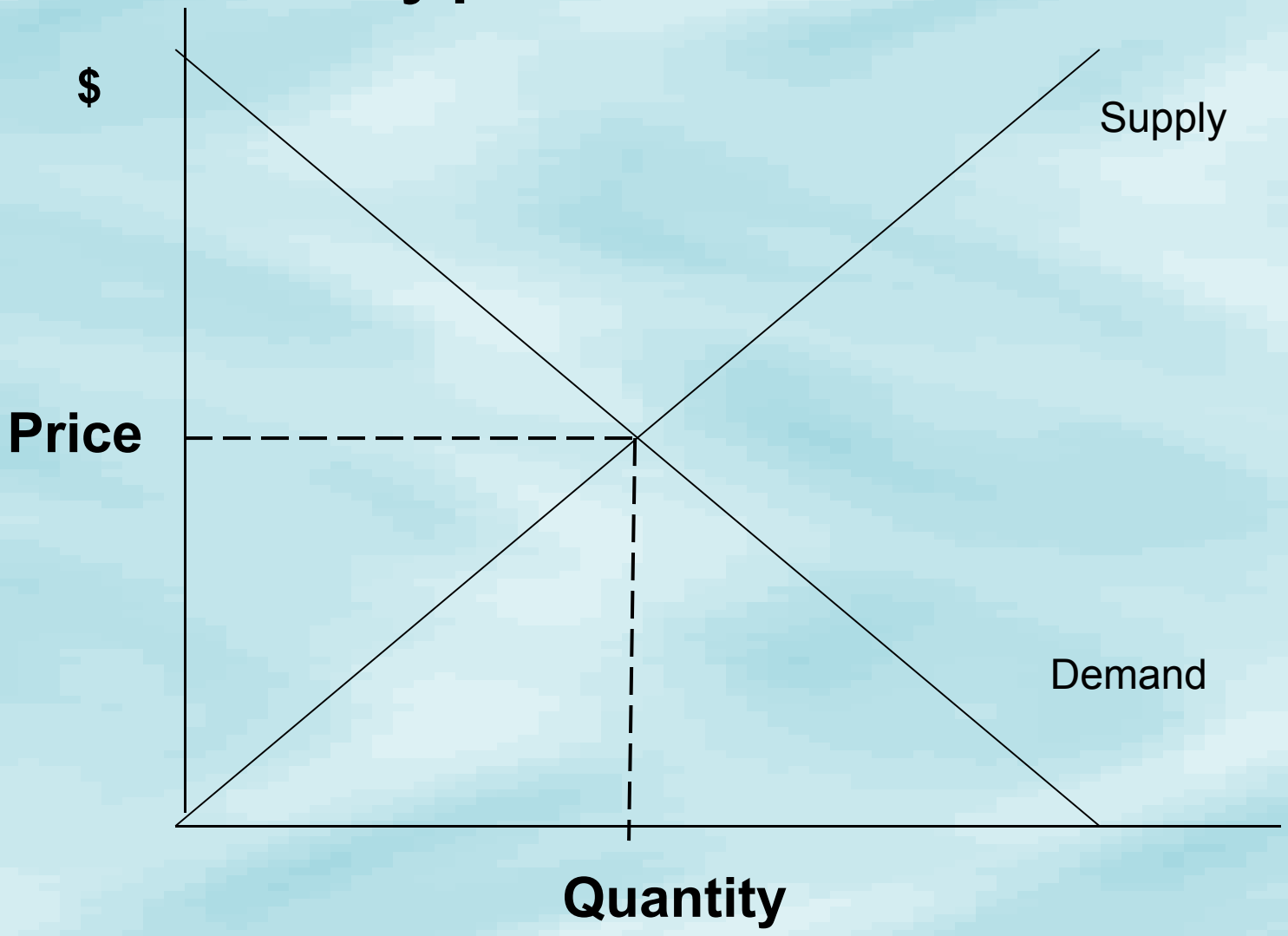
NEPA

- Broad requirements for economic analyses;
- Two important analytical requirements regarding Affected Human Environment:
  -“Indirect” vs “Direct” Effects
  -Cumulative Effects
    -account for cumulative effects of other known or reasonably foreseeable regulations (federal, state) in conjunction with proposed regulation.
- Important effect has been on structure of “integrated” documents/analysis (MSA/NEPA/RIR/RFA)

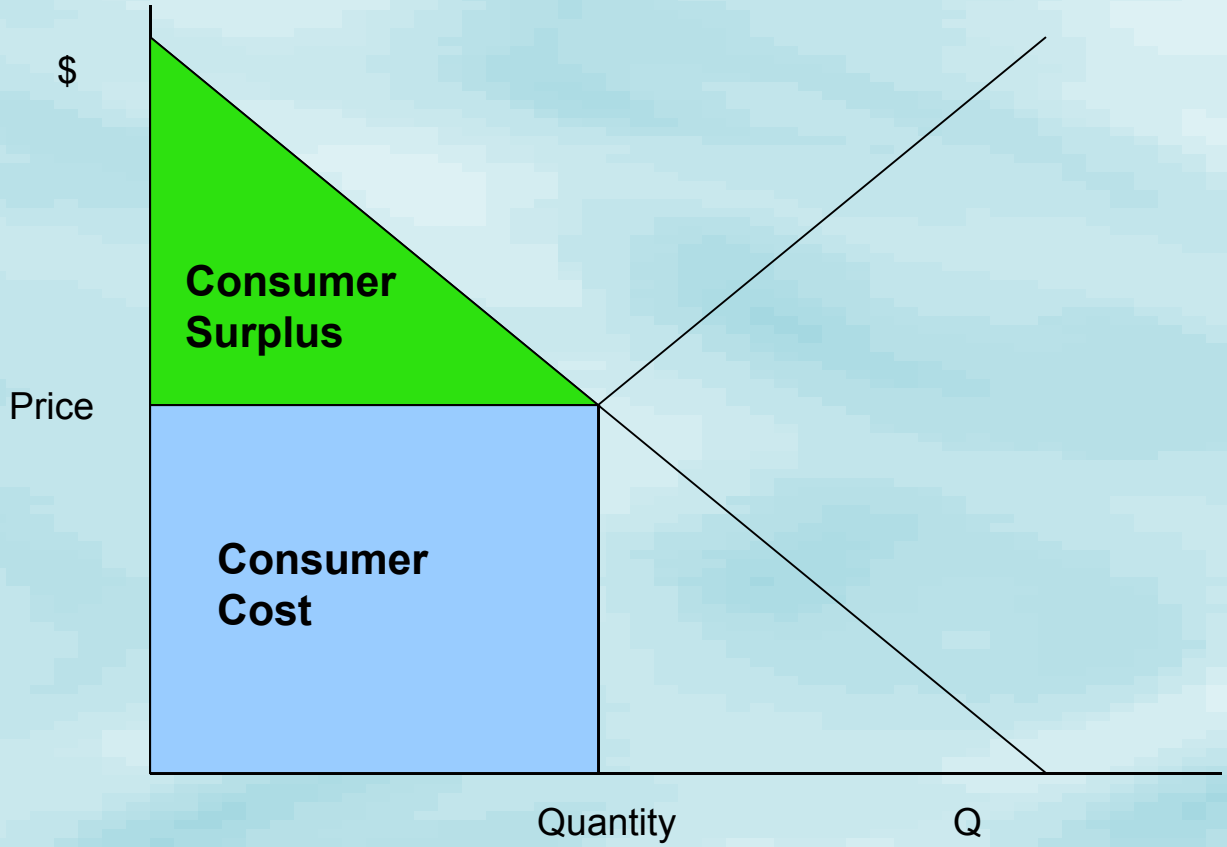
Economic Value

- Economic costs and benefits
- Two primary components:
  - Consumer surplus is the difference between the price actually paid for a good or service and what the consumer would have been willing and able to pay.
  - Producer surplus (economic profit) is the difference between the total cost of producing a good or service and total revenue.
  - Total cost includes <u>all</u> opportunity costs, including explicit costs (direct monetary payments for inputs not owned by producer, e.g., fuel) and implicit costs (costs of inputs owned by producer, e.g., owner operator's time, "normal" profit).

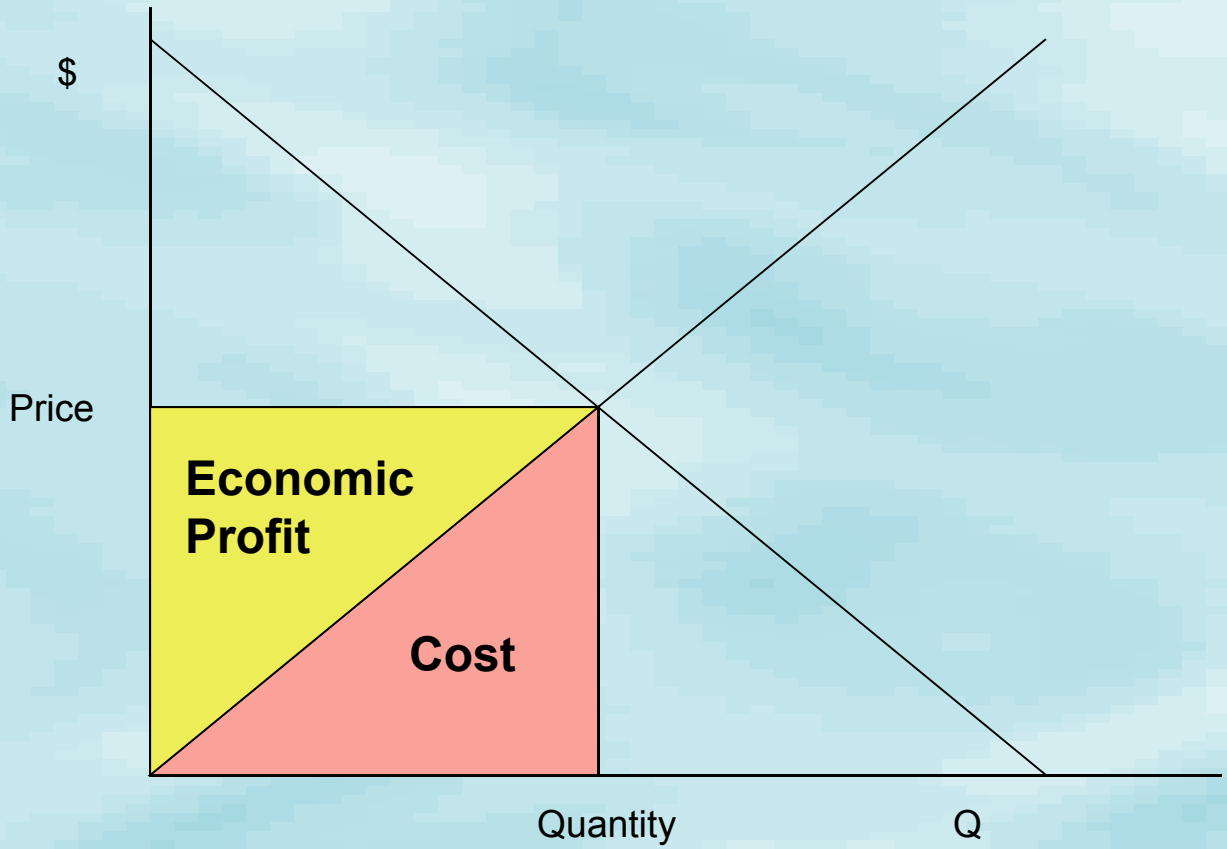
A Hypothetical Market



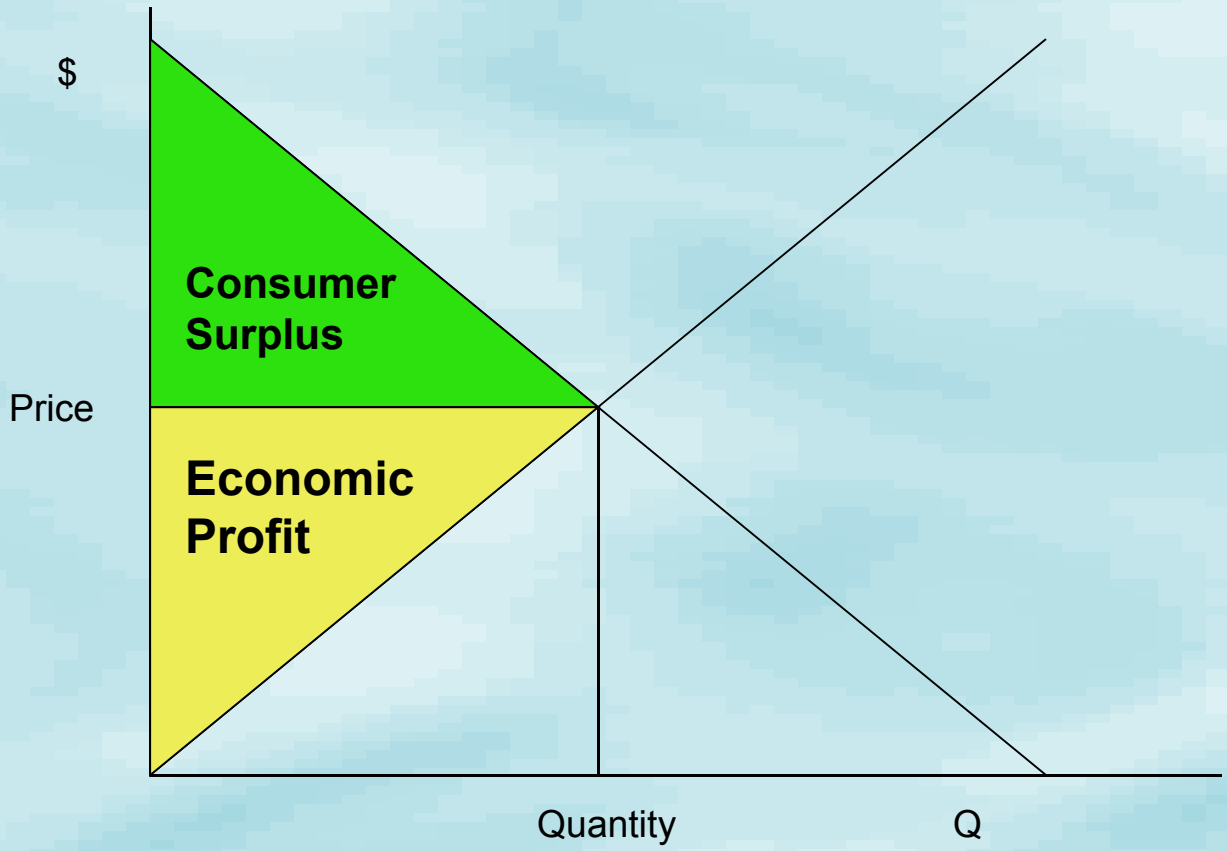
Consumer Surplus: Basis for Analysis of Anglers and Seafood Consumers



Producer Surplus: Basis for Harvester Analyses



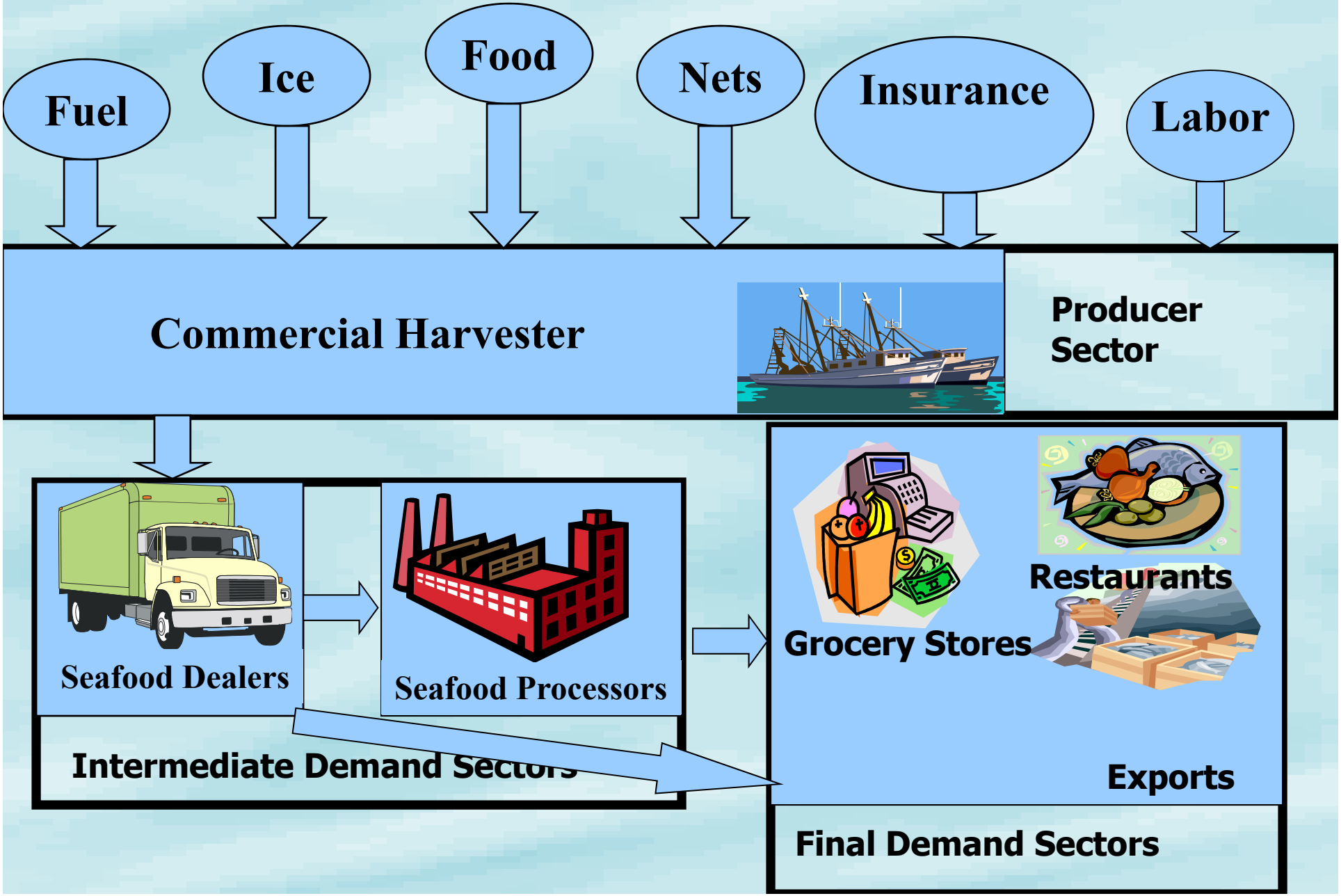
Economic Value / Net Economic Benefits



Uses of Economic Impact Models (aka Input/Output Models) in Fishery Management

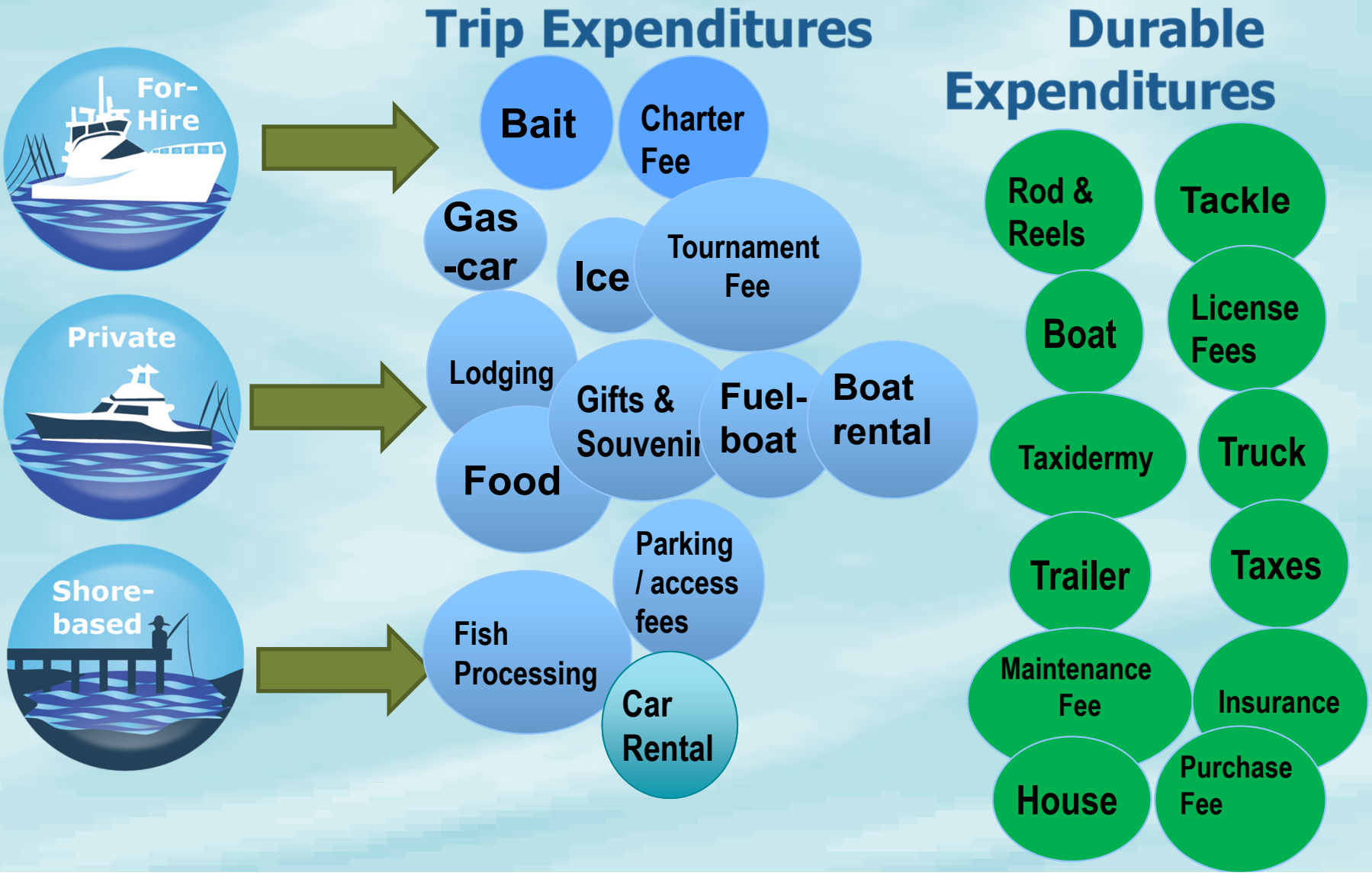
- Estimate impacts on sales, income, and jobs of different alternatives
- Inform managers of how these impacts are distributed
  - Across different regions, states, and (possibly) communities
  - Sectors of the regional economy
- I/O models capture inter-industry transactions between businesses and between businesses and final consumers in an economy

Commercial Fisheries Model



Recreational Fisheries Model

Angler expenditures generate economic activity



Economic Impact and Economic Value: An Example

- Sector A
  - $20 million in TR
  - $21 million in TC
  - $1 million econ loss
  - $200 million in sales
  - $100 million in income
  - 2500 jobs
- Sector B
  - $15 million in TR
  - $10 million in TC
  - $5 million in econ profit
  - $150 million in sales
  - $75 million in income
  - 1750 jobs

In the example above, Sector B generates the greatest economic value (net economic benefit). Sector A generates the greatest economic impacts.

Another Example: Recreational Anglers

- Private boat sector
  - Spends $25 million on trips
  - Willing to pay $50 million for those trips
  - CS is $25 million
- Shoreside sector
  - Spends $5 million on trips
  - Willing to pay $25 million for those trips
  - CS is $20 million

In the example above, the Private boat Sector generates the greatest economic value (net economic benefit) as well as the greatest economic impacts.

Consequences

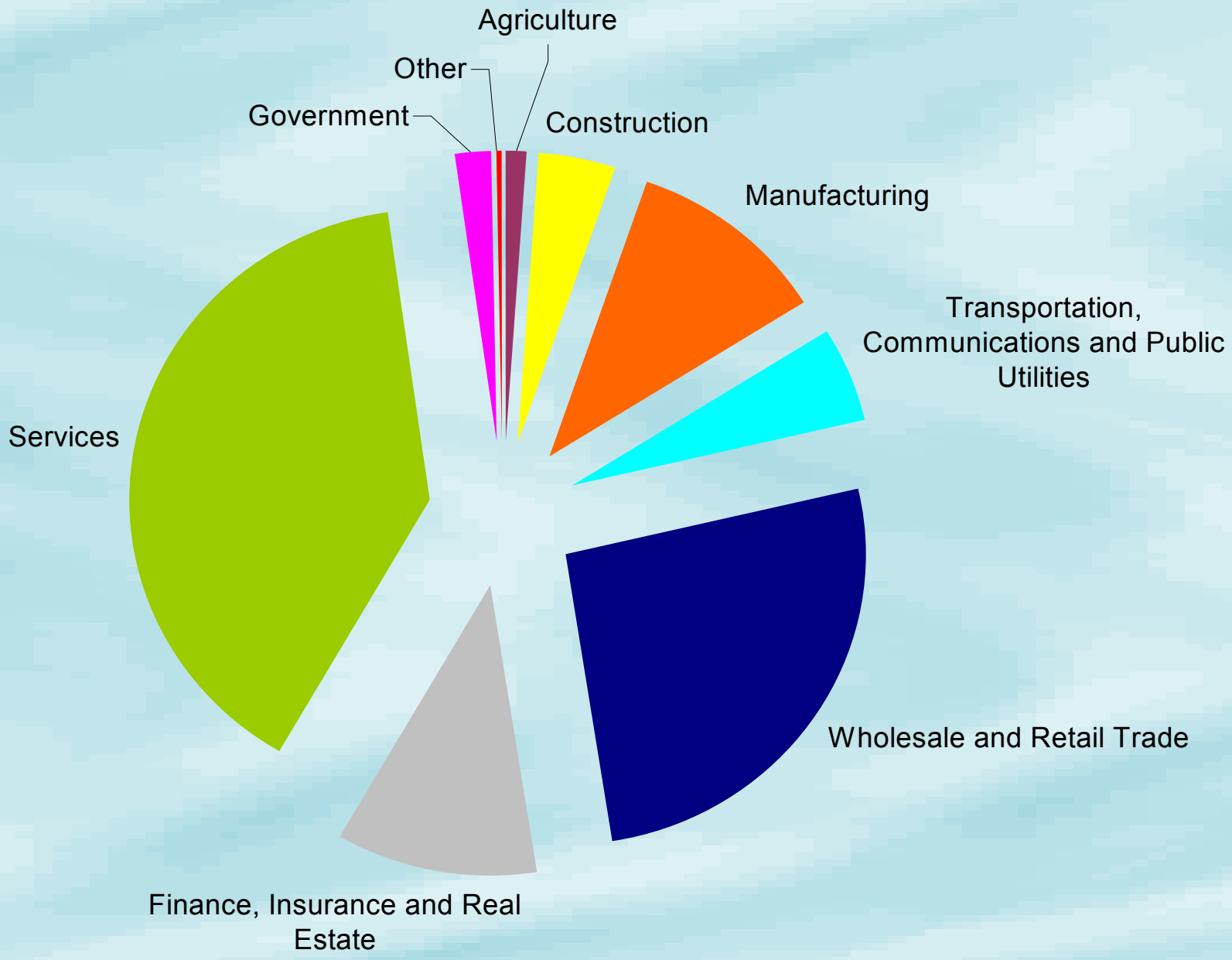
- Allocation based on economic impact rewards the highest spender or highest cost producer:

  the bigger the expenditure, the bigger the impact
- If economic efficiency is a policy goal (e.g., NS1, NS5, etc.), policy should seek to minimize the cost of providing goods and services to consumers and allocate resources to where they generate the greatest economic **value**.
- Primary use of I/O is to identify distributive effects.
- Economic Impacts should **NOT** be primary basis for allocation decisions; likely reward inefficient producers.
- Use I/O estimates with caution as they do not take behavioral adjustments to policy change into account (e.g., if you change quota allocation, fishing behavior will change and thus so will estimates of economic impacts).

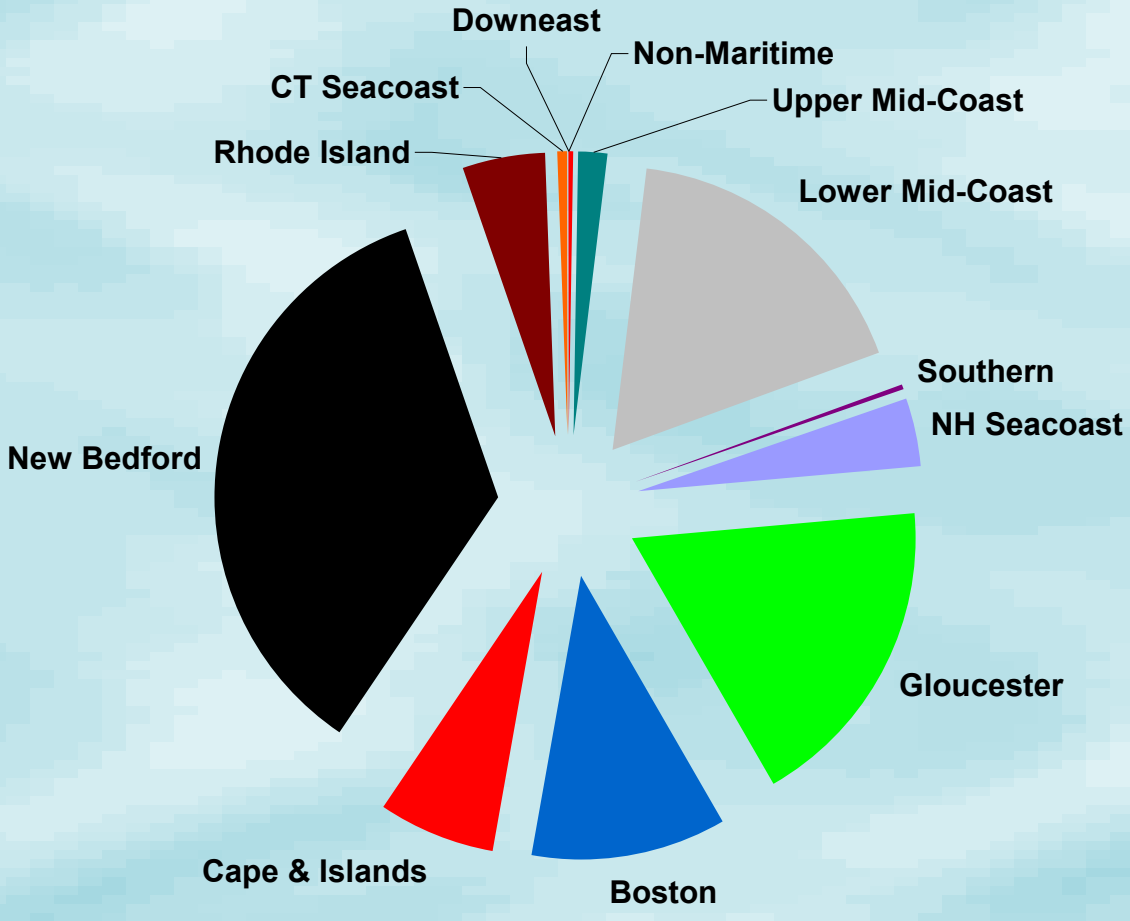
Example of Distribution of Income Impacts from a Reduction in Commercial Fishing Revenue

	Alternative 1	Alternative 3	Preferred
Commercial Fishing	-22,582	-29,537	-20,067
Processing	-5,267	-6,989	-4,673
Dealers	-9,097	-12,053	-8,056
Agriculture	-246	-326	-218
Construction	-1,019	-1,347	-901
Manufacturing	-1,677	-2,214	-1,481
Transportation	-3,598	-4,735	-3,161
Trade	-6,304	-8,340	-5,574
Finance	-2,614	-3,443	-2,319
Services	-9,542	-12,613	-8,439
Government	-463	-610	-409
Other	-75	-99	-66
Total	-62,488	-82,307	-55,367

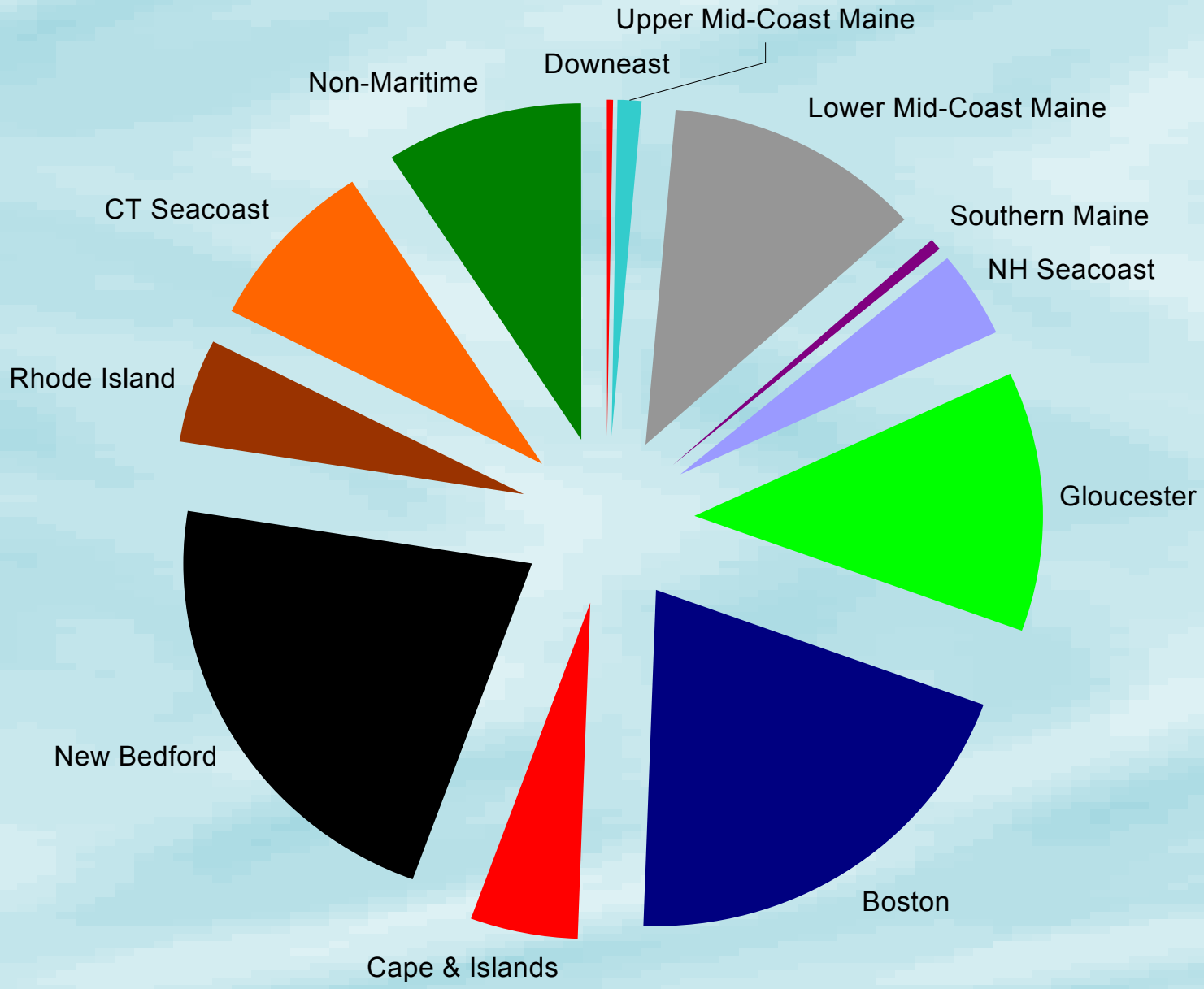
Economic Impact Model: Income impacts by Industry



Regional Distribution of Direct Income Impacts



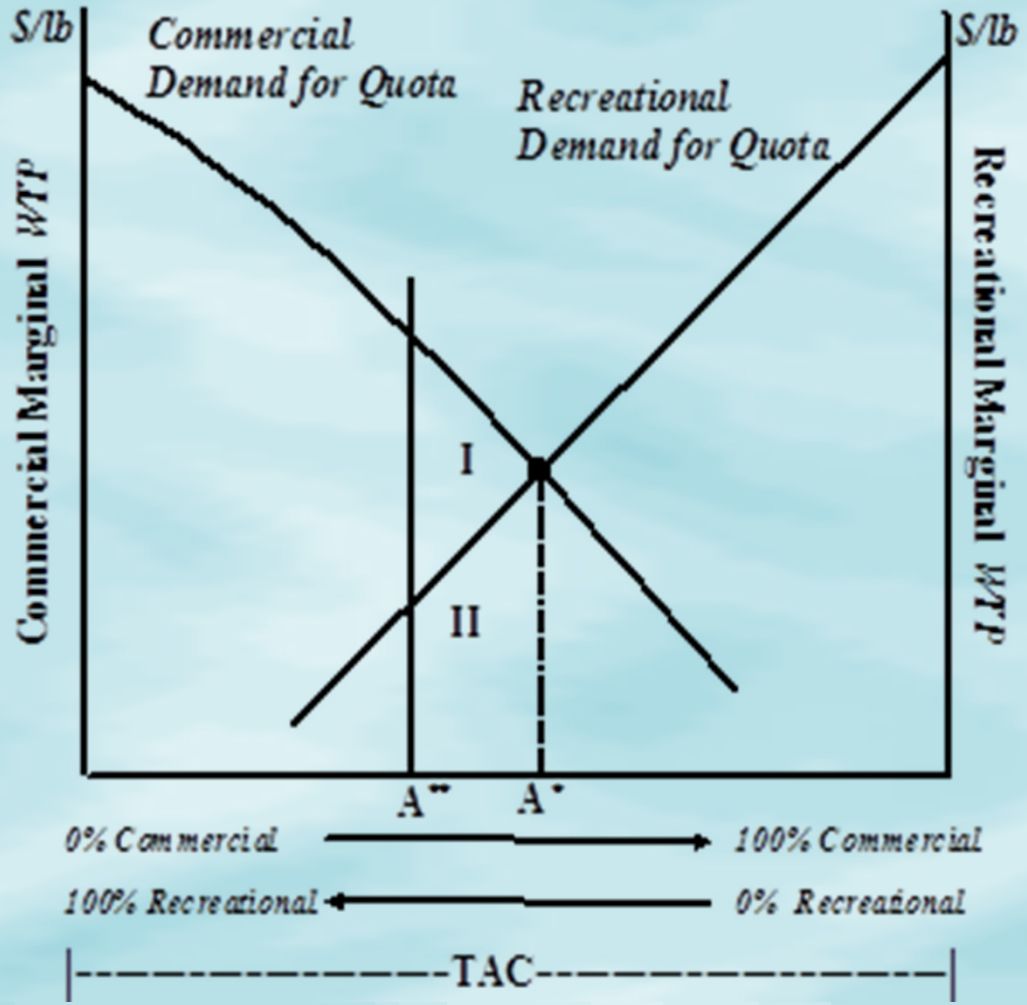
Economic Impact Model: All Income Impacts by Location



Net Economic Benefits and Reallocation of Quota/ACL

- Net economic benefits equal the change in consumer and producer surpluses due to new allocation of quota/ACL.
- If economic efficiency is the sole decision criterion for <u>how</u> to allocate (i.e., who gains/loses is irrelevant), then change allocation as long as gains in surpluses for one sector exceed reductions in surpluses for the other sector.
- Reallocate to sector with greater average marginal willingness to pay (MWTP) until MWTP is equal across sectors and net economic benefits are maximized (equimarginal principle).

Economically Efficient Allocation



Important Underlying Assumptions

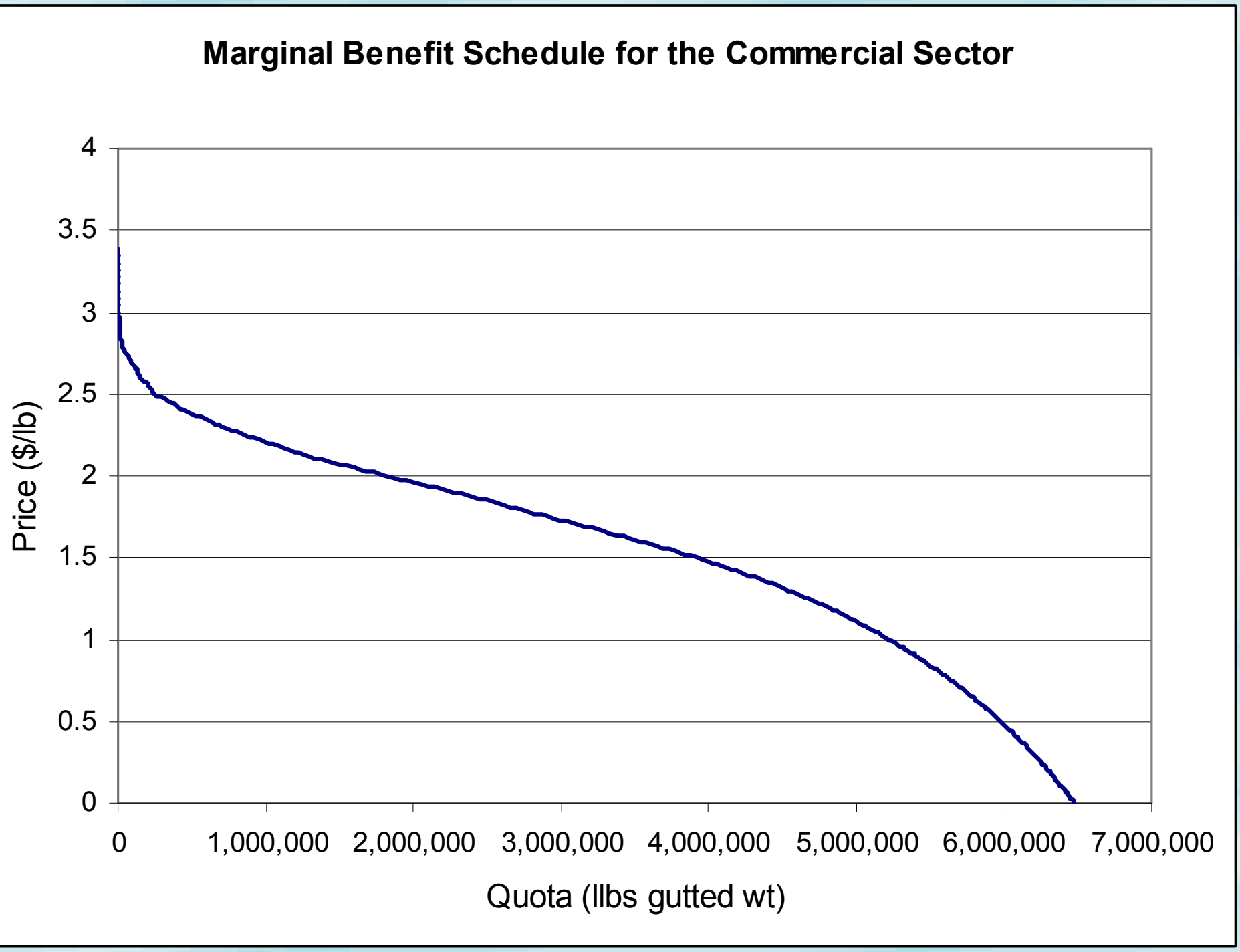
- Equimarginal principle assumes mechanisms (perfectly informed managers or markets) exist to allocate resource efficiently <u>within</u> each sector (i.e., those with greatest MWTP get the fish).
- If such mechanisms absent, resource is likely not efficiently allocated within each sector. Thus, applying the equimarginal principle across sectors will not lead to an economically efficient allocation in the fishery.
- For e.g., if sector is managed under regulated open access and demand for quota exceeds supply (derby conditions), efficient allocation within sector unlikely.
- Need for more research on <u>who will actually get the fish under different access conditions and their MWTP</u> (ongoing) and <u>focus on creating proper mechanisms</u>.

Example: Economic Allocation of Red Grouper in the Gulf of Mexico (Carter, Agar, Waters 2008)

- Red grouper an important species for commercial and recreational fishermen
- Historical catches unrestricted, resulting in equilibrium distribution between sectors
- Stock depletion resulted in lower quota
- Reallocation would redistribute the burden of stock recovery
- Estimates of gains and losses for <u>small</u> redistribution of quota for red grouper

Analysis of Commercial Sector

- MWTP equivalent to predictions of the annual lease price for quota under an IFQ system (analysis prior to Grouper-Tilefish IFQ program). Lease price approximates the expected economic profit on a per lb basis <u>to harvesting sector only</u>.
- Estimate demand for quota by calculating MWTP for a wide range of commercial quotas

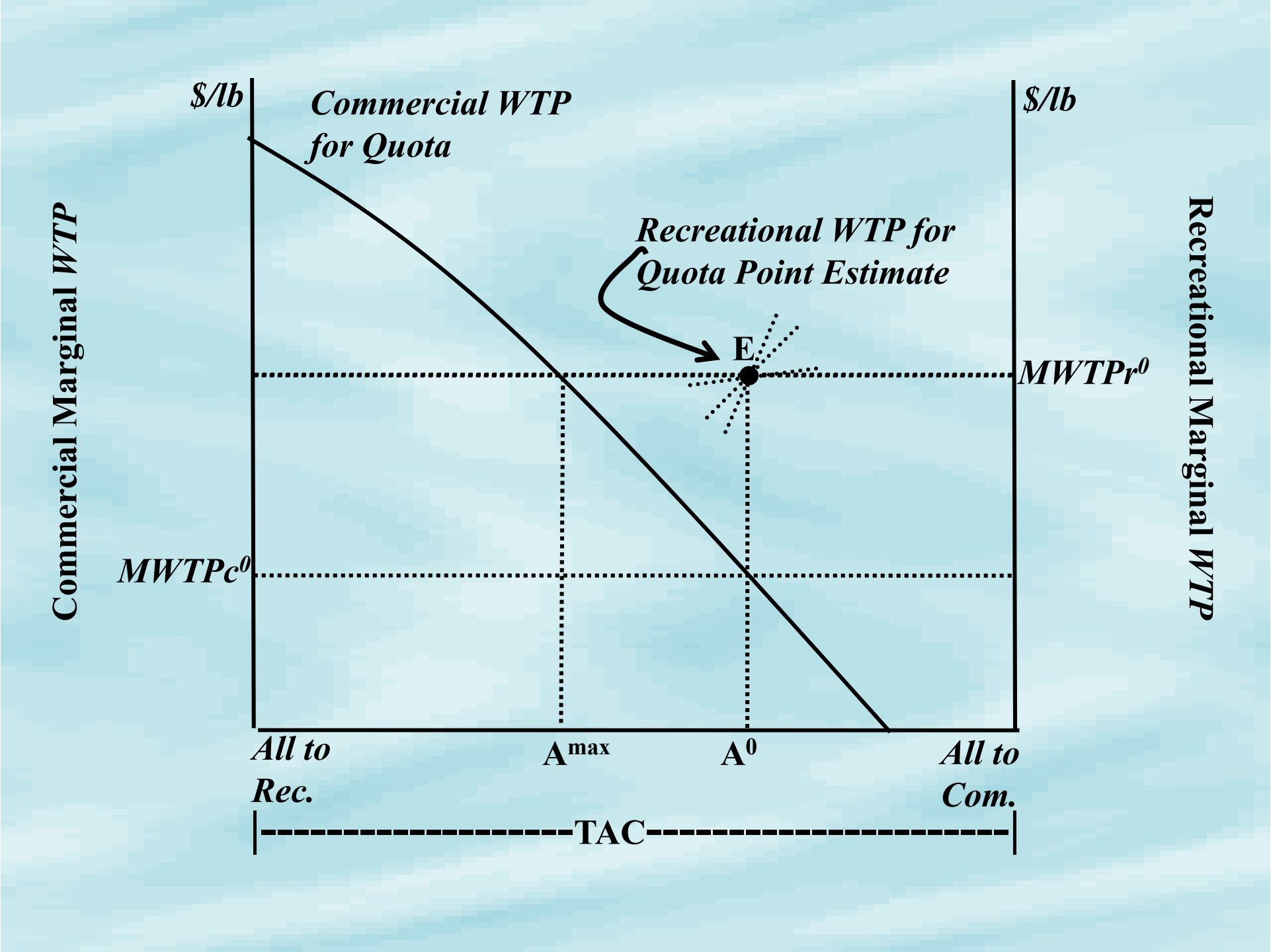

Marginal Benefit Schedule for the Commercial Sector
Price ($/lb)
4
3.5
3
2.5
2
1.5
1
0.5
0
0
1,000,000
2,000,000
3,000,000
4,000,000
5,000,000
6,000,000
7,000,000
Quota (llbs gutted wt)

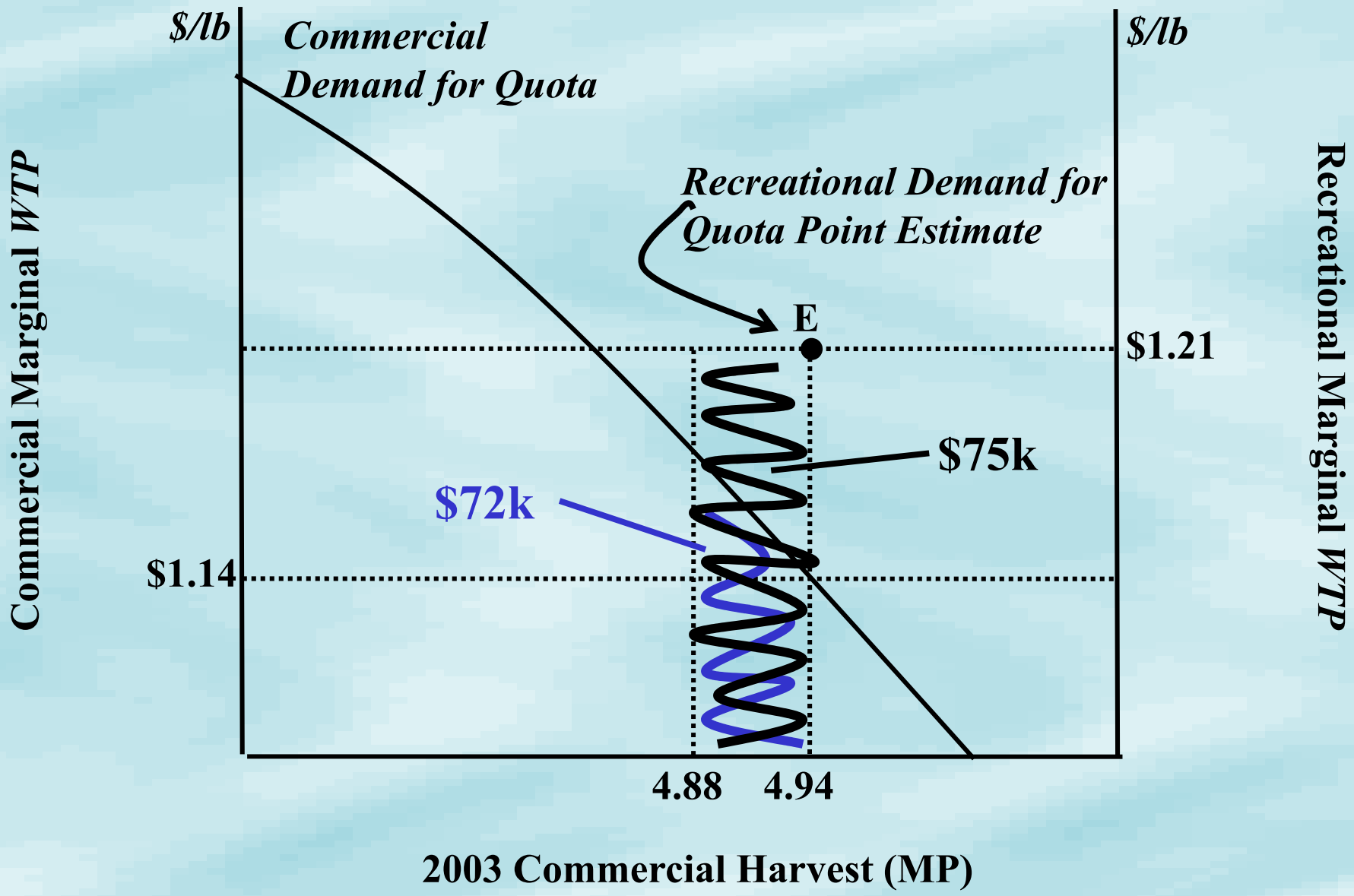
Analysis of Charter Sector

- Hedonic price function--charter trip prices a function of trip characteristics:
- Trip length (hours fished)
- Number of passengers
- County-level harvest characteristics that measure trip "quality" averaged over <u>all species</u>
  - Keep per angler hour fished
  - Discards per angler hour fished
  - Weight per fish kept

Recreational Model Results

- **Mean** *MWTP*/trip in 2003
  - $/keep = 5.86 (± 4.41)
  - $/discard = -2.90 (± 7.55)
  - $/lb ww = 1.11 (± 0.83)
  - $/lb gw = $1.21 (± 0.91)


$/lb
Commercial WTP for Quota
$/lb
Recreational WTP for Quota Point Estimate
E
MWTPr0
MWTPc0
Commercial Marginal WTP
Recreational Marginal WTP
All to Rec.
Amax
A0
All to Com.
TAC


$/lb
Commercial
Demand for Quota
$/lb
Recreational Demand for
Quota Point Estimate
E
$1.21
$75k
$72k
$1.14
4.88
4.94
2003 Commercial Harvest (MP)
Commercial Marginal WTP
Recreational Marginal WTP

Social Sciences & Fishery Management

- We manage **people/businesses not fish!**
- Management decisions are primarily about allocation and distribution issues
- Legal framework is primarily focused on net economic benefits not economic impacts
- Biological reference points are constraints
- Optimum yield is based on economic and social as well as biological/ecological factors
- Clearly defining fishing privileges and creating market based mechanisms (e.g., catch shares, intersector trading) are a potential means to achieve a more economically efficient allocation of fishery resources