# A Technical Guide to Assessing and Preparing Economic Impact Analysis of Regulatory Legislation
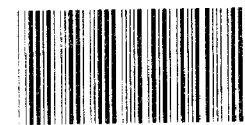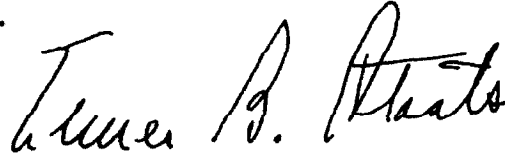
REPORT

FOREWORD

This document is intended to assist in implementing
Senate Rule 27.6, which requires that each Senate committee
include a regulatory impact evaluation with each public bill
or joint resolution reported by the committee. Specifically,
the rule requires that such an evaluation include the paper-
work impact, the impact on privacy, and the economic impact
of reported bills. This document covers only the required
economic impact evaluation, and is designed to provide tech-
nical guidance in preparing and assessing such an evaluation.

Preparing an estimate of the economic impact of regula-
tory legislation is, of necessity, a very complex exercise.
Some of the complexities are described in chapter 1. As a
starting point, any forecast of the future economic impact of
regulatory legislation is beset with uncertainties--including
the manner in which the legislation will be implemented and
the cost of the legislation relative to alternative ap-
proaches. Although interested parties may devoutly wish that
a short and easy approach exists to obtain cost estimates,
such is not the case. Even when done with sufficient skill
and comprehensiveness, a full scale economic impact analysis
may be wide of the mark. There is no assurance whatsoever
that an incomplete "quick and dirty" analysis will bear any
resemblance to the actual economic impact observed.

Therefore, this document is designed to provide technical
guidance in assessing and preparing economic impact analyses.
The document, however, is not a by-the-numbers guide for doing
an analysis. Nor does the guidance provided herein guarantee
a given result or outcome. Rather, this document is designed
for two audiences. First, it is designed to assist congres-
sional staffs in making a preliminary assessment of economic
impact analyses. Thus, chapter 2 provides a listing and de-
scription of the kind of information that should be contained
in a complete economic analysis. Evaluating an analysis
against the questions presented in chapter 2 will not by it-
self indicate the quality of the economic analysis, but it
will allow an appraisal of whether the analysis addresses the
relevant economic issues. While an economic analysis will of
necessity be a technical document, chapter 2 should at least
provide an orderly way for the user of the analysis to examine
the assumptions and data presented in the analysis.

Chapters 3 and 4 are more technical and provide guidance to the actual preparation of an economic analysis. The analysis will most likely require the assistance of individuals with training in economics. In the absence of such training the usefulness of providing a step-by-step approach to preparing a high quality economic analysis is lessened, but these chapters will nevertheless assist congressional staff who contribute to the preparation of regulatory analysis.

As this document is used in the preparation of economic impact evluation, any suggestions for improvement of the approach or specific examples that could be used in a revision would be appreciated. Please send any comments or observations to Mr. Morton A. Myers, Room 5033, U.S. General Accounting Office, Washington, D.C. 20548.

Comptroller General
of the United States

C o n t e n t s

Page

<u>TABLES</u>

## FIGURES

# CHAPTER 1

## INTRODUCTION

The 95th Congress adopted Senate Rule 29.5 (renumbered 27.6 on February 4, 1977). This rule requires that Senate committees, except the committee on appropriations, include a regulatory impact evaluation in the committee report accompanying each bill or joint resolution of a public character. Senator Lawton Chiles, Chairman of the Subcommittee of Federal Spending Practices and Open Government of the Senate Committee on Governmental Affairs, requested GAO to provide assistance in implementing this rule. Senator Chiles stated:

> "The purpose of these requirements is to attack excessive regulation, paperwork, and redtape demands the laws of this country seem to shower on the people of this Nation. It is worth recalling that the Paperwork Commission estimated conservatively last year that it cost $100 billion a year to meet just the paperwork demands imposed on citizens, State and local governments, and private businesses. Every 1 percent reduction in this growing figure represents a billion dollars. Rule 27.6 is a vehicle to discipline the committees of the Senate to address these costs at their source, the making of laws...." 1/

Senate Rule 27.6 requires that committee evaluation reports include (1) determining the economic impact of such regulation on the individuals, consumers, and businesses affected; (2) estimating the number, groups, and classes of individuals and businesses that would be regulated; (3) determining the impact on the personal privacy of the individuals affected; and (4) determining the amount of additional paperwork with estimates of record keeping requirements, time, and financial costs required of affected parties resulting from the regulations (see figure 1). In lieu of such evaluation, each Senate committee is to submit a statement explaining why compliance with the requirements of Senate Rule 27.6 is impracticable. The rule provides that the Senate cannot consider any such bill or joint resolution if the report of the committee does not comply with the above requirements.

---

1/As recorded in the Congressional Record, 95th Congress, Vol. 124, No. 168-Part V (S19460).

**FIGURE 1 — Rule XXIX of the Standing Rules of the Senate**
**February 4, 1977**



SENATE
COMMITTEE

Report on bill
or joint resolution

Contains
evaluation
of
regulatory
impact?

NO

No statement
of reasons
for non-
compliance

Statement of
reasons for
non-compliance

YES

Inclusive
requirements

Determination
of individuals
and businesses
(groups & classes)
to be regulated

Economic
impact

Impact on
personal
privacy

Paperwork
impact

Other
considerations

Consideration of
bill or joint
resolution by
the Senate

This report covers economic impact evaluation, the first of the Senate Rule 27.6 requirements mentioned above. The requirements for a paperwork impact and privacy evaluation will be addressed in another GAO report.

While this report deals with economic impact analysis when legislation is reported out of committee, Executive Order 12044 requires analysis at a later stage--the rulemaking process used to implement legislation.

Executive Order 12044 (see appendix I) calls for regulatory analysis for improving rulemaking by executive agencies, and sets forth the following requirements:

1. Criteria. Agency heads shall establish criteria for determining which regulations require regulatory analyses. The criteria established shall:

   a. ensure that regulatory analyses are performed for all regulations which will result in an annual effect on the economy of $100 million or more; or a major increase in costs or prices for individual industries, levels of government, or geographic regions; and

   b. provide that at the agency head's discretion, regulatory analysis may be completed on any proposed regulation.

2. Procedures. Agency heads shall establish procedures for developing the regulatory analysis and obtaining public comment.

   a. Each regulatory analysis shall contain a succinct statement of the problem, a description of the major alternative ways of dealing with the problem that were considered by the agency, an analysis of the economic consequences of each of these alternatives, and a detailed explanation of the reasons for choosing one alternative over the others.

   b. Agencies shall include in their public notice of proposed rules an explanation of the regulatory approach that has been selected or is favored and a short description of the other alternatives considered. A statement of how the public may obtain a copy of the draft regulatory analysis shall also be included.

c. Agencies shall prepare a final regulatory analysis to be made available when the final regulations are published. 1/

## DIFFICULTIES IN FORECASTING THE ECONOMIC IMPACT OF LEGISLATION

Ideally, the economic impact statement should be able to project a single reasonable estimate of the economic impact of a reported bill. Even beyond the complexities of economic analysis, however, there may be difficulties in preparing a reasonable estimate of the impact of the bill. For example, the two major difficulties--aside from the complexities of economic analysis--are the uncertainties of implementation and the question of alternatives.

### Implementation

Legislation differs in the amount of specificity and in the discretion given to the administrative agencies that will implement the legislation. Differences in implementation, especially differences in the extent and type of eventual regulations, will have a major effect on the economic impact of the legislation. Legislation usually vests considerable discretion in the agency which will promulgate specific regulations to implement that legislation. For example, the Clean Air Act Amendments of 1977, which provide a very specific implementation plan, mandate that "The Administrator (of EPA) shall promulgate regulations establishing standards of performance for the percentage of such categories of sources set forth in the following table before the expiration of the corresponding period set forth in such table." (42 USC 7411.) While the legislation thus establishes a possible broad range of impacts, it is only the specific standards that narrow that range. For legislation that is less specific, the potential impact is even more variable.

A degree of uncertainty is, thus, inevitable to project-ing economic impacts. To reduce this uncertainty and to obtain more information about the assumptions underlying an impact statement, committees should set forth the assumptions about implementation that underlie the regulatory analysis. Such specificity would have the additional benefit of providing additional guidance about congressional intent to agency administrators and affected constituencies. Nonetheless,

---

1/Executive Order 12044 also requires a "sunset" review of existing regulations. There are, therefore, requirements for analysis at all stages of the regulatory process.

there must always be some latitude in implementation and that
latitude will affect the eventual economic impact.

## Alternatives to proposed legislation

An important element of economic impact evaluation is
the analysis of alternatives, because typically there is more
than one approach to meet the objectives of a given piece of
legislation.  Accordingly, an analysis of alternative ways
to meet legislative objectives is a critical element in de-
termining the economic impacts of the legislation under scru-
tiny.  Thus, Executive Order 12044 explicitly requires that
in promulgating a regulation, an analysis of the economic
consequences of the major alternatives be considered by a reg-
ulatory agency.  Senate Rule 27.6 does not require analyzing
alternatives to the proposed legislation.  Admittedly, ana-
lyzing alternatives increases the scope of any analysis.
However, economic impact analysis cannot provide useful in-
formation if it is done in a vacuum.  To evaluate the impact
of a particular legislative approach, it must be viewed in
the context of other approaches--including the status quo.
Therefore, this report assumes that an economic impact evalu-
ation under Senate Rule 27.6 should include an assessment of
alternatives.

## MAJOR ASSUMPTIONS OF THIS REPORT

Given that the modus operandi of our economy is a market
system of resource allocation, every proposal for legislation
and regulation should have a market rationale from the per-
spective of economic impact analysis.  In other words, any
such proposal, if implemented, should lead to improving re-
source allocations.  This report, therefore, focuses on micro-
economic resource allocation effects rather than macroeconomic
effects, such as changes in the Nation's employment or output
which are difficult to attribute to change in a single regula-
tion.  This report also assumes that equity considerations are
political judgments that cannot be decided on the basis of
economic analysis.  But such analysis, by showing how differ-
ent groups or individuals are likely to be affected, can allow
equity judgments to be on as informed a basis as possible.

# CHAPTER 2

## INFORMATION NEEDED IN ECONOMIC IMPACT EVALUATION

## OF PROPOSED BILLS OR JOINT RESOLUTIONS

As Senate committees comply with Senate Rule 27.6, their reports may address many complex economic impact issues. Therefore, the Congress must have some means to assess each committee's compliance. We believe that one of the means should be a list of pertinent questions that should be addressed throughout the regulatory impact evaluation process. Such a list would help the Congress in determining and understanding better the economic impact possibilities before regulatory legislation is enacted. Evaluating an analysis against the questions presented in this chapter will not by itself indicate the quality of the economic analysis, but it will allow an appraisal of whether the analysis addresses the relevant economic issues.

The basic considerations in evaluating regulatory legislation in terms of potential economic impact are as follows:

- Will the regulations resulting from a proposed bill or joint resolution actually accomplish what is intended?

- What economic changes will occur when the resulting regulations are promulgated?

- What would be the economic costs and the benefits if the situation in question is left as is, or more or less regulated?

- Are there less costly ways to accomplish what is intended?

The following sections contain specific questions that focus on these basic considerations and on the economic requirements of Senate Rule 27.6. These questions serve as analytical benchmarks for evaluating and performing economic impact analysis, and are arranged to try to parallel the economic calculus. Accordingly, we have grouped the questions into three types: describing and modeling the problem, and identifying and measuring benefits and costs.

## DESCRIBING AND MODELING THE PROBLEM

The two critical questions of this first stage are:

- What is the problem or issue targetted by proposed legislation?

- Why is this a problem? For example, is there a market failure?

### Description

- How has the purported economic problem affected the production and consumption decisions of economic units (households, businesses, and governments) and the consequent distribution of goods and services?

### Model

Description of the problem is followed by construction of a model 1/ in the context of the markets subject to the problem and to the proposed legislation. Such a model should focus on why a problem exists and should clarify the problem's logic, so the best policy may be selected. The following question is relevant:

- What are the current determinants of the prices and quantities of goods in the relevant markets?

Although a consideration of alternatives is not specifically required by the rule, a more complete analysis would address the merits of alternatives not considered by proponents and opponents of the proposed legislation and the possibility of a superior, substitute model and its policy implications.

- Are there other feasible alternatives for solving the problem?

- What effects would these alternatives have on the relevant markets?

- Do institutional constraints delimit the feasible set of alternatives?

---

1/A model is defined as a logical framework for understanding the problem.

Generating a set of feasible alternatives is an important product of this modeling process. Such a model facilitates optimal policy by providing the means to gauge the worth of a legislative proposal. The worth of a legislative proposal depends upon two things, the costs and the benefits of meeting the proposal's objectives. To get answers requires an understanding of what the alternatives are. The model provides this understanding. For example, the model may reveal a cheaper way to meet the legislative objectives. In that case, the cost of adopting the proposed means of implementation includes unnecessary expense. In other cases, the objectives of the proposal may be too bold or not bold enough. When that happens, the model, not suprisingly, reveals a happy middle ground in which the benefits are substantially greater than the costs. In such cases, the cost of adopting the proposed objectives is the foregone gains to society if the Congress had adopted the superior alternative. In summary, knowing through the model what the alternatives are means recognizing what is sacrificed in choosing a legislative proposal. This sacrifice, or foregone opportunity, is aptly called an opportunity cost. A good model accurately gauges the opportunity cost of the proposal.

## IDENTIFYING BENEFITS AND COSTS

Once the model has been properly specified, major benefits and costs associated with various alternatives may be identified. On the other hand, a convenient way of testing the specification of various models is to identify their predicted impacts and check for empirical verification. [1] Thus, the economic calculus is likely to be more repetitive than suggested here.

- Which models of the market(s) subject to legislative reform are considered for identifying benefits and costs of alternatives?

- Which model is selected for identifying benefits and costs of alternatives?

- What benefits and costs are to be expected from implementation of various alternatives?

To minimize the risk of incomplete coverage of major impacts, the following generalized questions should be addressed.

---

[1] This report cannot address the truly important issues of statistical analysis and model specification. A large body of econometrics literature is available for that purpose.

- Who are the major parties being affected by the proposed legislation or alternatives?

- Have important externalities (third party effects) been accounted for?

The following questions relating to types of benefits and costs are also useful for assuring complete coverage of all impacts.

- Does the proposed legislation or alternative correct situations in which private and social costs and benefits diverge? 1/

- Do the proposals themselves create diverging private and social impacts?

- Have any significant indirect benefits and costs been identified?

- What are the explicit costs?

- What are the implicit costs?

- What opportunity costs are associated with the various proposals?

- What are the explicit benefits?

- Are there any implicit benefits?

- Are there benefits and costs in which a long period of time will elapse between the onset of the impact and observation of its effects?

- Are there any dynamic benefits and costs associated with proposed legislation and other alternatives?

Examples of the former, "latent" effects are likely to be characterized by delayed health, safety, and environmental impacts. Dynamic impacts often refer to effects on productivity, competition, research and development, technological change, innovation, enterpreneurial creativity, and so on.

_____

1/A social cost is the value of the best alternative use of resources available to and valued by society. A private cost is the value of such resources as valued by the individual.

## BENEFIT-COST MEASUREMENTS

After benefits and costs are identified, the next step of the analysis is measurement. These measurements must be singularly attributable to the alternative being considered.

- Are there other factors besides the proposed legislation (alternatives) which may contribute to the magnitudes of measured benefits and costs?

Measurement may take several forms: monetization, quantification, and qualitative assessment. Practical and other arguments will determine the extent of each type of measurement.

For monetized impacts, the following questions are germane in analyzing each alternative:

- What impacts can be monetized?

- Are the quoted prices accurate reflections of benefits and costs?

- Have price changes over time been accounted for?

- What is the appropriate discount rate?

- Does the discount rate change over time?

- Has the net present value been computed?

For nonmonetized impacts, consider:

- What impacts can be quantified but not monetized?

- What is the rationale for nonmonetization?

- Can an implicit monetized valuation of such impacts be obtained through comparison with existing regulations?

- Can a value for an intangible be expressed by what it is expected to produce?

When proposed legislation addresses the problems of specific groups of society, the benefits received and costs incurred by those groups should be stated.

- What is the incidence of benefits and costs across consumers, producers, and other interest groups?

10

- Is there any double counting of benefits and costs?

Previously, it has been tacitly assumed that impacts could be measured with certainty. This is seldom the case. The following questions are pertinent to most estimations, which are constrained by uncertainty or risk.

- What assumptions were made about values of key parameters, e.g., rate of inflation, in estimating the magnitudes of such benefits and costs?

- How do these estimated costs and benefits vary with changes in these parametric values?

- Have maximum, minimum, and expected values been computed for such impacts?

In a growing number of cases, especially those dealing with health, safety, and environmental problems, uncertainty or risk is even more pervasive as the nature of the impacts may not be known with certainty. Various probabilistic events may characterize a particular impact. In such situations, consider:

- What is the set of events or possibilities associated with the impact?

- Are the probabilities available for any of these events?

- Are these probability estimates conservative in the sense of overstating the chance of an adverse event?

- Can a monetized value be imputed based on actual market behavior that approximates the maximum price society is willing to pay to avoid the uncertainty or risk in question?


PRESENTING AND ORDERING THE RESULTS

To summarize and expedite review of the analysis, trade-offs between alternatives should be highlighted in the following ways:

- Does the analysis address the benefits and costs of taking no action?

- Does the analysis include the benefits and costs to be produced by each alternative?

11

● Does the analysis determine which alternative
maximizes net benefits, assuming no benefit or
cost constraints?

More specifically, this section should address the following
questions:

● Have alternatives been ranked according to net
present value of monetized impacts?

● Have alternatives been ordered separately according
to quantified impacts and intangibles?

● Have various tradeoffs between alternatives been
highlighted?

A summary checklist which can be used in assessing the
comprehensiveness of an economic impact analysis is pre-
sented in appendix II.

CHAPTER 3

## METHODOLOGICAL CONSIDERATIONS OF ECONOMIC

## IMPACT ANALYSIS

The methodology of economic analysis presents the basic elements of such analysis, and provides the basis for doing and evaluating it. This chapter is organized into three major sections. The first section focuses on defining the problem to be tackled by proposed legislation in a market economy like the United States. The second section focuses on identifying or observing impacts triggered by the proposed legislation. The third section provides the framework for testing hypotheses about the relative merits of various proposals.

Although geared toward individuals with economic training, this chapter is arranged to appeal to the needs of both generalists and specialists. A general text is accompanied by technical footnotes and appendices. The terms "economic impacts" and "costs and benefits" are used interchangeably. Also, the expressions "proposed legislation" and "proposal" are used interchangeably for the combined package of legislation and regulation subject to economic impact analysis.

## DEFINING THE PROBLEM

The first task of economic impact analysis is to establish the dimensions of the problem--to delineate what issues are addressed and to determine whether such issues pose a problem worth tackling. When the salient features of the problem are identified, one may reach a better understanding of the problem's causes and effects, to make an accurate judgment of alternative solutions to the problem. Is, indeed, the proposed legislation the best remedy? 1/

---

1/Two points need to be made. First, failure to understand a problem usually results from not having all necessary information or from misinterpreting such information. One makes the wrong diagnosis and, hence, administers "the wrong medicine." Second, the value of weighing the benefits and costs of proposed legislation is inextricably tied to the analysis of alternatives to that proposal. The big question is how well the benefits and costs of the proposal stack up against those of its alternatives. Thus, analysis of alternatives is vital in making the best choice--the proverbial heart of economic impact analysis. In turn, defining the problem is vital for recognizing feasible alternatives.

## Describing the problem

First, the problems addressed by the proposed legislation must be identified. These problems often can be identified superficially by examining the stated objectives or purposes of the proposal. For example, one of the stated purposes of the Clean Air Act is to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." 1/ This statement serves as a convenient starting point for describing the problem. Additional insights can be gleaned by focusing on how the problem impinges on, or what the problem suggests about, production, consumption, and distribution decisions of households, businesses, and governments. 2/ By necessity, such knowledge requires some insight about what would have been if there were no problem. One must determine the composition and distribution of economic goods had the problem never occurred. 3/

For example, let us return to the problems addressed by the Clean Air Act. If those problems did not exist, there would be more "clean air." Households would consume more "clean air" and would derive any benefits forthcoming. However, less steel, chemicals, and other polluting economic goods would be produced. Fewer of these goods would be consumed.

## Establishing a logical framework

Describing the problem emphasizes how production, consumption, and distribution of economic goods are altered by the problem; logical structuring asks why. Establishing a logical framework is commonly referred to as modeling.

---

1/The Clean Air Act, as amended, 42 U.S.C. 7401(b)(1).

2/Production deals with making goods while consumption relates to using goods to satisfy certain wants. Distribution deals with who gets to use goods. The central purpose of economics is to employ scarce resources to satisfy human wants. Resources are factors of production which are used to make goods. Thus, drawing attention to production, consumption, and distribution decisions is fundamental to economic analysis.

3/An economic good is both desirable and scarce, for which other desirable things are willingly sacrificed.

However, modeling and describing the problem are not separable processes. Generalizing from the "real world" portrays more accurately what transpires in establishing the logical framework.

For example, description of the problem may reveal that a producer can dump toxic wastes into an adjacent waterway without having to account for his actions. A generalization that captures accountability might be: producers will pollute more when the price of polluting is low. In other cases, the connection between description and logical structuring is less evident. For example, a positive correlation may be observed between the amount of an economic good produced such as steel and the amount of environmental pollution. Is it satisfactory to deduce from this correlation that producers will pollute more when they produce more? A more emphatic generalization might be: the price of polluting is a cost of producing; producers will produce more at a lower cost of production. Households consume more pollution because they desire more products that generate pollution when the price of those products is low. As suggested by a previous generalization, this price will be low when the producer is not held accountable for pollution or when the price of pollution is low.

## Identifying alternatives

Failure to define the problem accurately may omit some of its important features. In the previous example of environmental pollution, omitting the point that the producer was not held accountable for pollution would not reveal the whole problem. 1/ By not examining all dimensions of the problem, either through errors of omission or of logic, bad modeling will result. Since decision choices are derived from the model, failure to examine the dimensions of the problem is likely to result in an incomplete set of feasible alternatives. In the previous example, failure to note the lack of producer accountability for pollution might

---

1/There is always the danger that correlation may be construed as causation. The generalization that producers pollute more when they produce more fails to address the critical nexus between price of polluting and cost of producing. Sloppy logic can still occur when errors of omission have been eliminated.

result in no consideration of a regulation designed to make the producer pay for damages from such pollution. 1/

## The status quo, market intervention, and deregulation

Generally, a good model should enable evaluation of the merits of three broadly based categories of choice: the status quo, or do-nothing approach; market intervention, or increased regulation; and deregulation. The model should also be sufficiently detailed so that an incremental (or marginal) analysis may be made, so that alternatives which offer varying degrees of regulatory interference can be judged. 2/

## Institutional constraints

An institutional constraint that is the cause of the problem should be dealt with explicitly in the model. Otherwise, modeling the problem should be consistent with the greatest degree of flexibility involving choice of alternatives. The feasible set of alternatives should not be unduly bounded by institutions that are the target of legislation. Once the relatively unbounded set has been identified and its alternatives ranked, a systematic appraisal of institutional constraints is appropriate. Depending upon the results of analysis of alternatives, some of these constraints may be targetted for removal by new legislation.

---

1/This is sometimes referred to as internalizing the cost of pollution to the producer.

2/The importance of marginalism, in which the impact of adding or subtracting to the initial values of key variables can be measured, is underscored by growing concern regarding the proper balance of societal objectives. Marginality was popularized by the distinguished 19th century economist, Alfred Marshall, who "was led to attach great importance to the fact that our observations of nature * * * relate not so much to aggregate quantities, as to increments of quantities * * *." [Alfred Marshall, Principles of Economics (London: MacMillan & Co., Ltd., 1961), 9th ed., vol. 1, p. x.] For example, the policy maker may have a clear mandate to protect the environment. But the signal indicating how much protection is desired may be garbled. It is in this type of situation that marginal analysis, which might indicate the incremental benefits and costs of varying degrees of protection, can aid the public in enunciating the desired degree of protection.

## DEFINING THE PROBLEM IN THE CONTEXT OF A MARKET ECONOMY

### Welfare foundations of economic impact analysis

As previously mentioned, production, consumption, and distribution of economic goods are broad characteristics of economic behavior. Underlying these characteristics are myriad decisions made by households, businesses, and government aimed at maximizing each one's own welfare. Although in most cases in a market economy these decisions are at odds with each other, the conflict does not indicate different conceptions of welfare so much as it reveals divergent strategies to maximize welfare. All these decisions have in common a desire to allocate scarce resources, which make economic goods in such ways as to best satisfy the wants for those economic goods. 1/

Consequently, economic impact analysis can be a process of understanding the causes and effects of a problem in the context of resource allocation. For example, how does the problem impinge on the efficient use of scarce resources to meet the needs for economic goods? From the perspective of economic analysis, legislation and regulation should address misallocations of resources. In short, the problem is

---

1/For example, households have command of limited resources, primarily in the form of labor skills, which they may seek to employ to maximize their incomes. These incomes, in turn, are used to purchase economic goods. Incorporated businesses may seek to employ the labor, capital, and raw materials at their disposal to maximize their profits. These profits are also used to satisfy wants for economic goods. The Government intervenes in the above decision making when these private decisions are not consistent with maximizing social welfare, the summation of private welfares. However, the Government has at its command limited resources for accomplishing this goal of better satisfying societal needs for economic goods.

misallocation of resources by households, businesses, and Government. 1/

## The role of markets

Welfare maximization as envisioned by Adam Smith was the natural consequence of the workings of a market system of resource allocation. The "invisible hand," animated by the force of competition, would assure a welfare maximum. The force of competition comes to bear in the market. A market for a particular economic good or resource is characterized by demand and supply for that item and by the voluntary exchange of that item between demander (buyer) and supplier (seller) upon negotiation of a mutually acceptable price.

A system of ideal markets, in which Smith's "invisible hand" would guide society to the best choices, depends on the following assumptions:

- Every market is perfectly competitive.

  --nobody can rig the market by manipulating it for one's own personal gain.

  --nobody can be accused of ignorance. Buyers know exactly what they are purchasing and sellers are certain of their production costs, other investment opportunities, and future sales.

  --resources are engaged in their most productive activity.

- The economy has full employment.

---

1/Given this perspective on the problem, comparison of benefits and costs is at the heart of economic impact analysis. For the "economic problem" has two sides: wants and resources. "Benefits" stem from satisfaction of wants and "costs" originate from use of resources. The purpose of cost-benefit (or resource-want) analysis is the ranking of various choices of resource allocation. If the problem has been defined and feasible alternatives identified, cost-benefit analysis will reveal the best choice. This best choice corresponds to the maximum satisfaction of wants with the scarce resources at hand. This is simply another way of stating that cost-benefit analysis is consistent with finding the welfare maximum.

- The sensual and psychological satisfaction from any dollar of income is the same for all individuals.

- Any benefits or costs associated with selling and purchasing economic goods in a market accrue to, or are incurred by, participants of that market.

## Measurement of welfare in ideal markets

As stated previously, economic impact analysis tells us whether the proposal is consistent with the best possible use of resources or whether there is a superior, alternate use which maximizes welfare, or the difference between benefits and costs. This difference is sometimes referred to as net benefits.

A convenient way to visualize a legislative proposal's effect on net benefits is through graphical analysis of the market(s) subject to the proposal. Figure 2 depicts such a market. The vertical axis measures the price (P) of the good and the horizontal axis, quantity (Q). The demand (D) and supply (S) curves describe the behavior of buyers and sellers in that market. They agree upon a price and quantity, point E in figure 2. This price is sometimes referred to as market-

**FIGURE 2**
**AN IDEAL ECONOMIC MARKET**
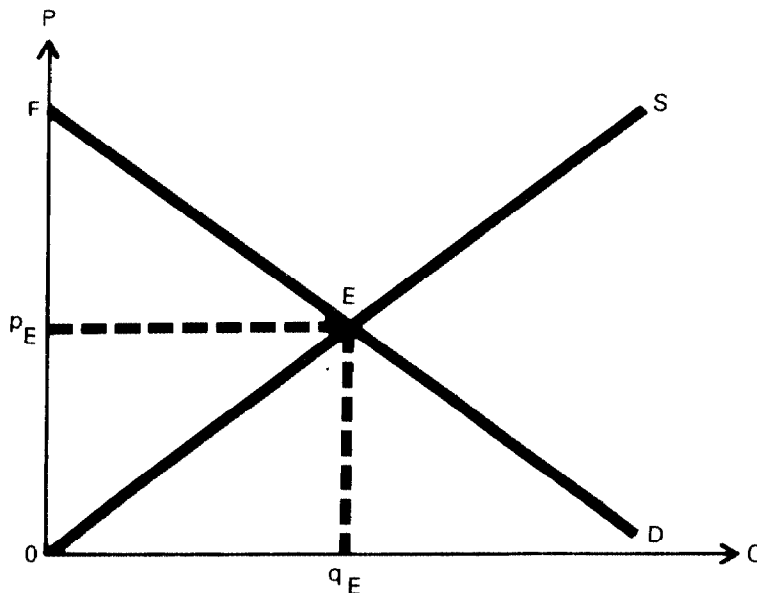
clearing. The triangular areas $EFp_E$ and $EOp_E$, respectively, measure the levels of net benefit received by buyers and sellers. For every unit of the good between 0 and $q_E$, the buyer receives a bonanza because he pays a price $p_E$ which is less than his maximum price, line D in figure 2. Similarly, for every unit of the good between 0 and $q_E$, the seller receives a price $p_E$, which is greater than the minimum price necessary to induce a sale, as shown on supply curve S in figure 2. 1/

## Maximizing welfare in ideal markets

If the market depicted in figure 2 is ideal, point E will correspond to the maximum net benefits. In figure 3, we duplicate that market and compare point E's maximum with welfare levels associated with other points.

For example, in comparing $q_A$ with welfare-maximizing $q_E$ for each unit of the product between $q_A$ and $q_E$, the demand curve D is higher than the supply curve S. For each of these units, societal benefit exceeds societal cost. For each of the units of product between $q_E$ and $q_Z$, the opposite holds. The supply curve lies above the demand curve. Thus, it "pays" society to produce that product up to $q_E$, but not beyond.

At point E, the sum of consumer and producer surpluses is at a maximum, equal to area EOF in figure 4. Quantities $q_A$ and $q_Z$ represent misallocations of resources: $q_A$ reflects

---

1/A conventional, theoretical framework for measuring net benefits or welfare is based on the twin concepts of consumer and producer surplus. The consumer surplus is measured by the triangular area $EFp_E$. Total welfare is measured by the triangular area EOF.

To underscore the idea that net benefit and welfare are synonymous, only the benefits and costs to the consumer and producer need to be identified in figure 2. Since a demand curve reflects all benefits to the consumer in an ideal market, area $FOq_EE$ measures such benefits. Total costs to the consumer equal area $Ep_EOq_E$. Subtracting these costs from benefits yields net consumer benefits measured by area $EFp_E$, consumer surplus. Similarly, producer benefits are equal to area $Ep_EOq_E$ total sales, and producer costs are measured by area $EOq_E$ (in an ideal market all resource costs are reflected in the supply curve S). Subtracting these costs from benefits yields net producer benefits measured by area $EOp_E$, producer surplus.

# FIGURE 3
## WELFARE MAXIMIZATION
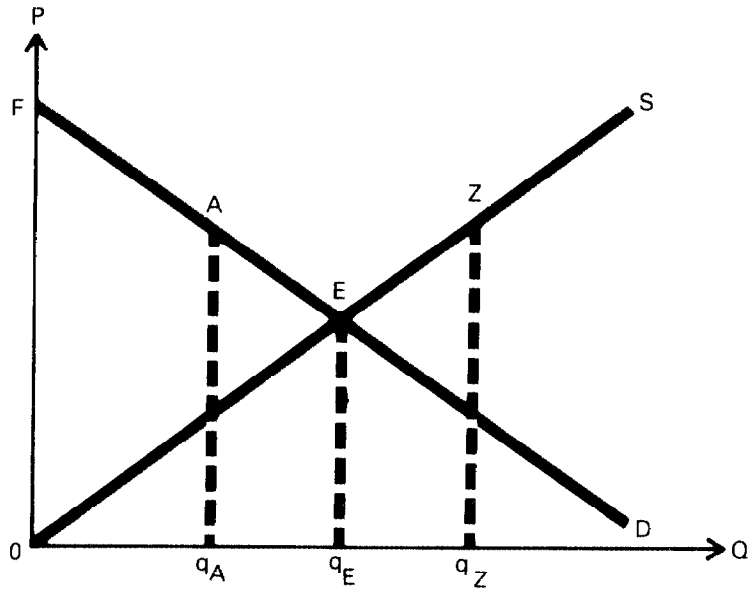


# FIGURE 4
## CONSUMER AND PRODUCER SURPLUS
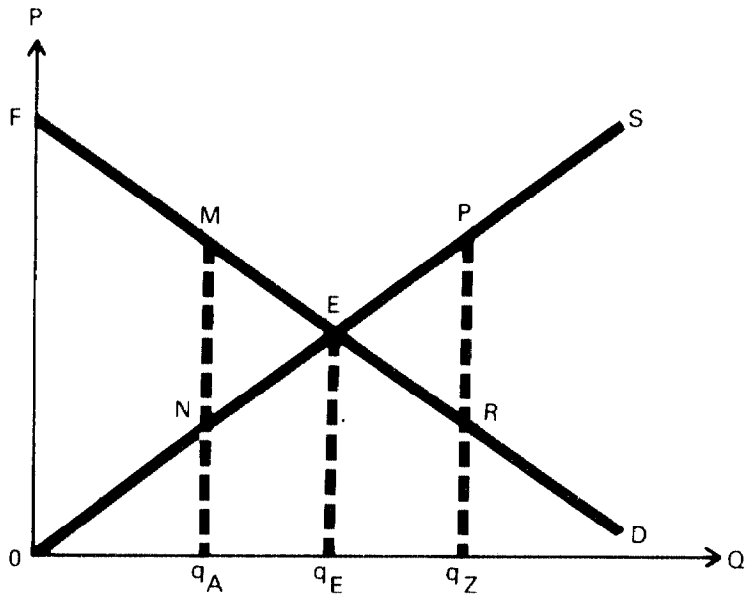
too few resources allocated to producing the good and $q_Z$ reflects too many. Total welfare at $q_A$ equals area FNMO which is less than total welfare at $q_A$ by area EMN. Total welfare at $q_Z$ equals area EOF minus area ERP which is less than $q_E$'s total welfare by area ERP. For all quantities between $q_A$ and $q_E$, marginal benefits measured by the height of the demand curve D exceed marginal costs measured by the height of the supply curve S. For all quantities between $q_E$ and $q_Z$ marginal costs exceed marginal benefits. The decision rule for maximizing welfare can be summarized as follows: resources should be allocated to production of the economic good as long as marginal benefits from such allocation exceed marginal costs. This optimizing rule, so expressed, highlights the welfare foundations of benefit-cost analysis.

## Welfare foundations of market intervention

Given that the modus operandi of our economy is a market system of resource allocation, every proposal for legislation and regulation should have a market rationale from the perspective of economic impact analysis. In other words, any such proposal, if implemented, should lead to improving resource allocations.

### Common types of market failure

Whenever any of the assumptions of an ideal market are violated, the stage is set for possible market intervention. The three most frequently cited occasions of market failure are characterized by: externalities, market power, and imperfect information.

An externality or spillover effect characterizes a situation when benefits and costs of a particular market transaction affect economic decision units other than those that are participating in that market. 1/ Environmental pollution is a good example of an externality. For instance, a factory escapes full accountability for resource costs incurred in

---

1/Externalities are also referred to as third-party effects: "effects, either good or bad, on parties not directly involved in the production or use of a commodity." In Richard Lipsey, Peter Steiner, Economics, 4th ed. (New York: Harper & Row, 1975), p. 924. We limit our discussion here to nonpecuniary externalities.

producing an economic good by dumping wastes into an adjacent waterway. A municipality downstream is compelled to install water treatment facilities as a consequence of this "spill-over."

Another important example of an externality occurs when the economic good is not easily priced. This difficulty may arise because of the indivisible nature of the product. It may not be possible to exclude consumption benefits from some-one in spite of his unwillingness to pay for such benefits. National defense goods provide benefits which are not readily excluded from those who do not wish to pay for such items. 1/

Market failure can also arise from market power, that is, from a lack of competition. Such "monopoly" (single supplier) or "monopsony" (single demander) can result in less than the welfare-maximizing quantity of economic goods.

Markets can also fail to produce welfare-maximizing quantities of economic goods when the assumption of perfect knowledge is divorced from reality. For example, when con-sumers are unaware of certain intrinsic qualities of products that they purchase, there is no assurance that they will pur-chase the optimal quantities. Questions of product safety and fraudulent advertising or other such claims about product quality are cases in point.

## Anatomy of market failure

Figure 5 shows a hypothetical market for steel, and the effect of a spillover cost, or negative externality, on wel-fare measured in that market is described.

Supply curve S does not reflect all costs incurred in employment of resources to produce steel. On the other hand, supply curve S' has "internalized" the spillover costs of producing steel, such as environmental pollution. Legisla-tion and regulation might be enacted and implemented to

---

1/This type of externality can be regarded as a problem on the demand side of the market, since it is the difficulty of deriving individual demands for the good which is the issue. Such goods are sometimes referred to as public goods.

23

**FIGURE 5**
**A HYPOTHETICAL MARKET FOR STEEL**
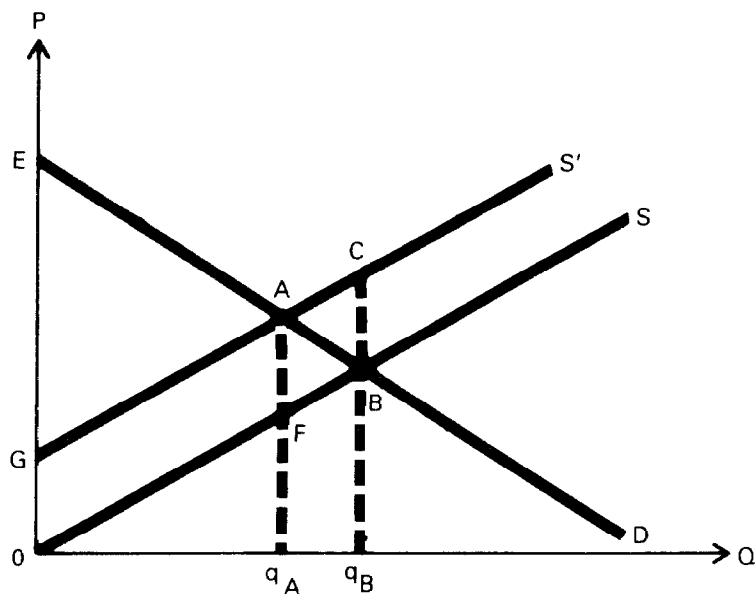


internalize these spillover costs. 1/ Without internaliza-
tion, the steel producer has no economic incentive to produce
the welfare-maximizing quantity $q_A$ because he is held account-
able only for costs delineated by the S curve. Unfortunately,
the costs to society of this producer generating the addi-
tional output from $q_A$ to $q_B$ are higher than the producer's

----

1/Before such action should be taken, the welfare with and
without internalization should be addressed. In other
words, are the marginal benefits of internalization
greater than the marginal costs? At quantity $q_B$, which
would be the market result without internalization, the
marginal cost of the last unit of steel produced (namely
the $q_B$th) is equal to the height of the S' curve (dis-
tance $Cq_B$). This is greater than the marginal benefit
which is equal to distance $Bq_B$. Indeed, for each unit
of steel produced beyond $q_A$ the marginal cost exceeds
the marginal benefit of such output.

24

costs and are greater than any commeasurable benefits to society, as shown on the D curve. 1/

## IDENTIFYING BENEFITS AND COSTS IN ECONOMIC IMPACT ANALYSIS

### Through analysis of the model

The scope of benefits and costs of proposed regulation is tied to the logical framework, or model, which is used to explain the problem at hand. This model should reveal all feasible alternatives for solving the problem. To do so requires that the model address the causes of resource misallocation in the context of the market economy of the the United States.

Failure to identify all feasible alternatives runs the risk of ignoring important impacts. Such failure can arise for a number of specific reasons. First, the model may not recognize all the principal participants in the legislative and regulatory process. Important "third party" effects may be missed because these parties are outside the boundaries of the basic bargain (regulation). Second, the model may recognize all the participants but fail to discover all the important impacts on them as a result of the regulation. Important "dynamic effects" such as the impact of regulation on technological change and economic growth are two examples.

The following typology of impacts is presented to minimize the danger of leaving important impacts "unturned." Our typology should accomplish two things: it should assist the reader in making qualitative observations of major impacts; and it should serve as a means, albeit imperfect, of checking the logical specifications of the model.

### Through the distinction between private and social impacts

As suggested earlier, opportunity cost can be defined as the value of resources used up in the process of production. Thus, value is the "benefit" that such resources would generate in their best alternative use.

--------------------------------

1/Legislation and regulation should be enacted to remove this external diseconomy in production of steel. This external diseconomy is equal to area ACB in figure 5. Welfare with internalization is equal to area EAG in the steel market. Welfare without internalization is equal to area EAG minus area ACB. For additional detail, see appendix III, "Anatomy of Market Failure."

Occasions arise when private and social costs deviate. Private cost measures the value of the best alternative uses of resources that the producer of an economic good is held accountable for in a market. Social cost measures the value of the best alternative uses of resources that society is held accountable for in the production of an economic good. A good example of when these costs deviate is the spillover cost we described earlier. A similar distinction can be made about benefits. Private benefits accrue to the parties directly involved in a market transaction. However, third parties may benefit from the transaction, and these benefits together with private benefits make up social benefits. For example, a householder, needing his house painted, engages a contractor. The householder and contractor presumably benefit from this transaction (private benefits). A third party, a neighboring householder, also benefits from this home improvement. His house and neighboring homes will appreciate at a greater value than if his neighbor's house had not been painted.

Market failure is a "wedge" between these private and social costs and benefits. Thus, the regulation being considered will typically address some categories of social cost and/or benefit, making the categories somewhat easier to identify. However, the proposed regulation itself may drive some wedges between private and social impacts. For example, proposed legislation encouraging the production of synthetic fuels may drive a wedge between private and social costs as in the form of environmental damage.

## Through the distinction between direct and indirect impacts

Many economic impacts of regulation can be classified as either direct or indirect. Such classification emphasizes that legislation affects not only those who are immediately controlled by regulation, but also those whose welfare is related to the directly controlled group. The relationship between those directly and indirectly affected can, in turn, occur through either a marketplace or a nonmarketplace link.

Figure 6 summarizes the distinction between direct and indirect impacts. Direct impacts refer to original impacts or those which spawn indirect impacts, labeled as "spillouts"

in figure 6. Note that some indirect impacts, labeled "feed-
backs," also affect those markets originally impacted. 1/
These "feedbacks," although affecting those whose actions are

**FIGURE 6**
**DIRECT AND INDIRECT IMPACTS**



SPILLOUTS

MARKETS SUBJECT TO REGULATION

REST OF THE ECONOMY (OTHER MARKETS)

DIRECTLY IMPACTED          FEEDBACKS

---
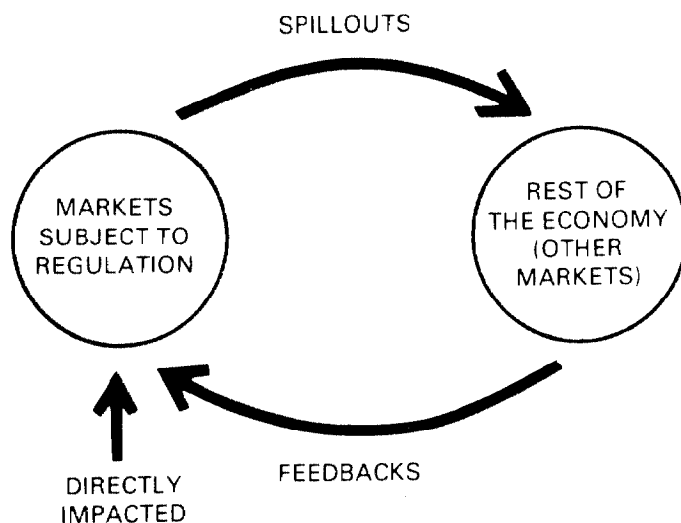
1/In economic theory, a distinction is made between partial
and general equilibrium analysis, which helps to dis-
tinguish between direct and indirect impacts in the market-
place. The basis for this distinction is an economy as an
interlocking and interreacting system:

"An impact on any sector has effects there, but
those effects will spill out and become impacts
to other sectors. These in turn may feed back into
the original sector." (Lipsey & Steiner, Principles
of Economics).

Partial equilibrium analysis assumes that "spillouts"
and "feedbacks" are small enough to be ignored. In other
words, partial equilibrium analysis is a study of direct
impacts only. When market interreactions are large, they
cannot be ignored without risking serious error. In such
cases, general equilibrium analysis is warranted, i.e.,
indirect impacts should be identified.

27

immediately controlled by regulation, are the progeny, once removed, of direct impacts. 1/

---

1/An example highlighting the need for general equilibrium analysis and distinguishing direct from indirect impacts relates to regulation of a transportation mode. The rationale for such regulation may allude to the danger of "destructive competition," which is associated with immobile resources. If resources are not perfectly mobile, one of the conditions of perfect competition, situations may arise in which either too much or too little of the economic good is produced compared to the ideal market result. If this "destructive competition" model is correct, one direct impact of such regulation might be reduction of some of this output divergence. Suppose the regulation is designed to accomplish this direct impact through limited entry of new firms and through limited price flexibility. (Such an example is discussed in more detail in chapter 4.) Unless this regulation can be designed to perfectly duplicate the results of an ideal market, higher prices in this transportation mode will probably occur, more than are desirable. Additionally, some transportation routes may not be operated to the degree desirable. A "spillout" from higher prices and underused routes may result in increasingly active markets for competing transportation modes. A "feedback" may result in a gradual shift in preferences away from the regulated mode--apart from considerations of price.

Indirect impacts are also spawned by direct impacts through nonmarket links. Such impacts fit under the heading of nonpecuniary externalities. For example, a regulation setting a ceiling price on natural gas not only encourages the production of coal--an indirect impact through the marketplace--but also produces more air pollution because coal is dirtier than natural gas. The "spillout" of air pollution is an example of an indirect impact conveyed through a nonmarket medium. Unlike coal which is negotiated for in the marketplace, air pollution afflicts society with or without the market's sanction.

Direct impacts can also be externalities. The improved health of a household resulting from a regulation forcing cleanup of an adjacent factory is an example. Had the household "bribed" the factory to clean up its act, such an impact would not be an externality. Improved health is not categorized as an "externality" when it is transacted in the marketplace. The household "bribe" exemplifies the process of internalizing an externality, i.e., incorporating the externality in the market.

Through the distinction between explicit and implicit
impacts

## Costs

All costs can be classified as either explicit or im-
plicit, regardless of whether the regulation directly or in-
directly impacts--and apart from excluding or including the
impact in the marketplace.  Explicit costs are incurred when
a producer purchases resources.  Implicit costs are also
incurred for resources that the producer neither purchases
nor hires for current use.  These implicit costs should
reflect the values of these resources employed in their best
alternative use. 1/

For the individual producer of economic goods, explicit
costs may be fixed, that is, not varying with output; and
variable, that is, varying directly with output.  Fixed costs
are often referred to as "overhead" costs and typically in-
clude expenses for capital goods and plant facilities.  Ex-
amples of variable costs are labor inputs and raw materials.

For the individual producer, an important implicit
cost is the value of his funds as judged by his next best
investment opportunity.  For example, suppose that a freight
hauling business is contemplating the purchase of a new truck.
An implicit cost associated with this purchase is the rate
of return that could have been earned if the funds for pur-
chasing the truck had been invested in a next best alterna-
tive, such as the government bond market. 2/

## Benefits

Most benefits stem from removal of the problem addressed
by the regulation.  Circumstances arise in which a market
system of resource allocation fails to supply certain worthy
economic goods and over- or under-produces others.  A regula-
tion designed to correct violations of an ideal market's

---

1/In a perfectly competitive world, resources purchased by
  a producer will be valued at prices that account for their
  next best use; such prices will reflect the opportunity
  costs of using those resources.  Because prices usually do
  not fully reflect such opportunity costs, there is an im-
  plicit element in most costs which must be measured.

2/A similar analogy may be made with the household and govern-
  ment in their roles as producers.

assumptions will increase economic welfare so long as the
regulation's benefits outweigh its costs.

Benefits, like costs, may be either explicit or implicit.
Explicit benefits equal the value of economic goods resulting
from implementation of the regulation which is consistent
with the regulation's intent. Explicit benefits should cor-
respond to the stated objectives of the parent legislation.

Implicit benefits refer to the value of economic goods
resulting from an unintentional or unaddressed product of the
regulation. 1/ The difference between an explicit and
implicit benefit might be the regulatory impact of legislation
that manages minimum fuel performance standards for U.S. auto-
mobiles. The explicit benefit in this legislation might refer
to fuel economy; the implicit benefits might be reduced air
pollution and an automobile that is more competitive in inter-
national markets. 2/

## Through analysis of the time dimension

There is a time dimension to the various impacts flowing
from proposed regulation. Generally, direct impacts occur
before their indirect counterparts. 3/ This generalization,
however, is subject to a number of important exceptions.
Direct impacts may be characterized by a long incubation
period, i.e., a long time may elapse between their onset and
observations of their total influence. This example may be
relevant when applied to environmental/health issues. 4/
Curtailment of a steel mill's air pollution may have a long-
term effect of reducing lower respiratory disease in children.

"Dynamic effects" is another category of potentially
latent, direct impacts. These effects can be latent because

---

1/Implicit benefits may be unaddressed because no mention is
  made of such benefits in the legislative language.

2/See appendix III for a graphical exposition of impact
  typology.

3/This impression is fostered by the distinction between
  partial and general equilibrium analysis made in figure 6,
  from which it is easy to imagine the sequential ordering
  of impacts: direct spillout and feedback.

4/Theoretically, the delayed realization of full impacts
  can be accounted for by discounting their time streams.
  However, such impacts may be ignored altogether, a real
  danger.

of their possibly late onset. For example, regulation that reduces the profits earned in the private sector may cripple that sector's capability to fund research and development from which future technological change is born. Because of long lead times typically associated with research and commercial development of new techniques, this direct, dynamic effect often escapes detection.

Consequently, closer examination of the time dimension may reveal a wide disparity in the way in which various direct impacts and indirect effects occur. A crosscut at any point in the life of a regulation probably will reveal various stages of impact development. 1/

## Through analysis of opportunity costs

Opportunity cost refers to the value which resources would generate in the best alternative use. In ideal markets, the prices quoted for resources are unbiased measures of social opportunity costs. Many situations arise, however, in which no market prices are available for the resource in question or in which the price is biased.

For example, in the case of common property resources, such as depletable fish stocks, the constraints imposed by private ownership are not operative and, as a result, marginal social costs are greater than marginal private ones. The private opportunity costs associated with catching the depletable stock today versus catching it tomorrow may be negative in the absence of ownership constraints. 2/ On the other hand, the social opportunity costs may be stark: a food supply inadequate to sustain society.

---

1/In terms of timing, rather than identification, indirect impacts are generally more difficult to pinpoint than direct ones, mainly because indirect impacts are induced by direct ones. A reaction function, mapping a continuum of time differentials between onset of direct and indirect effects and factors determining such differentials, conveys the difficulty of timing indirect impacts. For example, current inventories of steel and the degree of substitutability between steel and aluminum help to explain the alacrity, or lack thereof, of economic decision units to choose aluminum over steel after the latter good's prices have risen because of regulation.

2/If a private firm elects to wait until tomorrow, it may come away empty-handed as other firms deplete the stock today.

In another case, involving unemployed labor, the price paid for employment of the labor may be quoted as positive because the private opportunity cost of the previously unemployed person may equal the level of welfare compensation. For purposes of unbiased measurement, however, the social opportunity cost should be used, and in this case it is negative. 1/

## Through analysis of distributional implications

Two points need to be addressed involving identification of impacts. First, political necessity may require analyzing differential impacts on various segments of society. These segments can only be recognized by scrutinizing the proposed regulation's politics. Once the segments have been identified, all benefits and costs are assigned to each politically relevant societal segment. No new genus of impact is at issue.

The second point is more substantive in terms of its effect on economic welfare. As previously stated, one assumption of ideal markets is that the satisfaction from any dollar of income is identical for all persons. But if one person enjoys greater satisfaction than another from an incremental change in income, a far more complex analysis of welfare is needed than is suggested by the comparison in figure 5. 2/ For example, suppose that correcting a negative externality leads to temporary (and perhaps prolonged) unemployment of low-wage employees and an enhanced quality of life for all society in cleaner waterways. The distributional consequences of correcting this externality fall especially hard on the lower income groups. If these groups attach a higher value to income than other societal segments, correcting the externality will most likely cause a smaller increase in societal welfare than previously suggested.

## BENEFIT AND COST MEASUREMENT

Important precursors to accurate benefit/cost measurement are description of the problem, construction of a model that presents the market rationale for the problem, and identification of benefits and costs associated with various

---

1/This condition holds true, assuming that resources used to provide welfare compensation will be used in some other way if the previously unemployed are hired.

2/A more detailed comparison of welfare with and without regulation is made in appendix III. See table 15.

legislative prescriptions. The actual magnitude of such impacts, so measured, provides not only the basis for judging the relative merits of various proposals, but also information needed to test the model's specifications. For example, a model that suggests certain major benefits from a proposal may be challenged if those benefits fail to materialize.

## The need for baseline data

To measure properly the impacts of proposed regulation requires the capability to discriminate between pre- and postregulation scenarios. The world as is--or preregulation scenario--should be adequately portrayed in the description of the problem. This, together with information detailing the cause-effect relationships between legislative objectives and regulatory instruments, permits a picture of postregulation.

The role of baseline data is dual: It acts as a safeguard against the risk of attributing to a regulation what is properly the domain of the preregulation world, and it is necessary to measure what effects the proposal will have to resolve the problem.

For example, suppose a telecommunications regulation is being proposed that would establish minimum public news broadcasting times for all radio stations. To estimate the impact of this regulation requires data on existing public news broadcasting times. Information regarding how these times are determined, and whether radio stations fail to offer the proposed minimum public news time is needed. Data on the profitability of public news time versus that of other broadcast-time uses are needed to rank the relative importance of various factors that determine how a radio station uses its broadcast time. Both of these baseline data requirements are critical to evaluating the proposed regulation. On the one hand, all radio stations may be broadcasting public news for durations equal to or slightly less than the minimum proposed regulation times. On the other hand, the relative profitability of public news broadcasting may be increasing at a rate which ensures greater use of news time.

## Monetizing impacts

The fundamental reason for expressing impacts in pecuniary value is to help compare benefits with costs and thus permit the computation of net benefits. Net benefits equal total benefits minus total costs. Theoretically, all benefits and costs can be monetized, provided that they are economic goods. However, many instances arise in which

monetization is impractical for various reasons, ranging from the nature of the economic goods to a lack of underlying quantified data. For example, the provision by regulation of certain types of economic goods may be because no organized markets exist for such goods. Because there are no quoted prices, monetized values for these goods must be imputed. Such imputations may rely on evidence gleaned from other markets that have some bearing on the problem at hand. For example, anti-litter bottle legislation may be implemented by a regulation banning the sale of throw-away containers. One cost of such a regulation is the inconvenience imposed on consumers having to return containers. Data may be available that suggest what minimum monetary value consumers place on such inconvenience. These data might describe current price differentials between nonreturnable and returnable bottles.

Similar, albeit more controversial, problems of imputation arise, for instance, when trying to monetize the value of lives saved as a result of implementing a performance standard for commercial aircraft. Not only does the political nature of the impact--saving human lives--defy monetization, but also a reasonably accurate prediction of the lives saved may be difficult to obtain if such a standard were in place. Ideally, to place a dollar value on human life, information would be needed on the maximum price society is willing to pay to avoid deaths in commercial aircraft accidents. However, there is no easy access to such information.

### What prices should be used

If it is practical to monetize, efforts should be made to delineate between quoted and maximum prices that the consumer is willing to pay. 1/ Statistical estimation and consumer surveys are expensive ways to procure such data. 2/

On the supply side of the market, quoted prices for purchased resources are opportunity costs, provided that conditions of perfect competition prevail. The extent to which

---

1/Only by doing so will consumer surplus be measurable.

2/Variations in the prices of more expensive substitutes and the resulting number of consumers who switch to the product in question can also serve as a basis for measuring consumer surplus. However, in most cases, resources needed to provide reasonably accurate measures of consumer surplus may not be available. Consequently, impacts are likely to be monetized using quoted prices, and such estimates should be considered minimum values.

34

actual market conditions deviate from perfect competition is a measure of the need to estimate shadow prices, which measure the opportunity costs of the resources. For resources that are not purchased, use of an appropriate discount rate (to be discussed in discounting) is usually adequate to reflect their opportunity cost. 1/

### Pricing over time

For regulation with multiyear impacts, it is important to account for price changes over time. The principal reason for such accountability is that changes in the absolute price level might cause changes in benefits that are not commensurate with costs. For example, benefits might inflate more rapidly than costs during the life of the proposed legislation. 2/

In some cases, a budget constraint is not to be violated. Also, because a regulatory choice may be more inflationary than alternative decisions, the possibility of changes in the level and composition of savings is enhanced. These changes create implications for the composition of investment and, ultimately, economic growth. A more inflationary regulatory choice is likely to stimulate the accumulation of real estate, gold, and other forms of "savings" which are perceived as superior hedges against price rises. These portfolio changes can have repercussions on the composition of private capital formation which reduces the rate of economic growth and exacerbates future inflation trends.

### Price estimates

Despite compelling reasons to include price changes in impact measurement, economic models cannot predict such

_____

1/In most cases, it will be easier to obtain price information on the supply side, which is grossly representative of producer surplus because an institutional rationale exists for collecting such statistics. The private sector has an obligation as well as incentive to report accounting profits. Accounting profits differ from economic profits in that they do not include an opportunity cost calculation for unpurchased inputs.

2/These changes in relative prices may be due to changes in the relative prices of resources. For example, changes in the relative price of energy should discourage, though not necessarily prevent, adoption of an energy-intensive regulation.

changes very well. There are two major reasons for this shortcoming. First, some price changes may be predicted using a model expressly developed to analyze various regulatory choices. Such a model may be too localized--too partial in its analysis--to account for the myriad factors causing price movement. Second, recourse to the current generation of macroeconometric (global) models is unlikely to generate significantly better results. Generally, these models don't account adequately for supply-side factors of inflation. 1/

## Nonmonetized impacts

Practical considerations may impede the monetization of a variable impacted by proposed regulation. The absence of existing market values and the lack of data that permit quantification of the impact prior to monetization are two common problems. Added to these impediments may be sociopolitical and ethical arguments against monetization.

In situations where it is feasible to quantify the impact but not monetize it--as is the case, possibly, of expected lives saved resulting from mandatory installment of automobile-seat, passenger-restraint devices--there should be some comparisons of how many expected lives would be saved if the same amount of resources needed to supply the seat-restraint devices was used in alternative life-saving ways. For example, how many lives would be saved if those resources were used to provide additional police surveillance of highways to screen for drivers under the influence of alcohol. In addition to such comparisons of alternatives funded with a set amount of resources, an analysis should be conducted of regulatory choices which require varying amounts of resources. For example, several types of seat-restraint devices exist with varying price tags and degrees of protection. Other alternatives such as improved car design and highway quality should also be considered. Combinations of these alternatives should be analyzed. If it is feasible to monetize all impacts of these policy choice alternatives, save those related to health effects, the analysis should provide information on the incremental (marginal) costs of an additional life saved, of an additional injury avoided, etc., in comparing these alternatives.

---

1/Cf. L. R. Klein, "The Supply Side," American Economic Review, March 1978, pp. 1-8.

In other cases, it may be possible to place bounds on monetized values of impacts. Although the state of the art in estimation procedures or nonscientific arguments may prevent computation of "true" monetized values, it may be useful and, perhaps, more acceptable to estimate minimum or maximum monetized values, or to make comparisons with existing regulations' implicit monetized valuation of such impacts. For example, a regulation designed to reduce air pollution may have, as one of its benefits, reduced visibility impairment. A dollar estimate may be available of the value of increased airport activity made possible by better visibility, which would be a lower bound of the monetized value of such an impact. In the case of seat-restraint devices, an implicit monetized value may be determined for an expected life saved from FAA regulations designed to improve the safety record of commercial airlines. For example, assuming no other benefits from these FAA regulations, if $X have been spent by FAA to save an expected number of Y lives, a monetized value of life expressed as $X/Y may provide some guidance. 1/

A variable not well suited for quantification may be categorized as an "intangible" in the analysis. For example, the effect of an antitrust regulation on overall business climate--on business expectations concerning future government intention--is difficult to assess; yet, such an effect can have important implications for economic growth. At worst, such "intangibles" should be ranked in a qualitative way across alternatives. At best, it is desirable to express a value for an "intangible" by what it may produce.

## Discounting impacts

### Rationale for discounting

At the very least, legislation generates impacts that span the years or months coincident with its own life. Thus, economic impact analysis must account for a time stream of benefits and costs, sometimes referred to as life-cycle benefits and costs. 2/

---

1/Such a statistic is primarily useful as an instrument for judging consistency in Government safety efforts.

2/Discounting is unnecessary if benefits and costs in the first year of the proposal's life are representative of subsequent benefit and cost streams and if all opportunity costs have been accounted for.

At first, it might seem appropriate to total each year's dollar benefits and costs of regulation. But simply adding up the dollar benefits and costs of the first year and a later year (of the regulation's life) does not account for the preferences of society for present vs. future consumption. 1/ Such preferences for dollar benefits "now" vs. dollar benefits "later" do not suggest a one-to-one tradeoff between the first year's dollar of benefits and the 20th year's. Similarly, for costs, to pay one dollar "today"--foregoing one dollar of present consumption--as compared to delaying that expenditure for 19 years, underscores the burden of paying "today."

The preference for present vs. future dollars--irrespective of their benefit or cost connotation--is due to more than just subjective time preferences. Another important factor determining the rate of exchange between "today's" and "tomorrow's" dollars is the opportunity through investment for transforming present dollars or consumption claims into future dollars or consumption claims. The extent to which "today's" dollar can be invested in a productive activity to yield more than one dollar "tomorrow" characterizes the return on investment of "today's" dollar. The higher this return, the stronger will be society's preference for present vs. future dollars.

In summary, there are two principal reasons for suspecting that present dollars will be valued more highly than future dollars. These two reasons describe the motivations of those who consume goods--consumers or savers--and those who produce these goods--investors. The intersection of these two groups' preferences for present vs. future dollars provides a rate of exchange between "today's" and "tomorrow's" dollars that can be used for evaluating the life-cycle benefits and costs of regulation.

Determining a discount rate

The value of present dollars over future dollars can be summarized by a discount rate. For example, suppose that savers' and investors' preference for "today's" dollars over "tomorrow's" dollars intersect at the following rate of exchange: 50 cents "today" buys (is equivalent to) one dollar

---

1/The goal of economic activity is to provide goods which maximize society's satisfaction in consuming those goods.

"tomorrow." The discount rate is then equal to 100%
compounded daily, i.e., 50 cents, as principal, plus 50 cents
multiplied by an interest rate of 100% equal one dollar. 1/

In ideal markets, the discount rate can be estimated
from information on financial market rates. Actual practice
by the Government in choosing the appropriate discount rate
involves estimating the rate of return on capital formation
across key industries in the U.S. 2/

### Use of the discount rate

Before using the discount rate, benefits and costs over
the life of the regulation must be computed. These benefits
and costs should not be summed until after they have been
adjusted by the discount rate.

For example, suppose a regulation has an expected life
of 2 years. Benefits and costs must be computed for each
year. Benefits and costs in the first year will be measured
in present dollars; therefore, they do not need to be dis-
counted. Benefits and costs in the second year, measured
in future dollars, need to be discounted. Suppose benefits
in the first year equal $5 and benefits in the second year--
before discounting--equal $5. Further, assume a discount
rate of 10%. Summing these 2 years' benefits is accomplished
by the following formula: $TDB = B_1 + B_2/(1+r)$

where TDB represents total discounted benefits;

$B_1$  represents benefits in year 1;

$B_2$  represents benefits in year 2; and,

r    represents the discount rate.

_____

1/Appendix III contains the theoretical basis for determining
the discount rate.

2/In the context of figure 17, in appendix III, the Govern-
ment's choice of a discount rate involves estimating the
rate of transformation between present and future consump-
tion on curve AEB, assuming that the market for present vs.
future consumption is in equilibrium.

Using the values given, we obtain:

$$TDB = \$5 + \frac{\$5}{1+.1} = \$5 + \$4.55 = \$9.55.$$

The term $B_2/(1+r)$ deserves attention. From the above computation, $4.55 in year 1 is equivalent to $5 in year 2. Focusing on an investment interpretation of this equivalence, $4.55 invested "today" (year 1) will yield a 10% annual rate of return, so at the end of year 2 the investor will accumulate an additional $0.45 to bring his total to $5.00. 1/

Similarly, costs must be computed for each year. Suppose costs in year 1 equal $7 and in year 2 equal $3. Using the formula,

$$TDC = C_1 + C_2/(1+r) \text{ we obtain:}$$

$$TDC = \$7 + \frac{\$3}{1+.1} = \$9.73.$$

We can summarize the impact of this regulation by simply subtracting total discounted costs from their benefit counterpart:

$$NDB = TDB-TDC$$

where NDB represents net discounted benefits.

Using the values given, we get:

$$NDB = \$9.55 - \$9.73 = -\$0.18.$$

This regulation costs more than it benefits. The significance of discounting is underscored in this example by noting that an undiscounted summation of benefits and costs equals $0. Costs are $2 greater than benefits in year 1, and undiscounted benefits are $2 greater than undiscounted costs in year 2. Two dollars lost "today" (year 1) are worth more than $2 gained "tomorrow" (year 2).

Discounted benefits and costs are referred to as the present values of benefits and costs. This description is evident from the previous example. For instance, benefits in

_____

1/We assume that the $4.55 is invested at the end of year 1.

year 2 of $5 are equivalent to $4.55 in year 1, the present time period; $4.55 is the present value of $5 gained in year 2.

We can compute the net present value of a regulation with a life of N years by the following formula:

$$NPV = \frac{B_i - C_i}{(1 + r)^i}; \quad i=1,\ldots,N;$$

where NPV represents net present value;

$B_i$ represents $ benefits in year i;

$C_i$ represents $ costs in year i;

r represents the discount rate. [1]/

## Accounting for opportunity cost

An investment interpretation of the discount rate stresses that present dollars can be multiplied in the future. As indicated previously, both explicit and implicit costs of regulation must be identified. With ideal markets, the prices of purchased inputs will reflect the opportunity costs of such inputs. For unpurchased inputs, with no quoted prices, opportunity costs are not accounted for. The role of the discount rate can be viewed as addressing but not fully accounting for the opportunity costs of such inputs. [2]/

## Limitations of discounting

Critics of present value analysis often cite the failure of the selected discount rate to reflect the preferences of future generations. This failure, when it occurs, can be corrected by adjusting the rate downward. Unfortunately, there may be little, if any, scientific evidence upon which to base this adjustment.

---

[1]/For a discussion of accounting for price changes in the discount rate, see appendix III.

[2]/The discount rate does not fully account for the opportunity costs because the rate selected must, for practical considerations, be an average rate that does not account for the best alternative choice.

The preferences of future generations deserve special attention when irreversibility occurs. An example would be a regulation that leads to the extermination of an animal species. 1/

A more general criticism of present value analysis has as its basic argument the difficulty of choosing the "right" discount rate. One argument is that the discount rate is likely to change over time, so that choice of a single rate may bias alternatives' ranking. Another argument is that selection of a single rate, when valid, is fraught with error because of imperfect markets. Perhaps the best way to address these criticisms is to indicate the sensitivity of the results to variation of the discount rate.

## Distribution considerations

Economic impact analysis can be detailed further by examining the following: producer/consumer incidence, regional incidence, income-class incidence, interindustrial incidence, and public/private sector incidence.

### Producer/consumer incidence

Imposition of a regulation that results in higher costs of production is also likely to lead to higher consumer prices. However, both the increase in production costs and prices should not be added together, for this would be counting twice. Figure 7 indicates how much of the production cost increase is shifted to the consumer in the form of higher prices. S' corresponds to the postregulation scenario. Note that the market price rises from $p_A$ to $p_C$ as a result of regulation. On a per unit basis, the increase in production costs is equal to $p_B - p_A$. Consequently, it is

---

1/It is not necessary to show the effect of irreversible impacts through the value selected for the discount rate. For example, the importance of an irreversible impact, such as the possible extermination of the snail darter resulting from construction of the Tellico dam, can be reflected in the valuation of cost. However, due to the power of compounding interest, this valuation must be incredibly high over time to cause a reversal of the decision choice.

evident that the producer has shifted to the consumer the amount equal to $p_C - p_A$. [1]/


**FIGURE 7**
**PRODUCER/CONSUMER INCIDENCE**
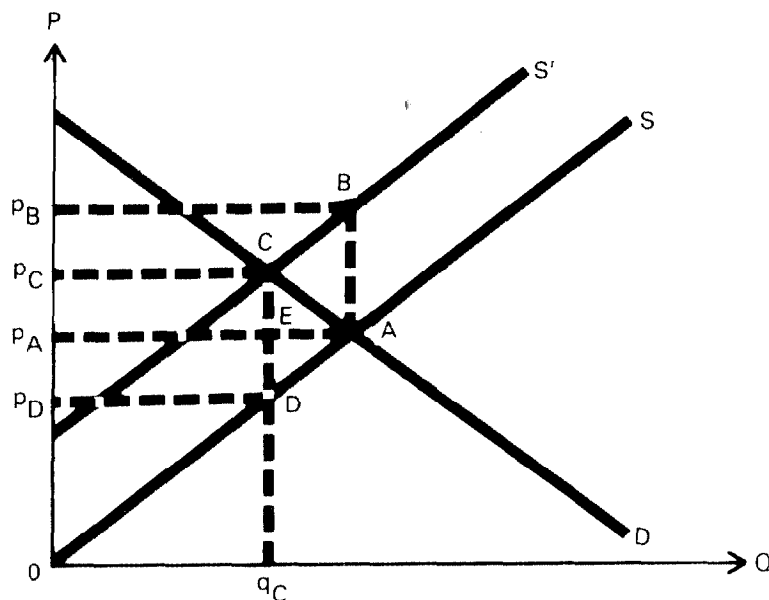


Although conceptually it is straightforward to determine producer/consumer incidence, practically such a calculation requires a large analytical input. Statistical estimation of both demand and supply curves may be needed. In some instances, it may be possible to refer to the ex post consumer/ producer incidence of a previous regulation to obtain some insight about the incidence of the new regulation.

If neither statistical nor historical analysis proves practical, it may prove useful to provide information on the increase in consumer price and consumer total cost if all regulatory costs were shifted to the consumer.

---

[1]/In terms of total cost incidence, consumers incur area $ECp_Cp_A$, and producers bear area $DEp_Ap_D$.

## Regional incidence

A regulation aimed at specific industries has a regional impact if the industries are located in different regions. In other cases, a regulation affecting minimum quality of an economic good may be manifested in the regional distribution of that good. For example, regulations governing housing quality may have a larger impact in urban than in rural areas.

A number of macro-econometric models have regional impact capability. These models predict regional impact incidence based on regional input-output data and regional final demand information.

## Income-class incidence

The impact of a regulation on income classes can be seen by analyzing income-class demand patterns. For example, deregulation of airlines will have an immediate effect on the welfare of airline passengers, who themselves have a particular income-class characteristic.

In other cases, the impact across income-classes will be harder to detect. For example, a regulation to improve coal mine safety has an important direct impact on the welfare of coal miners who generally are members of lower income classes. But this regulation is also likely to lead to higher coal prices. Since coal is an input in electric power generation, it follows that the income-class incidence of coal mine safety regulation is broader than first observed.

In general, information on household consumption of goods and services by selected income levels can prove to be valuable, as well as data on employment by industry and income class.

## Interindustrial incidence

As in the case of producer/consumer incidence, care must be taken to avoid double counting when mapping differential impacts across industry. For those industries that are vertically related, i.e., involved in producing a common final good, the use of input-output tables is recommended. 1/

---

1/See appendix III for an example of input-output use.

## Public/private sector incidence

Regulations which result in lost output can also cause lost tax revenues. Again, care must be taken to avoid double counting. A lost dollar sale of automobiles will be associated with a loss in income tax revenues of $0.25--if the rate is 25%--but the total impact is not equal to $1.25. The private sector loses $0.75 and the public sector, $0.25.

## Treatment of uncertainty

Uncertainty may pose special difficulties in two ways in the formulation and completion of economic impact analysis. 1/ The more prevalent uncertainty occurs when the magnitudes of impacts are not known for sure. More serious are those situations in which there is uncertainty about impact identification. 2/

### Magnitude of an impact

Assumptions are made in measuring impacts. These assumptions usually refer to parametric values used in the estimation process. For example, the "true" values of the discount rate, price elasticities, dose-response rates (for estimating adverse health effects), and inflation rates are unknown. As a result, indicating the sensitivity of impact magnitudes to variation of parametric values is best. Values for such parameters should be bounded in this sensitivity analysis. Possibly, confidence intervals can be constructed indicating maximum, minimum, and mean parametric values.

### Multi-outcome, latent, and phantom impacts

A more pervasive uncertainty may exist because some impacts are multidimensional and/or not well understood. Such impacts may be characterized by more than one possible outcome. In some cases, the problem may be magnified by an information gap that necessitates using highly subjective probabilities. The highest order of intractability occurs

---

1/A distinction has been made in the literature between the concepts of risk and uncertainty. Risk is characterized by a set of events with known probabilities; uncertainty, with unknown probabilities. However, no occasion arises in which such probabilities are ever fully known.

2/These two manifestations of uncertainty can be tied to economic calculus requiring generalization and the use of models, and to model specification being probabilistic.

45

when the very identity of some impacts or of impact outcomes is subject to uncertainty. 1/

This type of uncertainty may be shown by the myriad adverse health effects that an outdoor air pollutant may cause. Both the severity and types of health effects to be expected are conditional upon meteorology, demographic profile and size of the exposed population, smoking and diet history of this population, temporal duration of the exposure, and the presence of other pollutants in the ambient air. Arguably, dose-response rates, which map the severity and types of adverse health effects to pollution levels, should capture the influence of these factors. However, this point is academic because of data limitations. Typically, the analyst will have access only to an incomplete data set that fails to capture many of the possible synergisms. The severity of asthmatic attacks, decreased lung function, and short-term excess mortality due to varying levels of air pollution may have been mapped against only a small subset of possible values of these other synergistic factors. Aside from this information gap, there may be suspected long-term carcinogenic and mutagenic effects on humans for which no dose-response data are available.

For multidimensional impacts that can be quantified but not easily monetized, such as these health effects from the limited dose-response functions indicated above, a listing of the various outcomes and their probabilities (if available) may represent the best that can be achieved with that data. Needless to say, this listing constitutes only a small subset of possible synergistic effects as outlined in the above example, and it fails to account for possible long-term outcomes. For this unmapped part, the best that can be accomplished is a set of quantified outcomes--outside the scope of any estimated dose-response functions--with highly subjective probabilities. It is advisable in that case to indicate a range of probabilities that reflect the differences in scientific opinion. The number offering their opinion, as well as the sample size and possible bias, are also desirable. In addition, for those long-term, latent, and possibly phantom effects, the extent to which such impacts have been the subject of scientific scrutiny and important findings and qualifications should be indicated.

_____

1/It is one thing to identify an impact that is probabilistic and quite another not to recognize an impact or some of its outcomes.

46

For multidimensional impacts that can be monetized and for which there exist reasonably good estimates of their various outcomes' probabilities, the computation of expected present value is appropriate. This computation is straight- forward: simply multiply the outcome values by their respec- tive probabilities, discount, and total. This will yield the expected present value. Depending upon variance and number of possible outcomes, maximum and minimum values and their probabilities and confidence intervals may be revealed.

Given the limitations of assessing risk and uncertainty, an array of highly predictable impacts against those with a high degree of uncertainty may be instructive. In this way, the question is highlighted by society's willingness to bear risk (or uncertainty). How much is society willing to forego in order to avoid such uncertainty? Determining society's risk (or uncertainty) premium may be abetted by comparing the nature and relative size of the risk (or uncer- tainty) under investigation with other risks (or uncertain- ties) for which we have a record of societal acceptance or rejection.

PRESENTATION AND ORDERING OF RESULTS

It is unlikely that all benefits and costs will be mone- tized, for reasons cited in the previous section. Some im- pacts will be nonmonetized but quantified, and some intan- gibles may occur.

It is advisable to lump together all monetized impacts, which will be referred to as the net present value (NPV) of those impacts. It is not likely that nonmonetized, quanti- fied impacts can be summed.

Alternatives analyzed should be ordered according to these computed NPV's, and should also be separately ordered according to nonmonetized, quantified impacts and intangi- bles. In this way, the tradeoffs between alternatives can be highlighted.

It may also be fruitful to compare alternatives by focusing on their present values of monetized costs and their present values of nonmonetized, quantified benefits. Table 1 is an example of this type of ordering.

To the extent that individual nonmonetized benefit cate- gories can be costed, it may be useful to compute marginal cost schedules for these impacts. Even when this is not pos- sible, it may still prove useful to compute marginal costs for

Table 1

Comparing Present Values (PV) of Monetized
Costs with Lives Saved

| Alternative | PV costs (in millions of dollars) | Incremental costs (in millions of dollars) | PV expected lives saved (in hundreds) | Incremental lives saved (in hundreds) | Marginal cost of a life saved |
|---|---|---|---|---|---|
| Mandatory air bags | $10 | | 1000 | | |
| Lap and shoulder harness, padded dash | $ 5 | $5 | 750 | 250 | $200 |
| Lap strap, padded dash | $ 4 | $1 | 500 | 250 | $ 40 |
| Padded dash | $ 3 | $1 | 50 | 450 | $ 22 |

each category across alternatives, as an expositional device
highlighting tradeoffs.

Given the mixture of monetized, quantified but non-
monetized, and intangible benefits and costs which are likely
to be encountered in any economic impact analysis, and given
the limitations of tradeoff analysis, valid equivalencies be-
tween various impacts should be established. In other cases,
where it is difficult to demonstrate such equivalencies, in-
sights may still be gained by posing hypothetical equivalen-
cies between some impacts. Not only should such equivalencies
be sought consistently within a given alternative but also
across alternatives.

The following discussion dealing with legislation which
would relax the ambient air quality standard for sulfur di-
oxide in the State of Maryland is an application of such
"equivalency analysis," and highlights the types of data
likely to be presented for review by the policymaker. Since
this example does not expressly include other alternatives,
it should be viewed as an approximization of the lower end
of complexity to be encountered. Tradeoffs between benefits
and costs of relaxing the sulfur dioxide standard to the
national ambient air quality standards (National AAQS) are
noted in table 2.

Two alternative decisionmaking processes are illustrated in figure 8. Decisions and the tradeoffs characterizing them are arranged in a pyramid. In step one, all benefits and costs are sorted into two groups. First, the monetized benefit of cost savings is compared to the monetized cost of corrosion. Second, unquantified benefits of economic growth and improved health are juxtaposed to unquantified costs of adverse health, vegetation damage, and visibility impairment. Step two, using subjective judgment, considers likely equalities between a subset of all benefits and costs.

Step three considers the final tradeoff highlighting the two most important economic impacts in the policy decision. Thus, the final decision can be summarized in two possible ways:

1. Are Marylanders willing to forego between $69.3 million and $5.4 million per year in net cost savings to avoid the risk of adverse health which is undemonstrated at the National AAQS?

2. Are Marylanders willing to forego potential economic growth to avoid the risk of adverse health which is undemonstrated at the National AAQS?

## Table 2

### Economic Impacts From
### Sulfur Dioxide Deregulation

| Economic impact | Benefit | Cost | Magnitude | Special considerations |
|---|---|---|---|---|
| Adverse Health | | x | no demonstrated effect | assumed air quality just meeting National AAQS |
| Corrosion | | x | $1.6 million to $.7 million per year (1977 dollars) | air quality just meeting National AAQS |
| Vegetation Damage | | x | small | some evidence of crop damage from combined doses of NO2 and SO2 near the National AAQS. Some evidence of floral damage from doses of SO2 near the National AAQS |
| Visibility Impairment | | x | small | magnitude depends largely or relative humidity |
| Economic Growth | x | | unknown | gains in real personal income depend on reaction of existing & prospective Md. firms to deregulation |
| Cost Savings | x | | $70 million to $8 million per year (1977 dollars) or $62 million to $7 million per year (1977 dollars) | air quality just meeting National AAQS / air quality just meeting PSD provisions of Clean Air Act |
| Income- Health Effects | x | | unknown | |
| Transfers | | | unknown | |

**FIGURE 8**
**DECISIONMAKING PYRAMIDS AND TRADEOFFS**

CASE A
NET COST SAVINGS
vs. ADVERSE
HEALTH
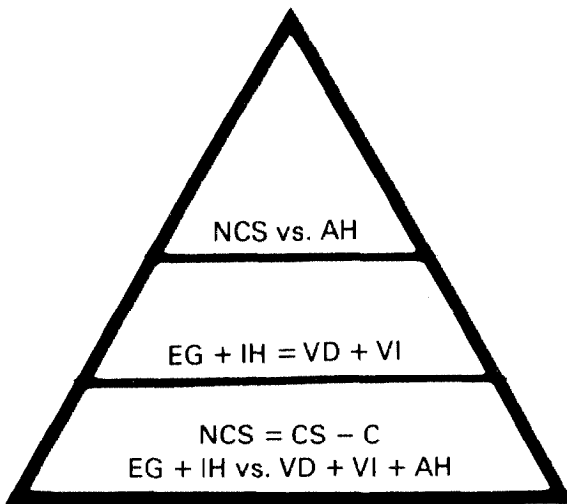
CASE B
ECONOMIC GROWTH
vs. ADVERSE
HEALTH



NCS vs. AH

EG + IH = VD + VI

NCS = CS − C
EG + IH vs. VD + VI + AH

EG vs. AH

NCS + IH = VD + VI

NCS = CS − C
EG + IH vs. VD + VI + AH
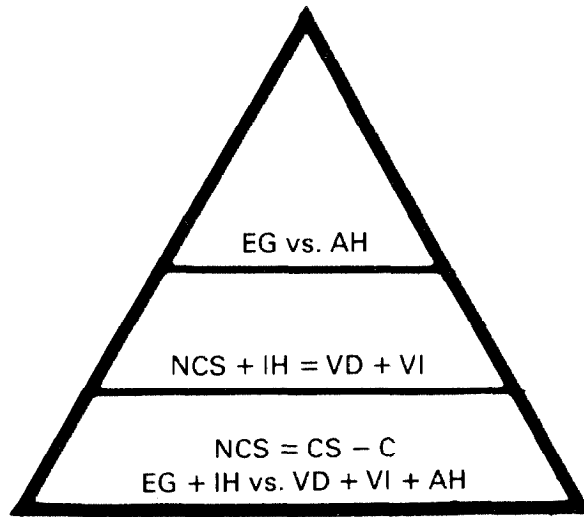
Legend:
NCS = NET COST SAVINGS
AH = ADVERSE HEALTH
EG = ECONOMIC GROWTH
IH = IMPROVED HEALTH
VD = VEGETATION DAMAGE
VI = VISIBILITY IMPAIRMENT
CS = COST SAVINGS
C = CORROSION

51

CHAPTER 4

APPLYING ECONOMIC IMPACT ANALYSIS:

THE CASE OF AIRLINE DEREGULATION

In this chapter the methodological principles presented
in this report are applied to an actual example.  The data and
analyses used are pooled from studies of airline deregulation
available before enactment of the 1978 Airline Deregulation
Act.  A number of techniques are used to illustrate this
example.

For instance, we present the following analysis as if it
had been written prior to consideration of the Deregulation
Act.  In addition, we preface each major section with ques-
tions summarizing its aim.  We also note shortcomings of the
analysis and suggest how they could have been mitigated.
Finally, applications are organized along the lines of
Chapter 3.

## DEFINING THE PROBLEM

The two key questions raised in this section are:

- What is the problem or issue targetted by the pro-
  posed Airline Deregulation Act?

- Why is this a problem?

To answer these questions we have described the problem and
identified its welfare implications in the context of this
country's market economy.

### Describing the problem

The proposed act addresses the issue of air transporta-
tion in the U.S. as regulated by the Civil Aeronautics Board
(CAB).  We answer how this issue bears on the decisions of
consumers and producers of air transportation and whether
there are any special distributional or equity consequences
after we examine the enabling legislation of CAB and its
regulation, and after we contrast these elements with legis-
lative proposals to deregulate.  This task has been facili-
tated by reviewing testimony which has played an important
role in shaping the original legislation and reform efforts.
Accordingly, we focus on the following questions:  What are
the principal regulations?  What legislative objectives are
they designed to fulfill?  How do these regulations affect
the decisions of producers and consumers of air transporta-
tion?  How do they bear on the distribution of that good?

What are the major reform proposals and what do they suggest about production, consumption, and distribution of air transportation?

## Existing legislation

In 1938, the Congress passed the Civil Aeronautics Act and authorized the Civil Aeronautics Authority (renamed the Civil Aeronautics Board, CAB, in 1940) to oversee domestic and foreign air transportation service of U.S. air carriers. 1/ A major objective of the 1938 Act was to protect an "infant" industry. Sponsors of this legislation stressed the need to safeguard the U.S. air transportation industry from destructive competition and resulting instability of service delivery and unattractiveness to venture capital. 2/

CAB was granted the following powers to implement the Act: to set fares and judge fare changes, to control entry, to grant antitrust immunity, to administer a subsidy for local carriers. 3/ CAB, through its policy of protective certification, generally has not permitted price competition by

---

1/Intrastate and commuter airlines for most purposes are not regulated by CAB. A commuter airline uses aircraft with fewer than 30 seats. Paul MacAvoy and J. Snow, eds., Regulation of Passenger Fares and Competition Among the Airlines (Washington, D.C.: American Enterprise Institute, 1977), pp. 39-41. Also, U.S. Dept. of Transportation, An Annotated Summary of the Arguments For and Against Regulatory Reform of the Domestic Airline System of the U.S., April 25, 1977, p. 5.

2/Civil Aeronautics Board, Regulatory Reform: Report of the CAB Special Staff, Washington, DC, 1975, p. 20. A similar interpretation of the driving force behind the 1938 legislation has been offered in: U.S. Congress, Senate, Civil Aeronautics Board Practices and Procedures, Report of the Subcommittee on Administrative Practice and Procedure of the Committee on the Judiciary of the U.S. Senate, 94th Cong., 1st sess., 1975, pp. 209-15. Hereafter, we shall refer to this report as the Kennedy report.

3/G. Douglas and J. Miller, Economic Regulation of Domestic Air Transport: Theory & Policy, 1974. Also, U.S. Department of Transportation, Annotated Summary, 1977, pp. 3, 20.

new carriers and has discouraged price competition by established carriers. 1/

CAB route policies, like rate regulation, have been aimed at "reconciling new competition with protection of the incumbents." CAB has approved new service to be provided by existing carriers if demand has been sufficient "to support the new service without seriously eroding the overall profitability of the incumbent carrier or carriers." 2/ In contrast to this "relatively liberal policy" toward existing carriers, CAB has prevented new firms from entering long haul scheduled routes with just one exception. 3/ According to CAB, underlying intent of antitrust immunity for intercarrier agreements has been to "facilitate the operation of the industry as an integrated system * * * [and] produce significant cost savings or product improvements which would not be available without cooperative action." For instance, it has been argued that capacity reduction agreements have prevented "a financial crisis brought on by the failure of traffic growth to meet expectations" and as preventing "a chronic tendency toward excess capacity inherent in the nature of airline competition." 4/

Beginning in 1943, CAB has used its subsidy program to assist local service carriers. CAB has adopted a "use-it-or lose-it" policy "intended to permit carriers to drop their

---

1/According to the Kennedy report, the law requires "that certificated carriers file tariffs with the Board specifying the rates [prices] that will be charged" (p. 104). CAB is authorized "to grant or deny 'certificates of public convenience and necessity' allowing firms to offer air service on individual routes" (p. 77). Lengthy litigation has discouraged existing firms. Also, Kennedy report, pp. 120, 178. Also, U.S. Dept. of Transportation, Annotated Summary, 1977, p. 6; CAB, Regulatory Reform, 1975, pp. 51-52, 55, 58-59; Douglas & Miller, Economic Regulation, 1974, pp. 40-41.

2/CAB, Regulatory Reform, 1975, pp. 43, 51-52, 54-55.

3/Ibid., pp. 43-49. Trans-Caribbean is the exception.

4/Ibid., pp. 92, 95-96. In such agreements, carriers have agreed to restrict the number of flights, for example, in the face of a passenger seating surplus. A lowering of fares to encourage more passengers has not been made part of such agreements. Consequently, consumers have suffered a decrease in available service without any reduction in fares.

least profitable stations." 1/  This has led to a switching
of losing trunk points to local service carriers and to a
dropping of many stations by the local service carriers. 2/

## Proposed legislation

Public and congressional inquiry of CAB rate-setting
procedures has been sparked by fare differences between certi-
fied interstate airline service and uncertified, irregular
service in the 1950s and, more recently, by fare differences
between interstate and intrastate carriers. 3/  Entry condi-
tions have also been criticized.  As a result of mounting
criticism, the Congress initiated a formal investigation of
CAB regulation in 1974, which culminated in the 1975 hearings
of a Senate Judiciary Subcommittee and subsequent legislative
proposals. 4/

During these hearings Senator Edward Kennedy raised two
thematic questions which appropriately summarized the thrust
of legislative proposals being made today.  Kennedy asked,

"First, are they [and CAB's practices and procedures]
effective? Do they result in reasonably priced air trans-
portation for the consumer and reasonable incentives for

---

1/Ibid., pp. 77-80.

2/Ibid., pp. 79-80.  A trunk air carrier is a member of "a
   class of certificated route air carriers receiving orig-
   inal certification under the 'grandfather clause' of the
   Act (1938) and whose primary operations are in domestic,
   scheduled passenger service between relatively medium
   and large air traffic hubs."  A local service air carrier
   belongs to "a group of air carriers originally estab-
   lished in the late 1940s to foster and provide air serv-
   ice to small and medium communities on relatively low den-
   sity routes to large air traffic hubs..." Civil Aeronautics
   Board, Glossary of Air Transportation Terms, Feb. 1977.

3/Irregular service refers to nonscheduled service.  As men-
   tioned previously, intrastate carriers are not subject
   to CAB regulation.

4/U.S. Congress, Senate, Oversight of CAB Practices & Proce-
   dures, Hearings Before the Subcommittee on Administrative
   Practice & Procedure of the Committee on the Judiciary,
   94th Cong., 1st session on Oversight of CAB Practices &
   Procedures, Vol. 1, Feb. 6, 1975.  These hearings are here-
   after referred to as the Kennedy hearings.

the airlines to provide that service?  Second, are they [these practices and procedures] fair?" 1/

In 1976 and 1977, Senator Howard Cannon held Commerce Committee hearings on CAB regulation before the Subcommittee on aviation. 2/  During this period, Cannon put forth his own proposals for airline deregulation which did not go as far as Kennedy's proposals.  Eventually, however, a compromise was reached between the two proposals, hereafter referred to as the Kennedy-Cannon proposals.

As the leadoff witness in the Commerce Committee hearings, Kennedy asserted that "[l]ow barriers to entry are the best incentive for incumbent carriers to keep service good and prices economical." 3/

### The Kennedy-Cannon Proposals vs. the Act

A comparison of reform with original legislative objectives provides a convenient summary not only of how CAB regulation has impinged upon producer and consumer decisions but also of what has been perceived as the distributional consequences of deregulation.  The principal point of departure relates to the role of competition among air carriers. In the Kennedy-Cannon compromise proposals, actual and potential competition would ensure "efficiency, innovation, and low prices" and would determine "the variety, quality, and the price of air transportation services." 4/  In contrast, the existing Act has relegated competition among producers to a secondary role.  According to this Act, competition is needed only "to the extent necessary to assure the sound development of a system."

---

1/Kennedy hearings, p. 2.

2/Hearings Before the Subcommittee on Aviation of the Committee on Commerce, Science, and Transportation, U.S. Senate 95th Congress, 1st Session on S. 292 and S. 689, March 21-24, 1977.  These hearings are hereafter referred to as the Cannon hearings.

3/Cannon hearings, p. 105.

4/Air Transportation Regulatory Reform (Washington, D.C.: American Enterprise Institute, March 1978), p. 4.

Modeling the problem 1/

Reviewing existing legislation, regulations, and major reform efforts suggests, in a preliminary way, why air transportation in the U.S. overseen by CAB is an issue. In this section, we explore the welfare implications of CAB regulation in the context of our market economy. We offer a more detailed explanation for the observed pattern of production, consumption, and distribution of airline services than was presented in the previous section.

In this section we probe for the causes of the present regulatory pattern, searching for answers in the context of the market for air transportation. How do CAB regulations impact upon this market? What impact do these regulations have on the resulting price and quantity of air transportation services? 2/ What are the economic welfare implications of this price and quantity? Whereas in the previous section we examined how these regulations affect the decisions of producers and consumers of air transportation services, in this section we ask why producers and consumers respond in the observed ways to such regulation. Answers are gleaned by analyzing the market.

While answers to some of these questions may appear self-evident after examining what the regulations say, those proposing and opposing regulation have constructed different models of the air transportation market. Differences in these models account for disagreement about the impacts of such regulation. 3/

The existing regulated market view of the proponents

Destructive competition-- As previously outlined in our discussion of the existing legislation's objectives, supporters of CAB regulation believe that in its absence

---

1/In chapter 3, we noted that establishing a logical framework to better understand the problem is commonly referred to as modeling.

2/The resulting price is sometimes referred to as the market-clearing price. This is the price which buyers and sellers negotiate.

3/As mentioned in chapter 3, modeling the problem means establishing a logical framework to understand the problem. Such a logical framework may be either explicitly or implicitly stated by the one arguing a particular point.

destructive competition would beset the air transportation
market.  According to this destructive competition model,
what impact do CAB regulations have on the price and quantity
of air transportation services?  What are the economic wel-
fare implications of no such oversight?

Destructive competition is a condition in which a spate
of price wars would render rival firms incapable of meeting
the demand for air service.  Two market characteristics have
been cited as conducive to destructive competition:  highly
capital-intensive firms and relatively immobile capital. 1/
In this context, CAB regulation has been judged by its pro-
ponents as preventing wide fluctuations in price and quality
and sustained losses by the producers. 2/

As a result, promoters of the destructive competition
hypothesis believe that CAB regulation has eliminated un-
satisfied demand for air transportation service by consumers
and has assured greater financial stability for air carriers.
According to this argument, by preventing price competition,
CAB regulation has eliminated the threat of price wars.  In
figure 9, these effects can be seen by comparing point E,
corresponding to a minimum regulated price $\bar{p}$ with point L,
a price-war result.  If capital is relatively immobile, the
survivors of price wars would not be able to respond expedi-
tiously to the shortage situation at point L.  But by regu-
lating rates and entry, proponents of CAB regulation feel
that the dynamics of destructive competition, possibly repre-
sented by the supply path EFL, can be obviated. 3/

Monopolization--Another version of the proregulation
model contains the following two elements:  economies of

---

1/"Report to the Congress, Government Regulatory Activity:
   Justifications, Processes, Impacts, and Alternatives,"
   U.S. General Accounting Office, June 3, 1977, pp. 13-14.

2/Ibid., p. 14.

3/Thus, using the concepts of consumer and producer surplus
   in the context of figure 9, proponents of CAB regulation
   might argue that a loss of economic welfare equal to area
   GEL could be prevented.  Producer surplus (profit) would
   be higher than in a deregulated scenario, and consumers
   would benefit from a greater quantity of service supplied.
   Consumers would also pay higher fares, so the impact on
   consumer surplus is ambiguous.

**FIGURE 9**
**DESTRUCTIVE COMPETITION**
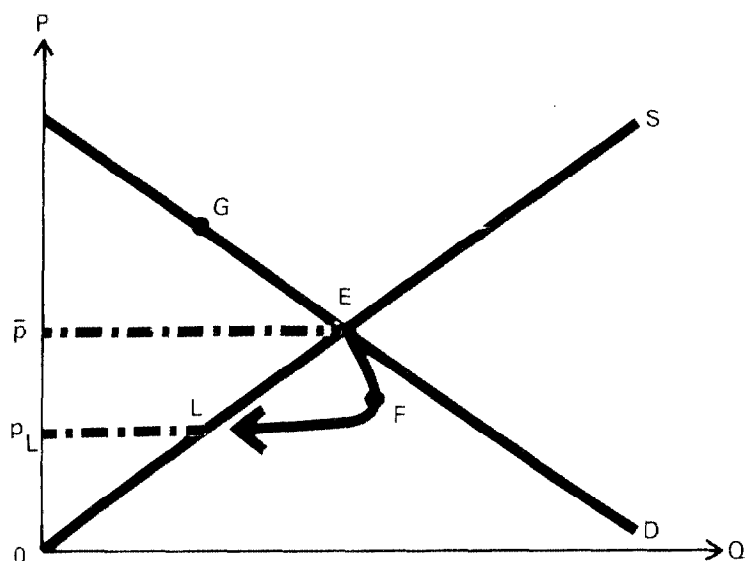


scale and predatory, below cost pricing leading to monopoly
power. 1/, 2/  What price and quantity will result from CAB
oversight?  What are the economic welfare implications of
no such regulation?

Figure 10 conveniently summarizes the "monopoly" model.
Supply curve S designates the production schedule under com-
petitive conditions.  Point M corresponds to the exercise
of monopoly power.  The monopolist levies a higher price and
supplies a smaller amount of air transportation service than

---

1/U.S. Department of Transportation, An Annotated Summary of
the Arguments For and Against Regulatory Reform of the
Domestic Airline System of the U.S., 4/25/77, p. 16.

2/The question, "What type of market failure is being ad-
dressed here?" is relevant.  In the previous chapter, it
was noted that an ideal market is perfectly competitive.
One of the characteristics of perfect competition is that
no one can rig the market by manipulating it for his own
gain.  Economies of scale means that the average per unit
cost of producing a product decreases as the number of such
units produced increases.

at the regulated point R. Consequently, as shown in this model, CAB regulation prevents a loss of economic welfare equal to area MRN. Consumers of air transportation services enjoy lower fares as a result of such regulation. 1/ Profits for the industry fall by the difference between areas $P_M MTp_R$ and RNT. 2/

**FIGURE 10**
**THE MONOPOLY MODEL**
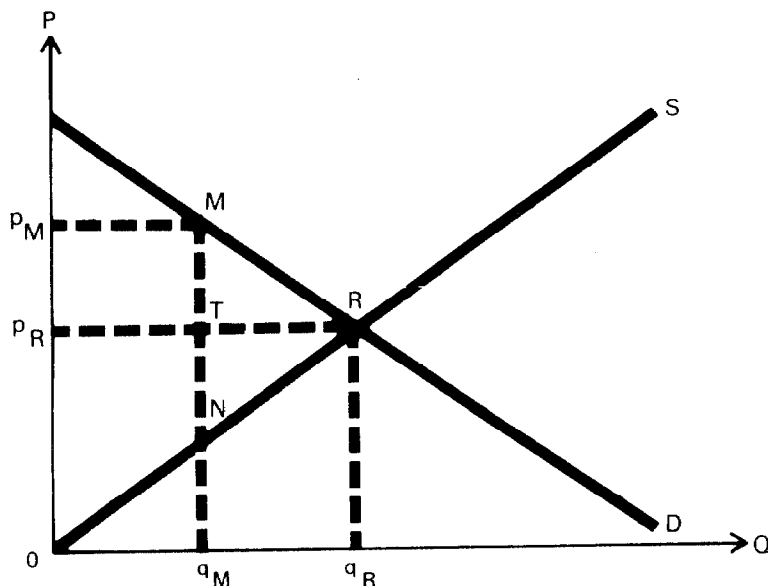


Externalities, imperfect knowledge, and equity--It can be argued that CAB regulation promotes safety and mitigates disruption of service to small towns. These arguments refer to two types of market failure. The issue of safety can be usefully classified as a problem combining the market failure

---

1/Regulation results in an increase in consumer surplus equal to area $P_M MRp_R$.

2/This equals the fall in producer surplus.

attributable to the consumer's imperfect knowledge and to
externalities. 1/ Disruption to small towns appears to be
primarily an equity issue.

Summary--How does CAB regulation impact upon the air
transportation market? The destructive competition model
predicts that regulation results in higher producer profits
and a greater quantity of air transportation supplied to
consumers. The monopolization model predicts lower producer
profits, lower fares, and more service. Imperfect knowledge,
externalities, and equity leads to the prediction that regu-
lation results in safer, more expensive air transportation
and more service to smaller communities. 2/

## The proposed deregulated market-view of the proponents

What impact would deregulation have on the market-clear-
ing price and quantity of air transportation services? What
are the economic welfare implications of continuing CAB
regulation?

The cartel model--During the Kennedy hearings, Alfred
Kahn likened the regulated market for airline services to a
cartel. He identified the characteristic pricing and pro-
duction behavior of a cartel, and suggested that such be-
havior aptly described the market in question. Restricting
capacity to maintain market shares, charging fares suffici-
ently high to protect inefficient carriers, and controlling
entry were all cited as characteristic of air transportation
under CAB aegis. 3/ However, Kahn added that this cartel
arrangement has been established in a "structurally competi-
tive market." The result, according to Kahn, has been heavy

---

1/In chapter 3, an ideal market was characterized by buyers
   (consumers) who know exactly what they're purchasing. In
   the absence of externalities, any benefits or costs associ-
   ated with selling and purchasing economic goods in a market
   accrue to, or are incurred by, participants of that market.

2/The apparent nexus between CAB regulation and safety in-
   volves the dual premise that CAB oversight prevents erosion
   of carriers' profits and that such erosion encourages air-
   lines to "cut corners" on matters of safety.

3/Kennedy hearings, pp. 96-97.

reliance by carriers on nonprice competition. Implications for price, quantity, and economic welfare are alluded to in the following statement by Kahn:

> ...where [CAB] regulation has been introduced principally to prevent competition from driving price down, [CAB has] had to recognize the service competition that pushes costs up can be almost as "destructive" as unrestricted price rivalry--witness the disastrous impact of competitive scheduling of flights on airline load factors, costs, and profits. 1/

The nonprice rivalry model--A similar description of the market was made by James Miller during both the Kennedy and Cannon hearings. 2/ Miller described a nonprice equilibrium process that inevitably led to a break-even point of normal profit. For example, if a carrier had a load factor in excess of the break-even load factor, excess profit would encourage airlines to increase their capacity until the break-even point was obtained. Thus, in both the Miller and Kahn analyses, an assessment was made that the market is structurally competitive.

A crucial question raised by Miller was whether CAB's choice of a 55% load factor in the Domestic Passenger Fare Investigation (DPFI) has been consistent with an optimum portfolio of price and service (nonprice) competition. He concluded that CAB has chosen a load factor standard which is too low. Thus, fares based on this standard and quality of service--the chief variable of nonprice competition--both have tended to be higher than consumers may choose on their own. Put another way, Miller concluded that airline passengers are paying a higher fare than the accompanying reduction in delay is worth; i.e., a low load factor standard means more frequent flights. 3/

The impacts of CAB regulation on the price and quantity of air transportation service and economic welfare are summarized in figure 11. Supply curve S' reflects the inflated costs attributable to such regulation. If carriers were free

---

1/Ibid.

2/U.S. Congress, Senate, Regulatory Reform in Air Transportation, Hearings Before the Subcommittee on Aviation of the Committee on Commerce, Science, and Transportation, 95th Cong. 3/21-24, 1977, p. 308.

3/Ibid., pp. 308-316.

to set fares so as to optimally balance price and quality
of service, supply curve S would depict their position. The
quantity of airline service, as a number of passenger-revenue
miles, is measured on the horizontal axis. CAB regulation
has resulted in fewer passengers (q') served at higher prices
(p') than in an unregulated scenario (q, $p_c$). Thus, accord-
ing to this model, some major direct benefits of deregulation
are lower fares to existing passengers and fares to new pas-
sengers which are lower than the maximum prices they would
have been willing to pay. 1/

**FIGURE 11**
**IMPACTS OF CAB REGULATION**
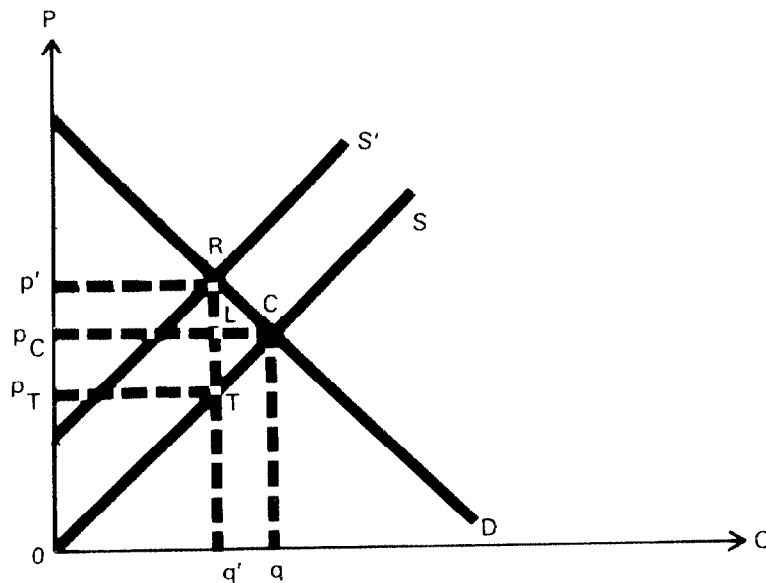


Another potentially important direct benefit from de-
regulation accrues to the producers of this air transporta-
tion. If airlines have been engaging in nonprice competition
and if such competition explains the location of S' vis a
vis S, deregulation will lead to a reduction in the costs
of providing such service. If deregulation leads to a fall
in per unit cost of RT in figure 11, producers receive an
additional profit equal to area $p_C LTp_T$ for q' passengers

---

1/For existing passengers, their consumer surplus increases
  by the area p'RLp$_C$ in figure 11. For new passengers, their
  consumer surplus equals area RLC.

served. Since deregulation also leads to an increase in passengers served, an additional profit equal to area LCT accrues to these producers. 1/ However, if the industry is competitive, any such gain in producer profit is temporary; for the gain will encourage market entry until only normal profit is earned. Nevertheless, such gain may be substantial while it lasts. In the long run--a duration marked by the time it takes to organize resources in response to these temporary profits--the supply curve S in figure 12 may shift further down and to the right. Figure 12 depicts long-run equilibrium in the air transportation market. The supply curve becomes horizontal at $p_E$, so there is no excess producer profit. 2/

**FIGURE 12**
**LONG-RUN EQUILIBRIUM IN THE AIR TRANSPORTATION MARKET**
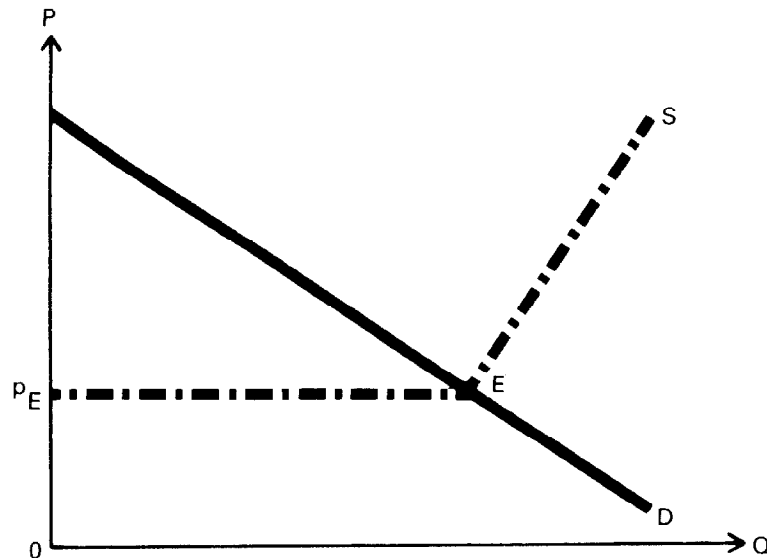


1/Gains in producer profit are equivalent to gains in producer surplus.

2/The distinction between excess profit and normal profit is that the former constitutes a surplus above the opportunity cost of the resources used.

Individual airlines supply service at a price $p_E$ which just covers the average and incremental costs of producing such service. This analysis of producer impact is in accord with the assumption that the airline industry is structurally competitive and that nonprice competition caused by CAB regulation has exhausted any excess profit.

The cartel model revisited--To some degree, entry restrictions may have prevented the full weight of nonprice competition, and resulting monopolistic profits may have accrued to some established producers. Deregulation would reduce these profits on routes which were successfully insulated from nonprice competition. Figure 13 portrays the market for such routes. Profits are reduced by area $p_Z Z W p_C$. Monopolistic output is $q_Z$ priced at $p_Z$. This loss in profit (producer surplus) will be partially offset by gains in profit as a result of more output, $q_C$. Consumers benefit from lower passenger fares, to the amount of $p_Z Z C p_C$.

**FIGURE 13**
**ROUTES INSULATED FROM NONPRICE COMPETITION**
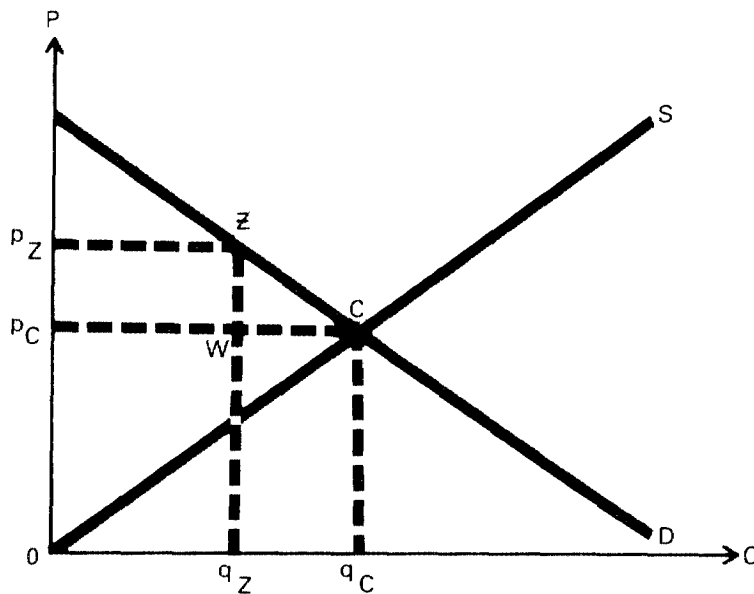


Summary--How does CAB deregulation impact upon the air transportation market? An examination of the cartel and nonprice rivalry models leads to the prediction that deregulation would generate lower fares and more output. If structural competition is an accurate barometer of the market, deregulation should lead to short-run gains in producers' profits.

## Identifying other alternatives
## and institutional constraints

Additional inquiries addressing the relative merits of
alternatives other than existing regulation or deregulation
and the role of institutional constraints in selecting alter-
natives have, to a limited extent, been answered.  The per-
tinent questions are

- How do the market results of actual and proposed
  legislation differ from those associated with more
  or less regulation?

- Do institutional constraints delimit the feasible
  set of alternatives?

The Kennedy report included some analysis of alterna-
tives.  The alternatives include

"(1) increased reliance upon fare competition; (2)
increased use of charter flights; (3) higher load
factor standards; (4) more discounts; and (5) im-
posing strict controls on scheduling." 1/

The reasons offered for supporting or opposing these alterna-
tives are much the same as have been offered for or against
deregulation.  The relative merits of alternatives (1) through
(4) compared to complete deregulation have not been examined,
and alternative (5) is simply a form of capacity restriction.
Depending upon the verdict on the deregulation proposal before
us, there may be no compelling reasons to examine these alter-
natives further.

One important institutional constraint deals with the
FAA's jurisdiction over airline safety.  However, the deregu-
lation proposal being considered affirms this jurisdiction.
It does not appear worthwhile or, for that matter, germane
to consider airline safety deregulation.

## IDENTIFYING AND MEASURING BENEFITS OF
## DEREGULATION

The key questions in this section are

- What benefits accrue to society from enacting and
  implementing the proposed legislation?

---

1/Kennedy report, pp. 129-130.

- How are these benefits measured?

- How are the estimated magnitudes of such benefits effected by variation in the values of estimation parameters?

The principal tasks are designed accordingly: to identify the types of benefits through model analysis, and to present various estimates of their magnitude.

## Identifying benefits through the model

As explained in chapter 3, there are a number of distinctions that can be made about types of benefits that are useful in identifying such benefits. A typology based on distinctions between private and social benefits, direct and indirect benefits, and explicit and implicit benefits was presented in chapter 3. Thus, relevant questions here are

- What private and social benefits will be generated by the proposed legislation?

- What direct and indirect benefits will be forthcoming?

- What explicit and implicit benefits will surface?

A separate question regarding identification of benefits pertains to choice of the model to be used in this task. Which model of the air transportation market is to be selected for identifying benefits? In this context, economic-impact analysis can be regarded as a test of the validity of various models offered by proponents and opponents of deregulation. 1/ However, rather than identify all possible benefits from all the models discussed in the previous section, a prudent course is to choose that model which supporters of proposed legislation have presented. 2/

---

1/A convenient way of testing the specification of various models is to identify their predicted impacts and check for empirical verification.

2/This is prudent for two apparent reasons: first, supporters of deregulation have offered one basic model, rather than the several offered by opponents; second, once the benefits from such a model are identified, they will be subjected to empirical verification. If such benefits do not materialize, then arguments for the other side will be more appealing.

Following this course, an analysis of the cartel, non-price rivalry models of the previous section suggests major expected benefits in passenger fare reductions and short-term improvements in the overall profitability of the air transportation industry.  Given pronouncements in the previous section about objectives of proposed legislation, both of these benefits appear to be accurately typed as explicit impacts.  Since deregulation would immediately impact carriers and the passengers that they serve, these benefits are also aptly typified as direct.  Finally, these benefits arise through the workings of the market system, so they are private impacts.  Undoubtedly, there are indirect impacts arising from deregulation.  In this example of airline deregulation, no major indirect benefits were identified through analysis of the model. 1/

## Measuring benefits

In chapter 3, the need for baseline data was cited.  Are there other factors besides the proposed legislation which may contribute to the magnitude of measured benefits?  A distinction was also also made between monetized and nonmonetized impacts.

For monetized impacts, the following questions are germane:

- Are the quoted prices accurate reflections of benefits?

- Have price changes over time been accounted for?

- What is the appropriate discount rate?

In this example, sufficient evidence was not available to answer these questions.  The need for discounting is not compelling since a strong case can be made that benefits in any given year are representative of future years.  With respect

---

1/As previously stated, deregulation should stimulate the market for air transportation by encouraging more people to fly at the lower rates.  Because this would result in more fights flown, there may be a positive impact on the airframe market; i.e., more planes will be ordered to meet the greater number of passengers.  However, this impact (dollarwise) is subsumed in the market for air transportation.

to price changes, there is also no compelling evidence to suggest a particular pattern in future years. Finally, insufficient resources were available to measure the correlation between price and benefit.

### Benefits to the consumer

What is the magnitude of consumer benefits as a result of the proposed legislation? How are these benefits computed? What assumptions were made about values of key parameters in measuring the magnitude of such benefits? How does the magnitude of these benefits vary with changes?

Passenger fares--Testimony during the Kennedy hearings compared the prices charged by CAB carriers with unregulated intrastate airlines. The former have charged fares which are 47 percent to 90 percent higher than those charged by Pacific Southwest Airlines (PSA) on flights between common city pairs within California. CAB fares have been 17.5 percent to 29.5 percent higher than Southwest Airlines between common Texas city pairs. 1/ The Kennedy Report concluded that

> "The strongest empirical confirmation of the critics' [against regulation] argument arises from comparing fares and service in California and Texas with flights elsewhere in the Nation where competition is more restricted by CAB." 2/

Citing a fare of $27 between San Francisco and San Diego and $47 between Boston and Washington, the Kennedy report found that "a comparison of virtually any intrastate route with virtually any comparable interstate route [regulated by the CAB] reveals similar fare differences." 3/ Based on the intrastate record of performance, a U.S. Department of Transportation study has estimated a 25 percent fare reduction during peak periods and 50 percent during off-peak in 60 to 160 routes of short-haul, medium to high density. 4/

---

1/Kennedy hearings, pp. 465-472.

2/Kennedy report, p. 3.

3/Ibid.

4/U.S. Department of Transportation, Annotated Summary, 1977, p. 13.

Several regulated airlines have denigrated such comparisons, claiming that other factors such as better weather, less dense traffic and congestion, etc., have explained such fare differentials. The Kennedy report concluded that "these factors account for less than half of the fare differences." 1/ Moreover, some of the factors cited as being contributory to these differentials are equally applicable to intrastate and CAB carriers serving the same city-pairs in California and Texas. 2/

Number of passengers served--As pointed out in the previous section, lower fares would benefit not only existing users of air transportation but also new passengers. These additional passengers can be predicted if the value of price elasticity of demand is known. In the DPFI this elasticity was estimated as 1.249. 3/ Similarly, GAO has provided elasticity estimates of 1.3 to 4.0 based on the intrastate carriers' experience and 0.96 to 1.37 based on cross-sectional analysis. 4/

Total passenger savings--the GAO analysis--We have estimated that actual fares charged by CAB carriers have exceeded other fares by an annual average of 22 percent to 52 percent between 1969 and 1974. Total annual dollar savings from deregulation to the passengers has been estimated at $1.4 billion to $1.8 billion. Table 3 summarizes our findings. These estimates are in current dollars. It is assumed in these estimates that an industry-wide average load factor of 60 percent is maintained. Savings to additional passengers are because "some passengers are willing to travel by air at an intermediate fare between the CAB-regulated fare and the lower fare." 5/

The estimation methodology used by GAO can be characterized as cost-based. We used an airline cost model developed by Professor Theodore E. Keeler and modified it to include

---

1/Kennedy report, pp. 3-4.

2/Kennedy hearings, pp. 465-472.

3/U.S. Department of Transportation, Annotated Summary, p. 28.

4/Ibid., p. 28.

5/"Lower Airline Costs Per Passenger Are Possible in the U.S. and Could Result in Lower Fares," U.S. General Accounting Office, CED-77-34, 1977, p. 13.

## Table 3

### Passenger Savings

| Year | Savings to actual passengers | Savings to actual and additional passengers for -1.3 elasticity |
|------|------------------------------|-----------------------------------------------------------------|
|      | ----------------(billions)---------------- | |
| 1969 | $1.8 | $2.5 |
| 1970 | 1.4 | 1.8 |
| 1971 | 1.6 | 2.0 |
| 1972 | 1.8 | 2.2 |
| 1973 | 1.6 | 2.0 |
| 1974 | 1.5 | 1.8 |

some parts of CAB's DPFI cost model. 1/ Coupling this model with hypothetical long-run competitive conditions, GAO estimated passenger fares.

Keeler assumed that CAB deregulation would lead to the following long-run competitive characteristics: a 60 percent seat occupancy rate (load factor), increased seating densities, 1968 trunk utilization rates, greater use of more efficient aircraft, and a pretax return on capital equal to 12 percent. 2/ With some minor modifications, we used these characteristics in estimating increased "efficiency" fares.

The values of many key parameters used in our study were not known with certainty. As a result, sensitivity analysis was performed in that study to see how sensitive passenger benefits were to variations in the assumed values of such parameters. Tables 4 through 9 summarize these findings.

### Benefits to the producer

What is the magnitude of producer benefits as a result of the proposed legislation? How have these benefits been computed? What assumptions have been made about values of key parameters in measuring the magnitude of such benefits? How does the magnitude of these benefits vary with changes in these parametric values? .

---

1/Theodore E. Keeler, "Airline Regulation and Market Performance," Bell Journal of Economics & Management Science, 3 (Autumn, 1972), pp. 399-424.

2/"Lower Airline Costs," p. 8.

Table 4

Effect of Load Factor Uncertainties on Study Results

| | Actual experience | Assumed industry-wide load factor | | |
| --- | --- | --- | --- | --- |
| | | Actual | 60% | 72% |
| Annual savings to actual passengers in 1969-74 (billions of dollars) | N/A | 1.1 to 1.5 | 1.4 to 1.8 | 1.9 to 2.4 |
| Annual savings to actual and induced passengers in 1969-74 (billions of dollars) | N/A | 1.2 to 1.9 | 1.8 to 2.5 | 2.6 to 3.4 |
| Excess of actual over estimated fares in 1969-74 (percent) | N/A | 19 to 39 | 23 to 52 | 39 to 72 |

Table 5

Effect of Uncertainties in Aircraft Seating Density

| | Actual experience | Aircraft seating density | | |
| --- | --- | --- | --- | --- |
| | | Trunkline seating | GAO assumed seating | Manufacturers' maximum |
| Annual savings to actual passengers in 1969-74 (billions of dollars) | N/A | 0.5 to 1.5 | 1.4 to 1.8 | 1.7 to 2.1 |
| Annual savings to actual and induced passengers in 1969-74 (billions of dollars) | N/A | 0.5 to 1.9 | 1.8 to 2.5 | 2.2 to 2.9 |
| Excess of actual over estimated fares in 1969-74 (percent) | N/A | 6 to 39 | 23 to 52 | 31 to 61 |

Table 6

Effect of Uncertainties in Pretax Rate of Return on Capital

| Impact area | Actual experience | Pretax rate of return on capital | | |
|---|---|---|---|---|
| | | 10.5 percent | 12 percent | 18 percent |
| Annual savings to actual passengers in 1969-74 (billions of dollars) | N/A | 1.4 to 1.8 | 1.4 to 1.8 | 1.0 to 1.5 |
| Annual savings to actual and induced passengers in 1969-74 (billions of dollars) | N/A | 1.8 to 2.5 | 1.7 to 2.4 | 1.1 to 1.9 |
| Excess of actual over estimated fares in 1969-74 (percent) | N/A | 23 to 52 | 21 to 50 | 13 to 40 |

Table 7

Effect of Uncertainties in
Fare Elasticity of Demand for Air Travel

| | Actual experience | Fare elasticity of demand | | |
|---|---|---|---|---|
| | | -0.7 | -1.3 | -2.0 |
| Annual savings to actual passengers in 1969-74 (billions of dollars) | N/A | 1.4 to 1.8 | 1.4 to 1.8 | 1.4 to 1.8 |
| Annual savings to actual and induced passengers in 1969-74 (billions of dollars) | N/A | 1.6 to 2.1 | 1.8 to 2.5 | 2.0 to 3.0 |
| Excess of actual over estimated fares in 1969-74 (percent) | N/A | 23 to 52 | 23 to 52 | 23 to 52 |

Table 8

## Effect of Aircraft Utilization Rate
## on Results

| | Actual experience | Annual aircraft utilization | | |
|---|---|---|---|---|
| | | Actual 1969-74 | Lowest 1969-74 | Highest 1969-74 |
| Annual savings to actual passengers in 1969-74 (billions of dollars) | N/A | 1.4 to 1.7 | 1.3 to 1.7 | 1.4 to 1.8 |
| Annual savings to actual and induced passengers in 1969-74 (billions of dollars) | N/A | 1.6 to 2.3 | 1.6 to 2.3 | 1.8 to 2.5 |
| Excess of actual over estimated fares in 1969-74 (percent) | N/A | 20 to 47 | 20 to 48 | 23 to 52 |

Table 9

Effect of Uncertainties in the Assumed Use of
the Most Efficient Aircraft Per Route

|  | | Our base case | |
|  | Actual experience | Most efficient aircraft used in same proportions as trunk airline actual use of corresponding aircraft classes | Alternative case<br><br>Most efficient aircraft used only in their most efficient ranges |
| --- | --- | --- | --- |
| Annual savings to actual passengers in 1969-74 (billions of dollars) | - | 1.4 to 1.8 | 1.6 to 1.9 |
| Annual savings to actual and induced passengers in 1969-74 (billions of dollars) | - | 1.8 to 2.5 | 2.0 to 2.7 |
| Excess of actual over estimated fares in 1969-74 (percent) | - | 23 to 52 | 24 to 56 |

Short-term improvements in carrier profitability--As previously suggested by Kahn and Miller, CAB carriers appear to have been forced to choose a level of nonprice competition which has led to normal profit given regulated CAB fares. Moreover, CAB fare regulations appear to have resulted in a second-best portfolio of price and quality of service. In addition, route restrictions by the CAB controlling entry and exit of carriers may have adversely affected industry profits. The extent to which carriers may have been locked into less profitable routes and the degree to which more efficient carriers may have been penalized and less efficient carriers rewarded in CAB routing determine the magnitude of this adverse impact. Finally, industry profits in the short run will also depend upon the relationship between increased revenues and increased costs resulting from additional

passenger traffic.  The impacts of route restriction removal and additional traffic on industry profits have been estimated. 1/

The impact on carrier profitability has been examined for two time periods:  the short-term or initial period (3-12 months), "when carriers are attempting to establish themselves on new routes," and an intermediate period (1-2 years), "when carrier capacity and share become relatively stable * * *" 2/  Tables 10-12 summarize the findings of this study.  In each table, estimated 1974 profits after deregulation are compared with actual regulation earnings in 1974.  These estimated gains in carrier profitability have been adduced to "gradual removal of all the certificate restrictions * * * on existing carriers and a limited 5% and discretionary expansion of the carriers' existing route structures." 3/  The impacts of fare flexibility and entry of new firms have not been estimated. 4/

Another analysis by Miller has addressed short-term carrier profitability and fare flexibility. 5/  Miller writes:

> Another way of posing this question is to ask
> whether a fare decrease would lead to a higher or
> lower equilibrium level of capacity * * *.  If that

_____

1/"The Effects of Route Restriction Removal and Discretionary Authority," by Simat, Helliesen & Eichner, Inc. in Regulation of Passenger Fares and Competition Among Airlines, edited by Paul McAvoy and John Snow (Washington, D.C.:  American Enterprise Institute, 1977), p. 169.  See also J. Miller, "The Effects of the Administration's Draft Bill on Air Carrier Finances," Paul McAvoy and John Snow, eds., pp. 181-196.

2/"The Effects of Route Restriction," p. 169.

3/Ibid.

4/The results of this study should be judged with caution. A number of questionable assumptions were made in this study which appear to assure the results.  See "An Analysis of the Effects of Route Restriction Removal and Discretionary Authority:  The Transition to a Less-Regulated Environment," Simat, Helliesen & Eichner, Inc., (Washington, D.C.: American Enterprise Institute, Jan. 1977), pp. 1-3.

5/"The Effects of Route Restriction," pp. 181-196.

## Table 10

### Impact of Entry Flexibility on Profitability of "Big Five" Trunk Carriers
(domestic annual profit before taxes in millions)

| Carrier | Base year/ 1974 | Initial term | Inter-mediate term: Worst case | Intermediate term: Expected results |
|---|---|---|---|---|
| American | $ 17.4 | $ 48.2 | $ 21.7 | $ 97.9 |
| Eastern | 33.7 | 21.5 | 40.5 | 103.9 |
| Delta | 150.1 | 174.8 | 139.5 | 198.7 |
| TWA | (0.4) | 26.3 | 31.6 | 90.5 |
| United | 201.5 | 271.7 | 196.9 | 301.6 |
| Total profit before tax | $402.4 | $542.5 | $430.2 | $792.6 |

## Table 11

### Impact of Entry Flexibility on Profitability of "Small Five" Trunk Carriers
(domestic annual profit before taxes in millions)

| Carrier | Base year/ 1974 | Initial term | Inter-mediate term: Worst case | Intermediate term: Expected results |
|---|---|---|---|---|
| Braniff | $ 24.5 | $ 33.8 | $ 70.1 | $ 93.9 |
| Continental | 13.5 | 25.1 | 42.2 | 67.8 |
| National | 47.4 | 67.3 | 66.2 | 89.0 |
| Northwest | 76.3 | 120.8 | 129.2 | 158.1 |
| Western | 37.5 | 31.9 | 39.2 | 66.1 |
| Total profit before tax | $199.2 | $278.8 | $346.8 | $474.9 |

77

## Table 12

### Impact of Entry Flexibility on Profitability
### of Local Service Carriers
(annual profit excluding subsidy and before taxes in millions)

| Carrier | Base Year/ 1974 | Initial Term | Intermediate Term |
|---|---|---|---|
| Allegheny | $ 6.1 | $ 20.4 | $ 39.1 |
| Frontier | 3.3 | 9.4 | 16.7 |
| Airwest | (0.1) | (10.4) | 7.6 |
| North Central | 3.6 | 4.3 | 23.7 |
| Ozark | (0.8) | 2.2 | 8.2 |
| Piedmont | 1.4 | 3.3 | 9.5 |
| Southern | (3.4) | 0.9 | 9.0 |
| Texas International | (6.8) | (4.0) | -- |
| Total profit excluding subsidy and before taxes | $ 3.3 | $ 26.4 | $113.8 |

new equilibrium level of investment were greater, then the industry would be made better off and might earn excess profits until which time industry investment expanded to the equilibrium [break-even] level. 1/

Miller noted that this "equilibrium level of investment will increase when fare is decreased if and only if $e_d$ $(1-C/F) < -1$, where $e_d$ = "full price" elasticity of demand, C = per-passenger "traffic cost," and F = average fare (i.e., price of ticket)." 2/ Miller has estimated a C/F ratio ranging from 0.201 to 0.236, which means that the industry could garner greater short-run profits if demand elasticity exceeds a value between 1.25 and 1.36. However, the above C/F values

---

1/ Ibid., p. 186.

2/ Ibid., p. 187.

do not account for "cost reductions because of less circuitous routings, easier matching of equipment to routes, and the effect of competition in holding down labor costs." 1/ Table 13 summarizes Miller's results for 1973, assuming "no adjustments whatsoever in capacity in anticipation of complete deregulation." 2/

## Table 13

### Sensitivity Short-Run Industry Profits to Demand Elasticity

(assuming sudden, complete deregulation; 16 percent fare decrease; $10 billion total industry revenue and cost; and 0.22 C/F ratio)

| Demand elasticity assumption | Change in (short-run) industry profit rate (millions of dollars per year) | Change in (short-run) industry profit rate as percentage of initial industry total revenue and cost |
|---|---|---|
| $e_d = -.7$ | − 660 | − 6.6 |
| $e_d = -1.0$ | − 352 | − 3.5 |
| $e_d = -1.3$ | − 44 | − 0.4 |
| $e_d = -2.0$ | + 675 | + 6.8 |
| $e_d = -2.5$ | + 1,189 | +11.9 |

## IDENTIFYING AND MEASURING COSTS OF DEREGULATION

The key questions in this section are

● What costs are incurred by society in the enactment and implementation of the proposed legislation?

● How are these costs measured?

● How are the estimated magnitudes of such costs effected by variation in the values of estimation parameters?

---

1/Ibid., p. 188.

2/Ibid., p. 189.

The principal tasks are designed accordingly: to identify
the types of costs through model analysis and to present
various estimates of their magnitude.

## Identifying types of costs through the model

As explained in chapter 3, there are a number of dis-
tinctions that can be made about types of costs which are
useful in identifying such impacts. A typology based on
distinctions between private and social costs, direct and
indirect costs, and explicit and implicit costs was pre-
sented in chapter 3. Thus, relevant questions here are
as follows:

- What are the private and social costs of the
  proposed legislation?

- What are the direct and indirect costs?

- What are the explicit and implicit costs of the
  proposal?

A related question regarding identification of costs
pertains to choice of the model to be used in this task.
Which model of the air transportation market is to be selected
for identifying costs? Logical consistency dictates that
the same model used to identify benefits be used to identify
costs. However, given the paucity of data typically encoun-
tered and the compelling nature of opposing arguments, it
is advisable to test the validity of that model which oppo-
nents of deregulation have presented in support of such argu-
ments. 1/ But such a test entails gathering evidence which
supports the existence of such arguments (or costs). Failure
of such evidence to materialize is an indictment of the
model's validity.

Following this course, an analysis of the destructive
competition and monopolization models suggests major expected
costs of deregulation in the form of reduced air transpor-
tation service to consumers, reduced safety, and disruption
of service to smaller communities. The destructive competi-
tion model predicts a fall in producer profits, whereas the
monopolization model predicts an increase. In the destructive
competition model, the effect of deregulation on consumer
savings is somewhat ambiguous but probably negative. The
monopolization model predicts a fall in consumer savings.

---

1/Arguably, such a test has already been performed by mar-
   shalling evidence supportive of important benefits not pre-
   dicted by (indeed, antithetical to) opponent models.

Given the objectives of proposed legislation, the costs of deregulation suggested by these models appear to be explicit impacts. Nevertheless, proponents of the legislation believe that deregulation would mitigate, not aggravate, most of these effects. 1/

Since the aforementioned costs describe mainly impacts upon carriers and the passengers that they serve, these costs are mainly direct. 2/ The costs arising from destructive competition and monopolization are transmitted through the market, so they are private impacts. Disruption of service to small communities appears to be largely an equity issue. Safety appears to be largely external or social in nature.

## Measuring costs to the consumer and producer

In chapter 3, the need for baseline data was cited. Are there other factors besides the proposed legislation which may contribute to the magnitude of measured costs? A distinction was also made between monetized and nonmonetized impacts. With regard to the former, the importance of using the proper prices, pricing over time, and discounting were emphasized. What prices were used in making the estimates? Were price movements over time accounted for in these estimates? Were these estimated costs discounted?

What is the magnitude of consumer and producer costs as a result of the proposed legislation? How are these costs computed? What assumptions are made about values of key parameters in measuring the magnitude of such costs? How does the magnitude of these costs vary with changes in these parametric values?

### Loss in consumer surplus—
### the threat of monopolization

Proponents of regulation have argued that unraveling CAB will lead to "deliberate below cost pricing," that "economies of scale" will lead to natural monopoly, and that deregulation

---

1/Proponents do not regard such impacts as unavoidable costs of deregulation. Rather, they envision a deregulated market as being free from such adversities. Consumer savings means consumer surplus. Producer profits refer to producer surplus.

2/Safety and small community considerations undoubtedly contain indirect elements. It will be assumed that such elements are of a relatively small magnitude.

will allow large airline systems to take advantage of smaller systems because of "beyond" or "feeder" traffic. 1/

The strategy of below cost pricing has been discounted by both DOT and CAB analysts because its success depends on restricted entry, which would be eliminated under deregulation. 2/ CAB analysis, as well as work by Miller, has indicated that there are no substantial economies of scale. 3/ During the Kennedy hearings, evidence was presented indicating "that airlines can achieve efficient size while relatively small and that entry is not overwhelmingly expensive * * *." 4/ A study by Lockheed Aircraft Corporation has suggested that it would be fairly easy for several new carriers to enter every major route segment in the country. 5/ Evidence supporting the premise that smaller airlines compete very well with larger systems on common routes has been presented by DOT. 6/ Consequently, it does not appear likely that monopolization and resulting loss in consumer savings are imminent.

### Loss in producer profits-- the threat of destructive competition

Alfred Kahn, in his model of the airline market, asserted that CAB regulation has substituted "destructive" nonprice competition for price competition. 7/ Similarly, the Kennedy report noted that "[t]he incentives that might drive an airline to lower fares * * * are exactly the same incentives that would lead an airline to add one more flight * * *." Moreover, in the late 1960s when there was significant excess capacity because of nonprice rivalry there was no widespread bankruptcy. 8/

---

1/Annotated Summary, p. 16.

2/Ibid., p. 16; See also CAB, Regulatory Reform, pp. 107-117.

3/Annotated Summary, p. 16.

4/Kennedy report, p. 63.

5/Ibid., p. 63.

6/Annotated Summary, p. 17.

7/Kennedy hearings, pp. 96-97.

8/Kennedy report, p. 60.

Finally, there is evidence suggesting that capital is relatively mobile. 1/

Thus, two conclusions are warranted. If the structure of the industry lends itself to destructive competition, such competition will occur and result in a loss in producer profits regardless of CAB regulation. Second, evidence does not support the conditions for, or occurrence of, destructive competition. As a result, there is little basis for expecting a loss in producer profit attributable to destructive competition. 2/

Loss in consumer savings—disruption of
service to small towns

The validity of this argument, that service to small towns is disrupted, is dependent upon two premises: existing carriers have charged higher prices on more profitable routes to "subsidize" less profitable small town routes, and/or small carriers have been unable to provide profitable service to such communities.

Douglas and Miller have disputed this cross subsidization claim because of the prevalence of nonprice competition. 3/ Excess profits earned on "profitable" routes can be expected to encourage additional nonprice competition, so that little if any "subsidy" would remain to operate other routes, according to their argument. The Kennedy hearings provided ample evidence indicating the extent of cross subsidization. The following statement summarizes these findings:

> In the subcommittee's view, the theoretical and
> direct practical evidence together suggest that
> some cross subsidy may exist within the present
> airline system, but that it is small in amount.
> The trunk carriers probably fly no more than 100
> to 150 routes—most of them short and infrequently
> traveled—that they would like to abandon. If the
> trunk carriers abandoned nonstop service over such
> route segments, most would still be served by local

---

1/ Ibid.

2/ Once again, producer profits are equivalent to producer
surplus.

3/ George Douglas and James Miller, Economic Regulation of
Domestic Air Transport: Theory and Policy (Washington,
D.C.: The Brookings Institution, 1974), p. 64.

service carriers, commuters, or even by trunk car-
riers providing one-stop or multistop service.  If
necessary, nonstop service on these route segments
might be maintained with a direct subsidy of well
under $25 million. 1/

DOT undertook a special study of small town service to
determine what differential effects, if any, can be expected
from deregulation.  Major conclusions of this study are that
CAB regulated carriers have discontinued service to 173
points; that this loss of regulated service has been replaced
"in most instances" by unregulated commuter airlines; and
that an alternative subsidy program to assure service to small
communities would probably cost $1.1 million per year (in
1975 dollars) as compared to an annual subsidy of $67 million
in 1974. 2/  The DOT study has concluded

> "that commuters provided far greater continuity
> and reliability of service than had previously
> been thought, [and] * * * that communities which
> receive service from commuter airlines are far less
> likely to lose it than those receiving regulated
> service." 3/

Thus, there would appear to be little or no differential
impact on the quantity of small town service as a result of
deregulation.  Any such disruption could be prevented by a
$1.1 million subsidy (in 1975 dollars).

Loss in welfare--safety risk

Competition, it is argued, will lead to lower profits
and the airlines' response will be to cut costs at the ex-
pense of safety. 4/  The Kennedy report concludes:

> "Efforts to measure the relative safety performance
> of CAB-certificated route carriers and the supple-
> mental carriers show that the latter, though subject
> to less economic regulation, are just as safe,

---

1/Kennedy report, p. 68.

2/U.S. Department of Transportation, Air Service to Small
  Communities, March 1976, pp. i-iii.

3/Ibid.

4/Kennedy report, p. 73.

or safer, than the former. The safety records of both types of air carriers are good. In 1966 and in 1970 the supplemental carriers had more fatalities per billion passenger miles flown than the CAB-certificated carriers; in nearly every other year they had _fewer_ fatalities per billion passenger miles flown. A further empirical study shows that there is no correlation between fatality rates and profits. Thus both the Air Transport Association and [DOT] have agreed that the problem of safety does not argue either for or against regulatory reform." 1/

However, our examination of the data comparing safety of CAB carriers and unregulated airlines is not conclusive. 2/

In an empirical study of airline safety and profit rates, Miller tested the hypothesis "that high profits mean safe operations." He found a positive, though statistically insignificant, relationship between industry profit rates and fatality rates for the years 1939 to 1953, "for which there appeared to be adequate variations in profit rates and fatality rates to make a test feasible." 3/ Miller's estimated equation was as follows:

Domestic fatality rate (passenger fatalities per 100 million miles flown) = 1.76 + (.009 x domestic industry profit rate). The T-statistic was equal to .25, with an $R_2$ = .08.

Miller's justification for using only that data spanning 1939 to 1953 is inadequate. Statistical techniques exist to determine when changes in the relationship between indepen-

------------------------------------------------

1/ Ibid.

2/ Supporters and opponents of deregulation appear to have chosen time periods which tend to substantiate their view; cf., testimony of PSA, Cannon hearings, 95th Congress Part 1, p. 379; Kennedy hearings, testimony of Edward Driscoll, President, National Air Carriers Assoc., pp. 1288-94; Cannon hearings, testimony of A. Kelly, Western Airlines, Inc., p. 567.

3/ Kennedy hearings, p. 65.

dent and dependent variables occur. 1/ Moreover, the equation
estimated by Miller is misspecified, so that the coefficient's
value is biased. Finally, the estimated equation accounted
for only 8 percent of total variation. Apparently, safety
has been neither denied nor confirmed as a legitimate cost
of deregulation.

### Labor problems

One explicit cost that has not been addressed by any
of the models is distributional impact. Various labor unions
have argued that deregulation will lead to dislocation of some
airline employees. Tenured employees, it has been asserted,
will have difficulty maintaining their seniority benefits
in the event of such dislocation. The problem of tenured
employees is a genuine one, but studies have also indicated
that unregulated carriers have paid comparable wages to their
employees and that deregulation is likely to promote industry
employment. 2/

## PRESENTING AND ORDERING THE RESULTS

The key questions in this section are

● What is the net present value of monetized impacts
for each alternative?

● What is the ordering of alternatives according to
monetized and nonmonetized impacts?

● Are there any valid equivalencies between various
impacts?

In the case of airline deregulation, impacts have not
been measured in a uniform way across alternatives. This is
principally because a complete analysis has not been per-
formed by any one investigator or summarized in a single
study. Given this "hodgepodge," the only relevant comparison
is between CAB regulation and deregulation. Information was
not provided across all impacts for varying degrees of regula-
tion. An accounting for the benefits and costs of deregula-
tion completes such a comparison. No impacts were discounted

---

1/Compare G.S. Maddala, "Switching Regression Models,"
Econometrics (New York: McGraw-Hill, 1977) p. 394.

2/Annotated Summary, p. 15.

in this example.  However, the importance of discounting is minimized by the temporal coincidence of most impacts. 1/

Table 14 summarizes the principal monetized and non-monetized impacts of deregulation and indicates the relevant tradeoffs.

EPILOGUE

On October 24, 1978, President Carter signed a deregulation bill into law.  The objectives of this bill marked a synthesis of the Kennedy-Cannon proposal and one sponsored in the House by Representative Glenn Anderson. Because it bore on the decisions of producers of air transportation, the bill left intact the major objectives of the Kennedy-Cannon proposal.  Primary reliance was placed on competition.  Competitive implications for consumer decisions and welfare were left largely intact.  However, one qualifier from the House amendment was added:  the assignment and maintenance of safety as the highest priority in air commerce.  The House amendment stated that increased reliance upon competition must not result in any deterioration in safety. 2/  Distributional implications regarding assurances of service to small communities were carried over from the Kennedy-Cannon proposal.  In addition, "* * * the need to encourage fair wages and equitable working conditions" was included.  This objective originated from the House amendment, which called for the CAB "to take account of the interests of industry employees by encouraging fair wages and equitable working conditions." 3/

---

1/If the benefits and costs measured are representative of future benefits and costs, discounting is not important.

2/95th Congress of the U.S., 2nd Session, Joint Explanatory Statement of the Committee of Conference, p. 55.

3/Ibid., p. 55.

## Table 14

### Economic Impacts from
### Airline Deregulation

| Economic impact | Benefit | Cost | Magnitude | Special considerations |
|---|---|---|---|---|
| Annual fare savings to actual and additional passengers (1974 dollars) | X | | Expected value =$1.8 billion Range $0.5 to $3.4 billion | -Assumptions, GAO study -Expected value based in elasticity of -1.3. |
| Annual profit gains before taxes from existing entry flexibility (1974) | X | | Expected Value =$0.80 billion Worst Case =$0.20 billion | -Assumptions, DOT study. -Not including effects of fare flexibility and new entry. |
| Annual profit gains (in short-run) before taxes from fare flexibility (1973 dollars) | | | =-$0.04 billion =$1.2 billion -$.7 billion | -Elasticity of-1.3 -Elasticity of-2.5 -Elasticity of-.7 -no adjustments to capacity in all magnitudes |
| Annual profit gains (in short-run) from elimination of suboptimal nonprice rivalry | X | | Large | Magnitude depends on structural competitiveness of industry |
| Disruption of service to small towns | | X | $0.001 billion per year | -Subsidy estimated by DOT to maintain service to small communities. Ignores regulation subsidy. |
| Safey risk | | X | unknown | -Magnitude depends on the tie between deregulation, profits, and safety expenditures; and on FAA enforcement |

Executive Order 12044

Mar. 23, 1978

IMPROVING GOVERNMENT REGULATIONS

As President of the United States of America, I direct
each Executive Agency to adopt procedures to improve existing
and future regulations.

Section 1.  Policy.  Regulations shall be as simple and
clear as possible.  They shall achieve legislative goals ef-
fectively and efficiently.  They shall not impose unnecessary
burdens on the economy, on individuals, on public or private
organizations, or on State and local governments.

To achieve these objectives, regulations shall be devel-
oped through a process which ensures that:

(a)   the need for and purposes of the regulation are
      clearly established;

(b)   heads of agencies and policy officials exercise
      effective oversight;

(c)   opportunity exists for early participation and com-
      ment by other Federal agencies, State and local
      governments, businesses, organizations and individ-
      ual members of the public;

(d)   meaningful alternatives are considered and analyzed
      before the regulation is issued; and

(e)   compliance costs, paperwork and other burdens on the
      public are minimized.

Section 2.  Reform of the Process for Developing Signif-
icant Regulations.  Agencies shall review and revise their
procedures for developing regulations to be consistent with
the policies of this Order and in a manner that minimizes
paperwork.

Agencies' procedures should fit their own needs but, at
a minimum, these procedures shall include the following:

(a)   Semiannual Agenda of Regulations.  To give the pub-
      lic adequate notice, agencies shall publish at least
      semiannually an agenda of significant regulations
      under development or review.  On the first Monday
      in October, each agency shall publish in the FEDERAL
      REGISTER a schedule showing the times during the

89

coming fiscal year when the agency's semiannual
agenda will be published.  Supplements to the agenda
may be published at other times during the year if
necessary, but the semiannual agendas shall be as
complete as possible.  The head of each agency shall
approve the agenda before it is published.

At a minimum, each published agenda shall describe
the regulations being considered by the agency, the
need for and the legal basis for the action being
taken, and the status of regulations previously
listed on the agenda.

Each item on the agenda shall also include the
name and telephone number of a knowledgeable
agency official and, if possible, state whether or
not a regulatory analysis will be required.  The
agenda shall also include existing regulations
scheduled to be reviewed in accordance with Section
4 of this Order.

(b)    Agency Head Oversight.  Before an agency proceeds
       to develop significant new regulations, the agency
       head shall have reviewed the issues to be consid-
       ered, the alternative approaches to be explored, a
       tentative plan for obtaining public comment, and
       target dates for completion of steps in the develop-
       ment of the regulation.

(c)    Opportunity for Public Participation.  Agencies
       shall give the public an early and meaningful oppor-
       tunity to participate in the development of agency
       regulations.  They shall consider a variety of ways
       to provide this opportunity, including (1) publish-
       ing an advance notice of proposed rulemaking; (2)
       holding open conferences or public hearings; (3)
       sending notices of proposed regulations to publi-
       cations likely to be read by those affected; and
       (4) notifying interested parties directly.

       Agencies shall give the public at least 60 days to
       comment on proposed significant regulations.  In the
       few instances where agencies determine this is not
       possible, the regulation shall be accompanied by a
       brief statement of the reasons for a shorter time
       period.

(d)    Approval of Significant Regulations.  The head of
       each agency, or the designated official with statu-
       tory responsibility, shall approve significant regu-
       lations before they are published for public comment

in the FEDERAL REGISTER.  At a minimum, this
official should determine that:

(1)   the proposed regulation is needed;
(2)   the direct and indirect effects of the regula-
      tion have been adequately considered;
(3)   alternative approaches have been considered
      and the least burdensome of the acceptable al-
      ternatives has been chosen;
(4)   public comments have been considered and an
      adequate response has been prepared;
(5)   the regulation is written in plain English and
      is understandable to those who must comply
      with it;
(6)   an estimate has been made of the new reporting
      burdens or recordkeeping requirements necessary
      for compliance with the regulation;
(7)   the name, address and telephone number of a
      knowledgeable agency official is included in
      the publication; and
(8)   a plan for evaluating the regulation after its
      issuance has been developed.

(e)   Criteria for Determining Significant Regulations.
      Agencies shall establish criteria for identifying
      which regulations are significant.  Agencies shall
      consider among other things:  (1) the type and num-
      ber of individuals, businesses, organizations, State
      and local governments affected; (2) the compliance
      and reporting requirements likely to be involved;
      (3) direct and indirect effects of the regulation
      including the effect on competition; and (4) the
      relationship of the regulations to those of other
      programs and agencies.  Regulations that do not meet
      an agency's criteria for determining significance
      shall be accompanied by a statement to that effect
      at the time the regulation is proposed.

     Sec. 3.  Regulatory Analysis.  Some of the regulations
identified as significant may have major economic consequences
for the general economy.  For these regulations, agencies
shall prepare a regulatory analysis.  Such an analysis shall
involve a careful examination of alternative approaches early
in the decision-making process.

     The following requirements shall govern the preparation
of regulatory analyses:

(a)   Criteria.  Agency heads shall establish criteria for
      which regulations require regulatory analyses.  The
      criteria established shall:

91

      (1)  ensure that regulatory analyses are performed
           for all regulations which will result in (a)
           an annual effect on the economy of $100 million
           or more; or (b) a major increase in costs or
           prices for individual industries, levels of
           government or geographic regions; and

      (2)  provide that in the agency head's discretion,
           regulatory analysis may be completed on any
           proposed regulation.

(b)   Procedures.  Agency heads shall establish procedures
for developing the regulatory analysis and obtaining
public comment.

      (1)  Each regulatory analysis shall contain a suc-
           cinct statement of the problem; a description
           of the major alternative ways of dealing with
           the problems that were considered by the
           agency; an analysis of the economic conse-
           quences of each of these alternatives and a
           detailed explanation of the reasons for choos-
           ing one alternative over the others.

      (2)  Agencies shall include in their public notice
           of proposed rules an explanation of the regula-
           tory approach that has been selected or is
           favored and a short description of the other
           alternatives considered.  A statement of how
           the public may obtain a copy of the draft regu-
           latory analysis shall also be included.

      (3)  Agencies shall prepare a final regulatory anal-
           ysis to be made available when the final regu-
           lations are published.

Regulatory analyses shall not be required in rulemaking
proceedings pending at the time this Order is issued if an
Economic Impact Statement has already been prepared in accord-
ance with Executive Orders 11821 and 11949.

Sec. 4.  Review of Existing Regulations.  Agencies shall
periodically review their existing regulations to determine
whether they are achieving the policy goals of this Order.
This review will follow the same procedural steps outlined for
the development of new regulations.

In selecting regulations to be reviewed, agencies shall
consider such criteria as:

(a)   the continued need for the regulation;
(b)   the type and number of complaints or suggestions
      received;

(c)    the burdens imposed on those directly and indirectly
       affected by the regulations;
(d)    the need to simplify or clarify language;
(e)    the need to eliminate overlapping and duplicative
       regulations; and
(f)    the length of time since the regulation has been
       evaluated or the degree to which technology, eco-
       nomic conditions or other factors have changed in
       the area affected by the regulation.

Agencies shall develop their selection criteria and a
listing of possible regulations for initial review. The cri-
teria and listing shall be published for comment as required
in Section 5. Subsequently, regulations selected for review
shall be included in the semiannual agency agendas.

Sec. 5. Implementation.

(a)    Each agency shall review its existing process for
       developing regulations and revise it as needed to
       comply with this Order. Within 60 days after the
       issuance of the Order, each agency shall prepare a
       draft report outlining (1) a brief description of
       its process for developing regulations and the
       changes that have been made to comply with this
       Order; (2) its proposed criteria for defining sig-
       nificant agency regulations; (3) its proposed cri-
       teria for identifying which regulations require
       proposed criteria for identifying which regulations
       require regulatory analysis; and (4) its proposed
       criteria for selecting existing regulations to be
       reviewed and a list of regulations that the agency
       will consider for its initial review. This report
       shall be published in the FEDERAL REGISTER for
       public comment. A copy of this report shall be
       sent to the Office of Management and Budget.

(b)    After receiving public comment, agencies shall sub-
       mit their revised report to the Office of Management
       and Budget for approval before final publication in
       the FEDERAL REGISTER.

(c)    The Office of Management and Budget shall assure the
       effective implementation of this Order. OMB shall
       report at least semiannually to the President on the
       effectiveness of the Order and agency compliance
       with its provisions. By May 1, 1980, OMB shall rec-
       ommend to the President whether or not there is a
       continued need for the Order and any further steps
       or actions necessary to achieve its purposes.

Sec. 6.  Coverage.

(a)  As used in this Order, the term regulation means
     both rules and regulations issued by agencies in-
     cluding those which establish conditions for finan-
     cial assistance.  Closely related sets of regula-
     tions shall be considered together.

(b)  This Order does not apply to:

     (1)  regulations issued in accordance with the for-
          mal rulemaking provisions of the Administrative
          Procedures Act (5 U.S.C. 556, 557);
     (2)  regulations issued with respect to a military
          or foreign affairs function of the United
          States;
     (3)  matters related to agency management or person-
          nel;
     (4)  regulations related to Federal Government pro-
          curement;
     (5)  regulations issued by the independent regula-
          tory agencies; or
     (6)  regulations that are issued in response to an
          emergency or which are governed by short-term
          statutory or judicial deadlines.  In these
          cases, the agency shall publish in the FEDERAL
          REGISTER a statement of the reasons why it is
          impracticable or contrary to the public inter-
          est for the agency to follow the procedures of
          this Order.  Such a statement shall include the
          name of the policy official responsible for
          this determination.

     Sec. 7.  This Order is intended to improve the quality
of Executive Agency regulatory practices.  It is not intended
to create delay in the process or provide new grounds for ju-
dicial review.  Nothing in this Order shall be considered to
supersede existing statutory obligations governing rule-
making.

     Sec. 8.  Unless extended, this Executive Order expires
on June 30, 1980.

                                        JIMMY CARTER

THE WHITE HOUSE,
     March 23, 1978.

## LIST OF QUESTIONS
## TO BE CONSIDERED IN
## ECONOMIC IMPACT ANALYSIS

| Issues | Are these issues Applicable? | | Addressed? | |
|---|---|---|---|---|
| | Yes | No | Yes | No |

BASIC CONSIDERATIONS

    Will the regulations resulting
from a proposed bill or joint
resolution actually accomplish
what is intended?

    What economic changes will occur
when the resulting regulations are
promulgated?

    What would be the economic costs
and benefits if the situation in
question is left as is, or unreg-
ulated?

    Are there other ways to accom-
plish what is intended?

Describing and modeling the problem

    What is the problem or issue tar-
getted by proposed legislation?

    Why is this a problem?

Description

    How has the purported economic
problem affected the production
and consumption decisions of eco-
nomic units (households, busi-
nesses, and governments) and the
consequent distribution of goods
and services?

Model

    What are the current determinants
of the prices and quantities of
goods in the relevant market?

    Are there other feasible alterna-
tives for solving the problem?

95

| | Are these issues | | | |
|---|---|---|---|---|
| | Applicable? | | Addressed? | |
| Issues | Yes | No | Yes | No |
| What effects would these alternatives have on the relevant markets? | | | | |
| Do institutional constraints delimit the feasible set of alternatives? | | | | |

Identifying benefits and costs

| Issues | Yes | No | Yes | No |
|---|---|---|---|---|
| Which models of the market(s) subject to legislative reform are to be selected for identifying benefits and costs of alternatives? | | | | |
| What benefits and costs are to be expected from implementation of various alternatives? | | | | |
| Who are the major parties being affected by the proposed legislation or aternatives? | | | | |
| Have important externalities (third party effects) been accounted for? | | | | |
| Are the groups or classes of individuals and businesses identified as to who should bear costs and enjoy benefits according to legislative objectives? | | | | |
| Does the proposed legislation or alternative correct situations in which private and social costs and benefits diverge? | | | | |
| Do the proposals themselves create diverging private and social impacts? | | | | |
| Have any significant indirect benefits and costs been identified? | | | | |

96

| Issues | Are these issues | | | |
|---|---|---|---|---|
| | Applicable? | | Addressed? | |
| | Yes | No | Yes | No |
| What are the explicit costs? | | | | |
| What are the implicit costs? | | | | |
| What opportunity costs are associated with the various proposals? | | | | |
| What are the explicit benefits? | | | | |
| Are there any implicit benefits? | | | | |
| Are there benefits and costs in which a long period of time will elapse between the onset of the impact and observation of its effects? | | | | |
| Are there any dynamic benefits and costs associated with proposed legislation and other alternatives? | | | | |

Benefit-cost measurement

| | | | | |
|---|---|---|---|---|
| Are there other factors besides the proposed legislation (alternatives) which may contribute to the magnitudes of measured benefits and costs? | | | | |
| What impacts can be monetized? | | | | |
| Are the quoted prices accurate reflections of benefits and cost? | | | | |
| Have price changes over time been accounted for? | | | | |
| What is the appropriate discount rate? | | | | |
| Does the discount rate change over time? | | | | |
| Has the net present value been computed? | | | | |

| Issues | Are these issues Applicable? | | Addressed? | |
|---|---|---|---|---|
| | Yes | No | Yes | No |
| What impacts can be quantified but not monetized? | | | | |
| What is the rationale for non-monetization? | | | | |
| Can an implicit monetized valuation of such impacts be obtained through comparison with existing regulations? | | | | |
| Can a value for an intangible be expressed by what it is expected to produce? | | | | |
| What is the incidence of benefits and costs across consumers, producers, and other interest groups? | | | | |
| Is there any double counting of benefits and costs? | | | | |
| What assumptions were made about values of key parameters in estimating the magnitudes of such benefits and costs? | | | | |
| How do these estimated costs and benefits vary with changes in these parametric values? | | | | |
| Have maximum, minimum, and expected values been computed for such impacts? | | | | |

Uncertainty or risk

| Issues | Yes | No | Yes | No |
|---|---|---|---|---|
| What is the set of events or possibilities associated with the impact? | | | | |
| Are the probabilities available for any of these events? | | | | |

| Issues | Are these issues Applicable? | | Addressed? | |
|---|---|---|---|---|
| | Yes | No | Yes | No |
| Are these probability estimates conservative in the sense of overstating the chance of an adverse event? | | | | |
| Can a monetized value be imputed based on actual market behavior that approximates the maximum price society is willing to pay to avoid the uncertainty or risk in question? | | | | |

PRESENTING AND ORDERING THE RESULTS

| Issues | Applicable? | | Addressed? | |
|---|---|---|---|---|
| Does the analysis address the effect on benefits and costs that would occur given acceptance of the status quo? | | | | |
| Does the analysis include the benefits and costs to be produced by each alternative? | | | | |
| Does the analysis determine which alternative maximizes net benefits, assuming no benefit or cost constraints? | | | | |
| Have alternatives been ranked according to net present value of monetized impacts? | | | | |
| Have alternatives been ordered separately according to quantified impacts and intangibles? | | | | |
| Have various tradeoffs between alternatives been highlighted? | | | | |

## TECHNICAL ISSUES

ANATOMY OF MARKET FAILURE

Table 15 summarizes the principal findings regarding the negative spillover cost, using figure 5 on page 24. The $q_A$ row corresponds to the case of internalization and the $q_B$ row to no internalization. Although $q_B$ has a higher benefit than $q_A$, this advantage is outweighed by $q_B$'s higher cost. Column 3 of table 15 shows that regulation leading to internalization results in greater net benefit. The net benefit at QA exceeds that at QB by area ACB. The second part of table 15 summarizes the costs and benefits of internalization. Two principal costs are reckoned: the dollar outlays to reduce environmental damage and the impact on employment of resources in the steel industry. The dollar outlay to reduce environmental damage should reflect the optimal choice of corrective regulation. The impact on resources is captured by the value of foregone steel output, equal to QB minus QA. It is important to remember that this output or resource cost is, at the minimum, fully compensated by alternative, new employment of resources when conditions of perfect competition and full employment prevail. If resources released due to output contraction from QB to QA could not find equally attractive employment, then the private supply curve S in figure 5 should be shifted down and to the right to reflect alternative employment possibilities. If resources are receiving payment above their opportunity cost, then monopoly occurs, distorting ideal market results.

Table 15

Welfare Comparison

| Quantity | (1)<br>Total benefits | (2)<br>Total costs | (3)<br>Net benefits (=(1)-(2)) | |
|---|---|---|---|---|
| QA | area 0EAqA | area 0GAqA | area EAG | |
| QB | area 0EBqB | area 0GCqB | area EAG-ACB | |
| Policy: | Marginal<br>benefits | | Marginal<br>costs | |
| Internalizing | from environ-<br>mental damage<br>abatement | from relo-<br>cation of<br>resources | from environ-<br>mental damage<br>cleanup | lost<br>output |
| | = area 0GCB* | = $qAFB_qB$ | 0GAF | $q_AABq_B$ |

*This benefit may be higher due to consumer surplus associated with environmental protection.

## TYPES OF IMPACTS THROUGH GRAPHICAL ANALYSIS

The impacts of a regulation to curtail air pollution of a steel mill will be examined in this part. First, the direct benefits and costs of the regulation will be displayed in a two-market scenario which accounts for some indirect impacts.

### A two-market world

A regulation to curtail the emissions of sulfur dioxide and total suspended particulate matter by a steel mill stipulates that the mill install the best available control technology. A closed system of wet scrubbers, cyclone precipitators, thickeners, and cooling towers is installed. The capital (fixed) and operating (variable) costs are substantial. Additionally, costs are incurred because of a change in the production process. Raw materials previously discharged are recycled and the resulting space requirements are enlarged. Recycled materials may not be perfectly adaptable to the manufacturing process, so there may be additional losses in productivity. All of these costs are properly labeled as explicit.

If higher explicit costs of production compel the steel mill to raise prices of its products, it is likely that some loss in the value of steel products will occur. Prospective steel buyers will substitute for the more expensive steel. The value of lost steel purchases and, hence, production is an opportunity cost of the regulation. Figure 14 displays these impacts. The supply curve labelled S' is postregulation and intersects the demand curve at a higher market price and lower market quantity. The hatched area in figure 14 corresponds to explicit costs of the regulation, while the cross-hatched refers to implicit costs.

In this two-market analysis, the regulation also directly impacts the market for health. It will be assumed for simplicity that better health is the reason for cleaner air. Prior to regulation, air pollution was responsible for some incidence of morbidity and mortality. Consequently, an important explicit benefit is the value of improved health as a result of cleaner air. In addition, such regulation may reduce the cost of ensuring any given level of health quality; i.e., air pollution control as a preventive measure may be less costly than curative procedures. This reduced cost is an implicit benefit of the regulation. 1/

---

1/This cost reduction equals the value of economic goods that resources freed from curative "duty" can produce in their best alternative use.

**FIGURE 14**
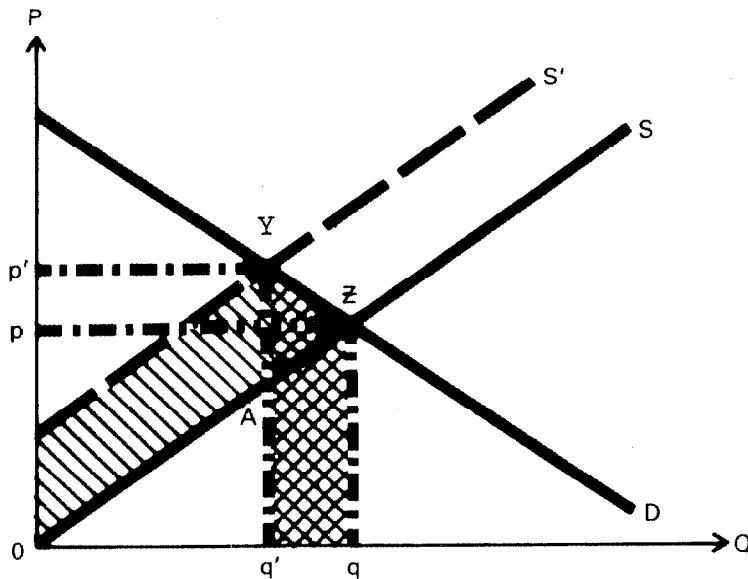**REGULATING THE MARKET FOR STEEL**



Figure 15 summarizes these findings.  The supply curve S'
once again depicts postregulation; it intersects the demand
for health at a lower market price and greater market quan-
tity.  The hatched area corresponds to the reduced health
costs and, thus, refers to an implicit benefit.  The cross-
hatched area denotes the value of increased health.

In addition to these major benefits and costs, which im-
pact on the health and steel markets, there are incidentally
noticed benefits to the steel mill in the form of eliminated
costs of producing steel and incidental costs to health pro-
vision in the form of expenditures for added health.  In both
figures, these impacts are measured by area AZqq'.

The results of this partial equilibrium analysis are
simplified for three reasons:

●       Other markets not depicted are likely to be im-
        pacted as a result of the regulation.

●       There may be additional interreactions between the
        markets for steel and health because of changes in
        the market prices and quantities shown.

102

**FIGURE 15**
THE MARKET FOR HEALTH
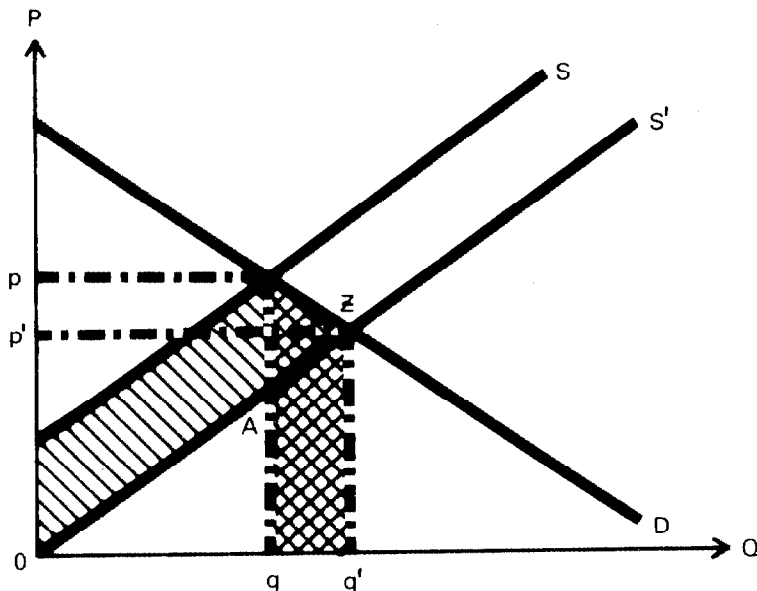


o    So-called dynamic effects, that is, the nexus
     of profit and technological change, and the nexus
     of improved health and intergenerational productiv-
     ity have been ignored. 1/

A three-market world

     The principal departure in a world of three markets is
the presence of indirect impacts in the first round of com-
parative statics--i.e., the comparison of equilibrium mech-
anics of stationary markets under pre- and post-regulatory
conditions.  In this model, a third economic good, aluminum,
is introduced as a substitute for steel because regulation
has caused the relative price of steel (relative to aluminum's
price) to rise (see p' in fig. 14).  Figure 16 shows the in-
crease in value of aluminum marketed.  This increase is an
indirect, implicit benefit and is depicted as the hatched
area.

_____

1/It is not likely that intergenerational effects will be
   accounted for in the first round of measuring direct health
   impacts.

**FIGURE 16**
THE MARKET FOR ALUMINUM
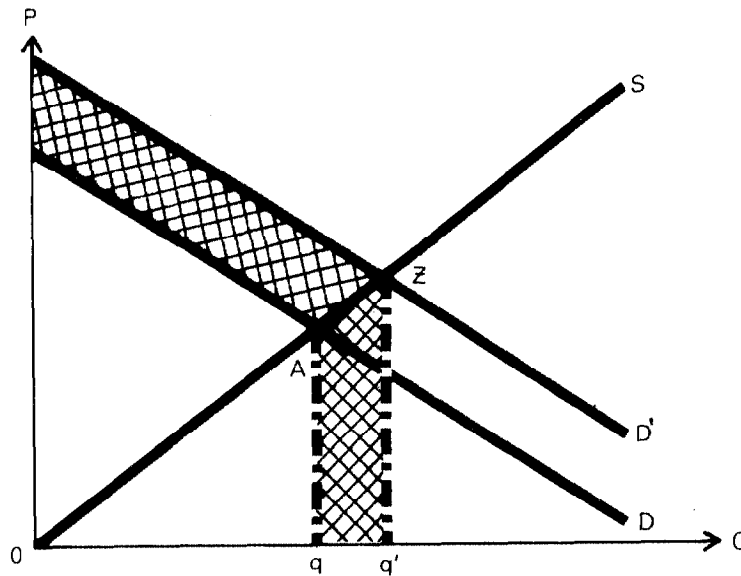


Explicit, indirect costs of producing additional aluminum
are equal to area AZq'q.

## DETERMINING THE DISCOUNT RATE

Figure 17 serves as a framework for understanding how
a discount rate is established and provides guidance for
the appropriate value of the rate.  The vertical axis measures
future consumption, and the horizontal axis measures present
consumption.  Curve AEB depicts the productive opportunities
available to investors; i.e., it shows the rates of transfor-
mation from present dollars or consumption to future dollars
or consumption.  So curve AEB indicates the maximum price
or rate of interest which an investor, as a borrower of "to-
day's" dollars, is willing to pay to potential savers, as
lenders of "today's" dollars, as an inducement for their act
of saving--by which they forego present consumption for future
consumption.  Similarly, curve HL displays savers' subjective
time preference for present versus future dollars.  As such,
curve HL indicates the minimum price or rate of interest which
a potential saver is willing to accept as compensation for
sacrificing present consumption.

**FIGURE 17**
**VALUE OF THE DISCOUNT RATE**
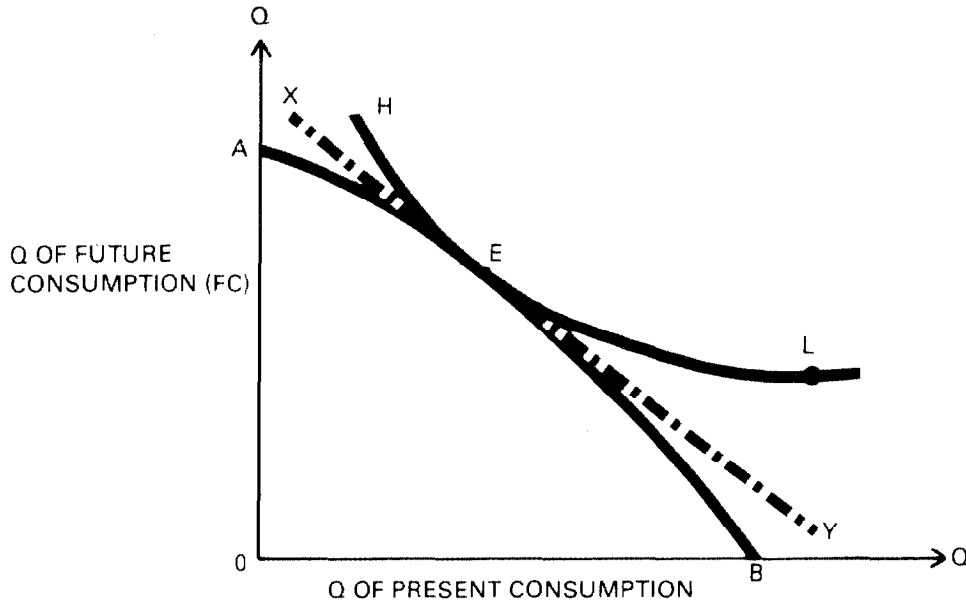


A unique rate of interest--or discount rate--which satisfies both investors and savers is determined at the tangency point E of curves AB and HL. At point E a unique rate of transformation exists between present and future consumption. This rate is measured by the slope of a straight line passing through E and tangent to curves AB and HL. Such a line (XY) has been drawn in figure 17.

ACCOUNTING FOR PRICE CHANGES IN THE DISCOUNT RATE

It is desirable, although not always practical, to account for future price changes in the measurement of benefits and costs of regulation. The theoretical discussion of how a discount rate is determined did not explicitly account for price changes. However, the introduction of price inflation, for example, in the analysis does not present any particular problem.

The discount rate can be thought of as consisting of two parts, a real rate of interest plus a price expectations component. In previous discussions of the discount rate, it was implicitly assumed that this price expectations component was equal to 0 percent; i.e., a discount rate of 10 percent being equal to a real rate of 10 percent plus an expectations rate

105

of 0 percent.  If, on the other hand, the price expectations
rate was 5 percent, then the discount rate would equal 15
percent.  If financial markets are ideal, their quoted rates
of interest will accurately reflect future price movements.

EXAMPLE OF USE OF INPUT-OUTPUT ANALYSIS

 Suppose the automobile industry must comply with a regu-
lation requiring minimum pollutant emission standards.  To
comply with these standards, the auto industry is forced to
install catalytic converters.  Depending upon price elasti-
cities of demand and supply in the relevant auto price range,
a percentage of the increased cost will be shifted to the
consumer. 1/  Figure 18 provides the scenario.  S' represents
postregulation.  A decrease in the producer's value of auto-
mobiles equal to area ABq'q is a result of the regulation.

**FIGURE 18**
**THE MARKET FOR AUTOMOBILES**



―――――――――――――――
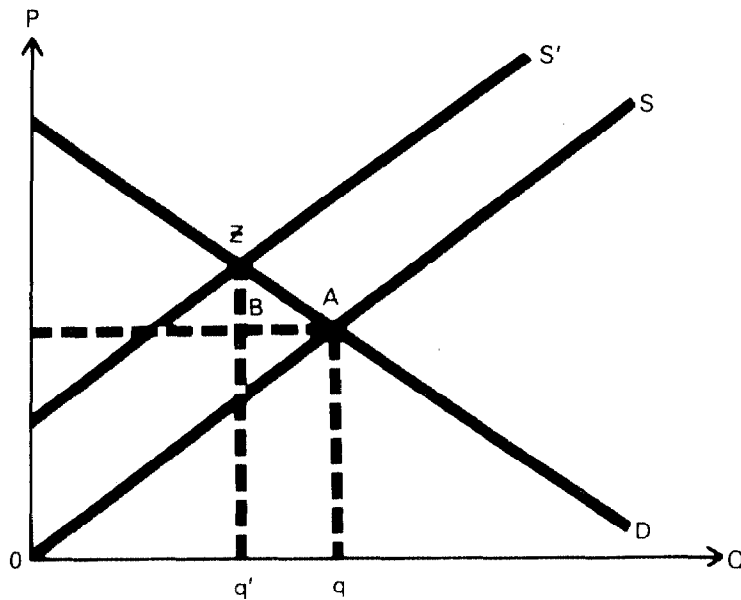
1/The price elasticities of demand and supply measure the
  responsiveness of the quantity demanded by consumers and
  of the quantity supplied by producers to a given price
  change.

If interindustrial incidence is desired, it is incorrect to say that the automobile industry incurred the entire loss in producer's value, area ABq'q. Rather, the auto industry has lost whatever producer's value that it added to the inputs purchased from other industries to make q-q' autos. Value added is defined as the market value of a product minus the cost of materials purchased to make it.

As a result, for interindustrial incidence, it is necessary to calculate the loss in value added for the industry directly affected by the regulation. Before this can be done, however, the expected decline in gross output (sales) --equal to ABqq' in the previous example--for that industry needs to be estimated. The decline in gross output can then be multiplied by the appropriate value-added index from any standard input-output table to arrive at the loss in value added. 1/

Using input-output statistics provided by the U.S. Department of Commerce, for example, a lost dollar of auto sales will generate a loss in value-added for that industry of $0.31. This lost dollar in automobile sales will generate the following losses in gross outputs by selected industry:

| Industry | Loss in gross output |
|---|---|
| Primary iron and steel | $0.07 |
| Rubber and miscellaneous plastics | $0.02 |
| Wholesale and retail trade | $0.02 |

Losses in value-added for these selected industries can then be computed by multiplying the above gross losses by their respective value-added indices. For example, for primary iron and steel, a loss in gross output of $0.07 corresponds to a loss in value-added equal to $0.07 x 0.39 = $0.03. 2/

---

1/Survey of Current Business, Feb. 1974, Table 2-"Direct
   Requirements Per Dollar of Gross Output, 1967," (Washington,
   Bureau of Economic Analysis, U.S. Department of Commerce).

2/Ibid., p. 5.                                      (972080)