Parable Beach

A Primer In Coastal Zone Economics

J.W. Devanney III
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Traditionally the vast and versatile resources along our seacoasts have been developed according to the rules of private enterprise. In recent years, however, as the dangers of rewarding the highest but not necessarily best dollar have become evident, a series of laws have moved to control private development by putting the lion's share of decision-making power into the hands of the federal, state, and especially local governments. This has placed new burdens on the elected members of these government bodies, who must choose among development proposals, weighing often exaggerated arguments pro and con, and make decisions that may affect the well-being of the area for years to come.

This book focuses on the economic aspects of this choice. It provides a method for analyzing the complex factors that will determine the economic impact of the proposed development. It does so with the narrative of a hypothetical coastal town, Parable Beach, modeled after hundreds of once graceful, now shabby oceanfront towns, victims of urban expansion and the automobile. Parable Beach is faced with two different development proposals: one for a large apartment/recreation complex and one for an offshore drilling operation. Step by step, the authors trace the process by which the town evaluates the claims on all sides. Background chapters provide detailed information on the difficult projections involved: employment figures, taxes, interest rates, revenues, inflation, and others. In effect, *Parable Beach* offers a way for government decision-makers to compute accurate figures on their own and frees them from a reliance on the projections of the interested parties.

Originally prepared as a report to the Office of Coastal Zone Management of the National Oceanic and Atmospheric Administration, *Parable Beach* has been reworked to serve as a guide for elected decision-makers and as a text for classes in coastal zone management, marine resources, and marine economy. Its narrative format renders the complex information accessible to those untrained in economic forecast and coastal zone management.

PARABLE BEACH:
A PRIMER IN COASTAL ZONE ECONOMICS

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PUBLISHER'S NOTE

This format is intended to reduce the cost of publishing certain
works in book form and to shorten the gap between editorial pre-
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have been avoided by photographing the text of this book directly
from the author's typescript.

To ourselves

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ACKNOWLEDGMENTS

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A PRIMER IN COASTAL ZONE ECONOMICS

INTRODUCTION

Coastal zone management is a resource allocation problem.
American society must somehow decide how to allocate an es-
sentially fixed supply of coastal zone resources among grow-
ing public and private demands for coastal areas. Histori-
cally, the answer has been to allow supply and demand to
determine the usage of coastal areas through the price mech-
anism--the use which paid the highest price for a particular
property obtained it. Zoning provisions, public ownership,
and tax laws have all had an impact on the market results,
but the current allocation is essentially the result of
private market operations.

Increasingly, these results have been called into ques-
tion. A series of laws have been passed which attempt to
modify the private market operation. Usually, these laws
involve a transfer of at least part of the allocative deci-
sion to some public body. At present, along most of our
coastline it is impossible to effect even a moderate-sized
development without the approval of a number of municipal
and state agencies. A large development will require the
approval of a score of municipal, state, and federal bodies.
This transfer of the allocative decisionmaking to public
bodies places a heavy responsibility on the individuals
within these bodies, for it is they who must now decide on
how society uses its coastal zone. On any such decision,
they will be besieged with arguments pro and con. The inten-
sity of these pressures reflects the increasing value that
society places on the coast and the subsequent importance of
their decisions.

Often the arguments for and against some change in coastal
zone allocation will take an economic form. This is a reflec-
tion of the fact that an extremely important measure of a
town's or a state's well-being is its wealth--its ability to
consume market goods. A prospective developer will claim
that his proposal will have a substantial effect on the
economy of the region and will buttress this claim with a
great deal of analysis and figures. Similarly, anti-
development forces will offer counterclaims also supported
by extensive figures, expert testimony, and analysis.

The purpose of this manual is to aid the responsible pub-
lic decisionmaker faced with such claims to sort out these
arguments. We will be pointing out the common fallacies in
many "economic" arguments, both pro and con a development,
sifting out the truth, aiming to put the decisionmaker in a
position to assess the true impact of a development on the
market wealth of the political entity to which he is respon-
sible, be it a town, a state, or the entire country. An im-
portant byproduct of our prescriptions for these public
decisionmakers is the establishment of the true economic

basis of the conflict between individual municipality, state, and country which is central to much of the coastal zone issue.

Our procedure will be by allegory. We will consider the case of a hypothetical coastal community, Parable Beach, and two important decisions which it finds itself faced with. We hope you will find Parable Beach an interesting place.

THE CASE OF THE PARABLE BEACH HIGHRISE

The Town of Parable Beach

The two women and five men who serve on the town council of Parable Beach face a number of difficult decisions. These decisions are not made any easier by the fact that each member of the council is a volunteer with limited time to devote to the council's activities. None of them has any formal training in regional economics, yet they are about to be besieged with a variety of "economic" arguments and counter-arguments on issues which they all realize will have a very substantial impact on their town's future.

Parable Beach is a community whose year-round population is a little over 10,000. The town is situated on a narrow, low-lying peninsula spitting out into Metropolitan Bay (see Figure 2.1). Parable Beach is located approximately twenty-five land miles away from Schrod City, a large metropolitan complex. Its major asset is its three miles of oceanfront shoreline, which features a large beach attracting a summer population of about 30,000, and some 75,000 day visitors from the Schrod City area on a hot summer weekend.

The town contains 2,000 acres, the bulk of which is situated at the root of the peninsula. The peninsula itself averages a little over a quarter-mile in width. In the central portion of the root is an abandoned quarry covering some 650 acres, presently being used as the town dump.

Despite the magnificent beach and the long bayfront, Parable Beach's history has not been entirely happy. At the turn of the century, Parable Beach was a favored summer home area for the wealthy and near-wealthy of Schrod City. However, over the first third of this century, Parable Beach fell out of favor with the rich. The automobile made newer coastal communities, further away from the city, accessible to the wealthy, who found the large crowds of day visitors traveling by excursion boats from the city on the weekends incompatible with their desires for quiet and prestige. Parable Beach fell out of fashion.

Residential construction all but stopped. Presently seventy-four percent of all housing in Parable Beach was built prior to 1939, with eighty-five of that standing before World War I. Portions of the beachfront sprouted penny arcades and beer joints serving the day people. This trend was aggravated by the fact that in 1912 the State Parks Commission, in a legislative deal that is still being quarreled about in the town, was able to gain control of the southern third of the beach. Parable Beach not only lost a rather large piece of real estate from the tax rolls but, to add insult to injury, found itself assessed a portion of the costs of maintaining and protecting the State Parks Commission area. On a ten-acre site behind the public beach, an

To Schrod City
8 Miles by Sea

Metropolitan

Bay

South

Daffyland

Beach

Route 3

To Schrod City
25 Miles by Land

Town
Dump

Sand and Gravel Pits

Parable Beach
Horseham
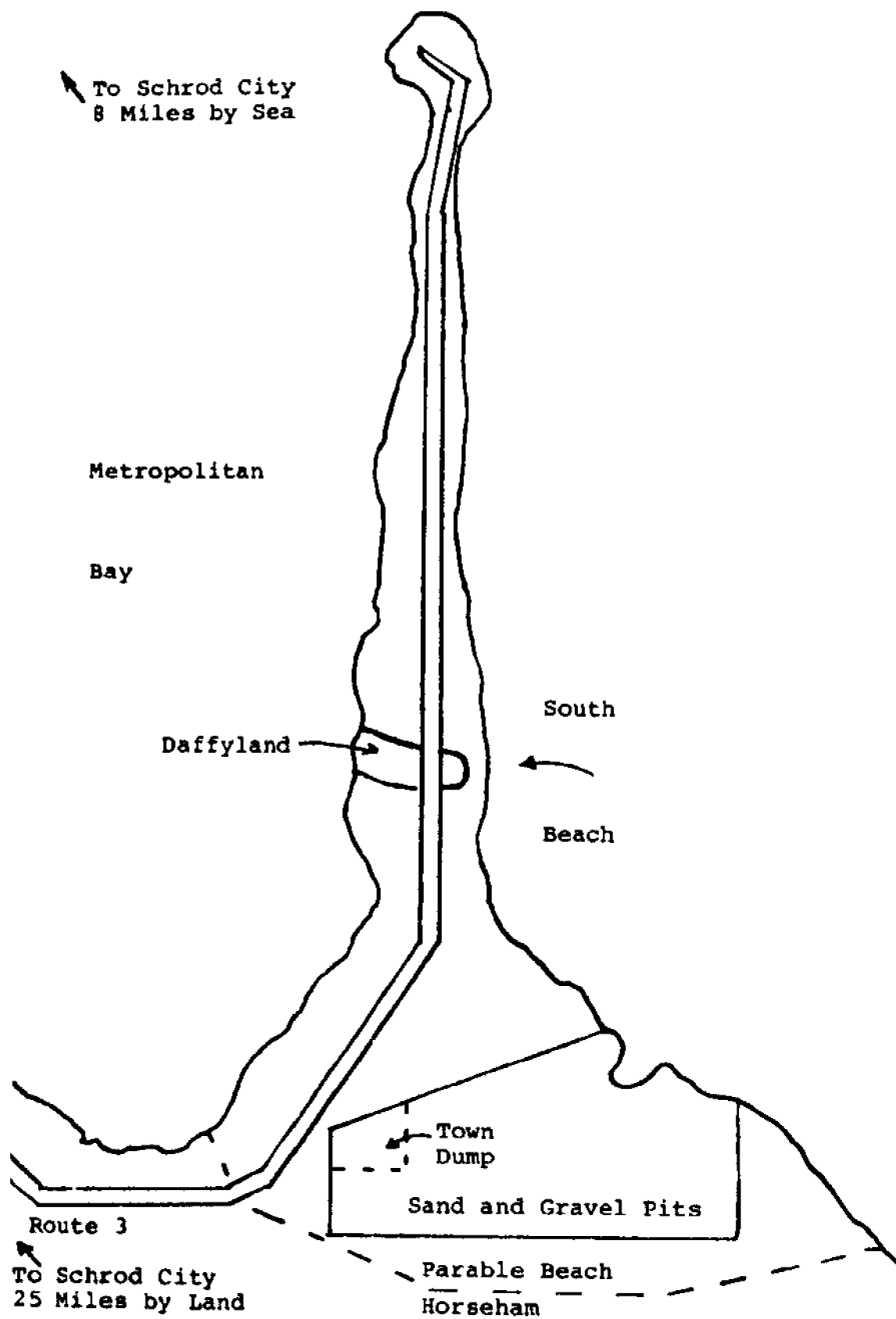
Figure 2.1
Parable Beach

amusement park, Daffyland-by-the-Sea, was erected, complete
with roller coaster and carnival booths.

During this fifty-year period, the major transportation
developments in the region tended to bypass the Parable Beach
peninsula, making commuter access to Schrod City difficult.
Only one rail line served the area, and this was abandoned
before World War II. Since the area lacks any type of ex-
pressway, rush-hour travel time to the central business dis-
trict of Schrod City by private car is an hour or more. A
commute by public land transportation, involving two trans-
fers, requires at least two hours. Therefore, middle-class
commuters have not found Parable Beach a suitable home.

Abandoned by the rich and ignored by the middle class,
after World War II Parable Beach became increasingly a
workingman's town. Larger summer home properties were sub-
divided into very small single-family plots, many less than
5,000 square feet. Smaller properties were converted to year-
round residences. Year-round population grew rapidly, as
shown in Figure 2.2, while summer population fell slowly.

The new year-rounders were young, lower-middle-class
whites. In 1970 only twenty-five percent of the families
had incomes over $15,000, as opposed to thirty percent for
the metropolitan region. In that year, average family income
($11,979) and median family income ($10,677) were lower than
for the metropolitan area. Forty-four percent of the popula-
tion is under twenty, as compared to thirty-five percent for
the region. Even more striking is the fact that thirty-nine
percent of the population is under eighteen. Some forty per-
cent of the town's year-round population is in school. The
rise in the enrollment of the Parable Beach public schools
is depicted in Figure 2.3. This explosion in school-age popu-
lation occurred at a time when unit education costs were also
spiraling. Presently, Parable Beach's education budget is
$3.8 million, or over $1,100 per student after federal aid.

Despite the relatively low incomes, most Parable Beach
residents (eighty-nine percent) live in single-family homes,
and most own their own homes. However, the median number of
people per dwelling unit is 3.4 in Parable Beach, as opposed
to 3 for the metropolitan area. Only four percent of these
single-family homes were valued at $20,000 or more in 1970,
as opposed to twenty-nine percent for the metropolitan area.
The median value of such units in Parable Beach was $18,600
as compared to $21,800 for the entire area. Only eighteen
percent of these homes have been built since 1950, and only
1.5 percent since 1965.

In short, the transition from a wealthy resort area to a
lower-middle-income bedroom community plus metropolitan beach
has not been easy for Parable Beach. It has, in fact, en-
tailed a number of problems: rising cost of government far
outstripping increase in property values, overcrowding and
congestion, inadequacy of sewerage and schools. Now, how-
ever, the region as a whole has begun to take another look
at Parable Beach, its magnificent beach and its relative prox-
imity to town, at least as the crow flies. Even the abandoned
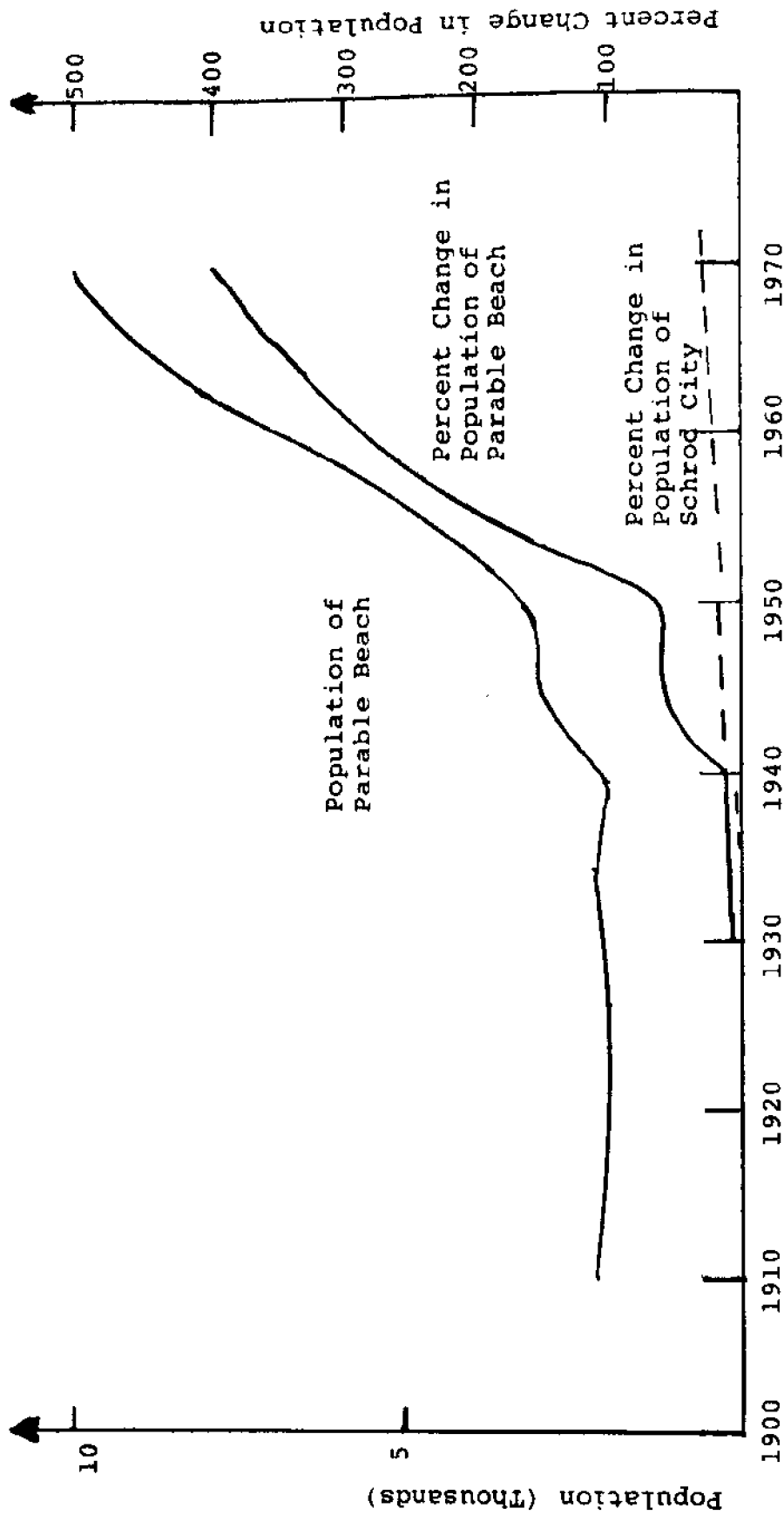
Figure 2.2.
Population Trends.
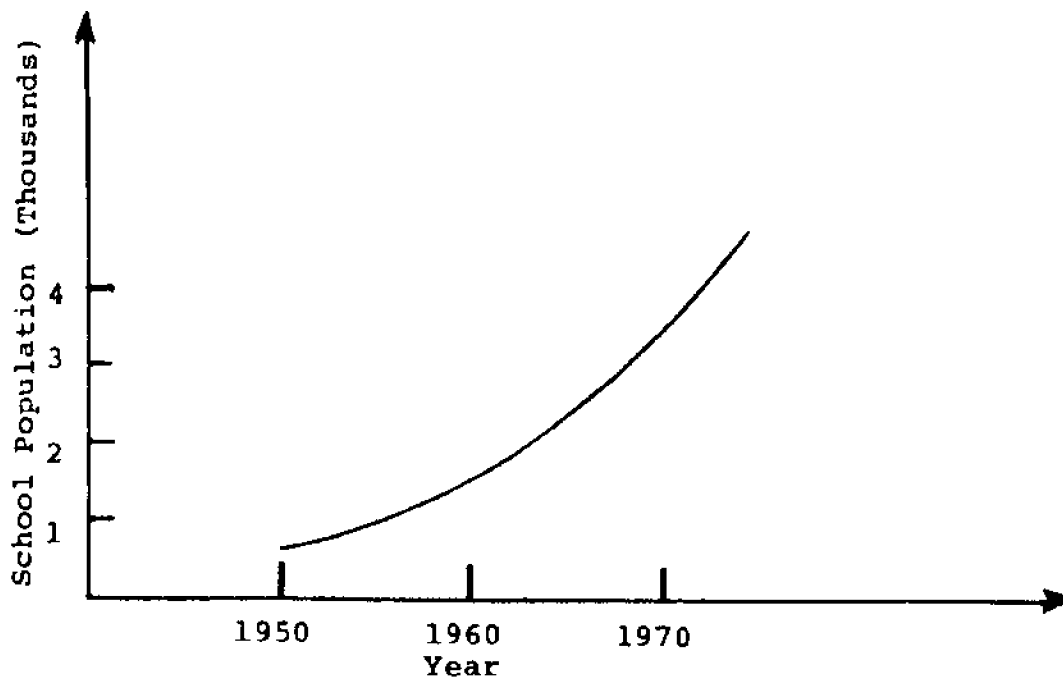
Figure 2.3.
School Population Trends.

quarry has drawn developer interest. These development pro-
posals present Parable Beach with a number of important
choices and the town is attempting to decide what to do with
them.

Paragon Park

The first proposal we want to consider is that of the Ithaca
Development Corporation. Ithaca believes that the population
pressures on the metropolitan area are so great and the at-
traction of a smog-free, coastline location so large that it
can now sell high-rise apartments to middle-income commuters
despite the horrendous commute to Schrod City. Ithaca has
identified a twelve-acre plot in the middle of the beach area
and obtained an option to buy the parcel. Ithaca also envi-
sages the possibility of marina facilities, a moderate-sized
motel for summer patrons, and an associated commercial devel-
opment to service the complex and replace existing business
which would be displaced. To this end, it has approached
the town council for a variance to present town ordinances
with respect to building height and density. The council
has called a meeting at which Ithaca has been asked to pre-
sent its proposal in some detail.

The council meeting is about to begin. The Parable Beach

High School auditorium is full. A few latecomers are still
trickling in the rear door, forcing the other standees outward
along the rear wall. Simon D. Montfort, the chairman of the
council, calls the meeting to order. He's a dentist who works
in Schrod City. His family has lived in Parable Beach for
three generations. After review and acceptance of the minutes
of the last meeting, Simon announces that the ordinary busi-
ness of the council will be put off so that they can move
immediately to the Ithaca proposal. After cautioning the
audience on the need for order, he introduces the head of the
Ithaca presentation team, Edwin Steuben, president of Ithaca.
Most of the people in the audience know Steuben from his pic-
tures in the Parable Patriot, the local weekly. The Patriot
has run two rather unflattering articles on Steuben and Ithaca
and has taken a strong editorial stand against the develop-
ment. Steuben is a tall, grey, impressive man, but he reads
his presentation in an uncomfortable monotone, only occasion-
ally glancing up from his text.

   "Thank you, Dr. Montfort. We at Ithaca are extremely
grateful to the council for granting us this opportunity to
present our ideas to Parable Beach. As you know, I am not a
resident of this area. However, almost every summer I have
sailed along this coast and I have never failed to marvel at
your beach and your location. It is not surprising to find
that Parable Beach was one of the earliest permanent settle-
ments along this coast, a thriving trading station between
Indian and colonist. It is easy to imagine that these
earliest settlers naturally assumed that Parable Beach, with
its unique location, magnificent beach, and beautiful hills,
would be the hub around which future development would take
place, the focal point, the apex of regional development.

   "We all know that that dream did not come true. It is
perhaps in the nature of smaller communities that they go
through cycles, responding to the ebb and flow of society's
sometimes capricious whims. For the last fifty years, the
region has not treated Parable Beach kindly. The state has
taken one-third of your beach and in return assessed you for
its upkeep. Parable Beach has been ignored by the state's
transportation planners and as a result it is more isolated
from Schrod City, eight miles away, than towns fifty miles
inland.

   "However, we at Ithaca believe the tide is turning. The
same unique features which attracted the Indian and the early
settler are still here. However, it is up to us to capitalize
on them. As a first great step in this direction, Ithaca
proposes Paragon Park."

   The hall lights darken and an artist's rendering of the
development is projected on a screen behind the council.

   "Paragon Park is an integrated residential, retail, and
recreational development carefully planned to take full ad-
vantage of a unique site. Paragon Park would occupy a twelve-
acre area currently containing Daffyland. Paragon Park will
be built in three phases. The first phase will involve the
construction of 262 modern oceanfront apartments in two

fifteen-story towers, together with forty-two units of du-
plex garden apartments. The second phase involves a 500-slip
marina and shopping center on the bayfront, and the third
phase will involve an additional three towers containing some
400 apartments.

"What would Paragon Park mean for Parable Beach? In
purely monetary terms, Paragon Park will involve a total ex-
penditure of close to $20 million. At present tax rates,
this development when completed will generate $1.5 million
per year in property taxes. This is equivalent to a ten per-
cent increase in the tax base or an average decrease in an-
nual property taxes of $125 for each and every property owner
in Parable Beach.

"And this is only the beginning. The construction phase
will require the expenditure of $12 million on local labor.
Many of these jobs will go to Parable Beach residents, inject-
ing this money into the town's economy. Further, construc-
tion personnel will make considerable expenditures in the
area. Our consultants estimate that six percent of the pay-
roll, or $720,000, will be spent in the area of the site,
generating revenues for local businesses and retailers. To
this must be added the expenditures of the new residents of
Paragon Park. Independent economic consultants tell us that
some ten percent of their income, estimated at $9 million,
will be spent in the immediate area. Thus, some $900,000
will be added to the town's revenues. Further, these expen-
ditures will generate respending, which will have an addi-
tional impact on the local economy. This is the 'multiplier
effect,' as what one person spends is spent again and again.
Our experts inform us that the effect of this respending
will be to increase the direct impact of this spending by a
factor of 3.5. In summary, then:

Annual property tax revenue	$1,600,000
Spending by construction	720,000
Spending by residents	900,000
Multiplier effect	5,000,000
Total annual impact on local economy	$8,000,000."

Steuben then proceeds to a more detailed description of
the physical development, finally ending with the prediction
that "Ithaca fully expects Paragon Park to become the corner-
stone on which a new era for Parable Beach will be built."

Montfort thanks Mr. Steuben, and notes that he will be
available for questioning later, but indicates that in the
interest of making the issues involved as clear as possible,
he first wants to call on Mr. Giles D. Ray, head of the South
Beach Businessmen's Association.

"Thanks, Simon. It's my honor to be representing the
South Beach Businessmen's Association tonight but, in a larger
sense, I and the SBBA are representing all the people of
Parable Beach whose destiny you and the rest of the council
hold in your hands.

"We have heard a most impressive presentation about what

is essentially a high-density urban housing project which the developers wish to transplant into our coastal suburban community. Tonight I'm going to leave to others the assessment of what this transplantation of Schrod City will mean for Parable Beach in terms of scenic values, community texture and our whole way of life. Tonight I'm going to concentrate on the economic impact of this development on the town. In a word, economically this development would be a disaster for Parable Beach.

"Presently, the largest export industry in Parable Beach is Daffyland-by-the-sea. Each year over 500,000 visitors come to Parable Beach. SBBA records indicate that on the average each of these visitors spends $4.45 for a total revenue of $2.25 million. The Ithaca proposal would involve the demolition of Daffyland together with its thirty-three concessions, but also the destruction of eighteen businesses on properties surrounding Daffyland. These businesses have a total gross annual income of $650,000. Together with Daffyland, they employ 167 people and have a gross payroll of $800,000. Destroy these businesses and you will have destroyed over $2.9 million of direct revenues, $800,000 in payroll and $400,000 in property taxes, for a total of $5.1 million. And these are only the direct effects. What about the indirect effects as the businessmen of South Beach respend this money, much of it in Parable Beach, and that money is respent and so on? I would say that Mr. Steuben's multiplier of 3.5 is conservative. In any event, even if the multiplier were only 1.6, we would be talking about losses in excess of $8 million, the best we can expect from the new development. At a multiplier of 3.5 we are talking about a loss of $17 million per year.

"In summary, the proposal involves the destruction of fifty-one local businesses including the largest export industry in the town, the loss of 167 local jobs, and a gross loss to the local economy which is likely to exceed $10 million. In accepting Paragon Park, you will be cutting off the economic blood system upon which Parable Beach is based."

A lively discussion follows, which after a time tends to move away from the strictly economic impact and concentrate on scenic values, congestion, and, in a disjointed manner, on the community's view of itself.

At 11:30 Dr. Montfort adjourns the meeting after the council agrees to meet in a closed session on the following Monday.

The Next Meeting

It is a week after the Ithaca presentation and the town council is meeting in camera. Dr. Montfort has attempted to focus the discussion for this meeting on the economic arguments offered by the prodevelopment and antidevelopment forces. The ensuing discussion is confused and increasingly heated, consisting mainly of comments on the accuracy of individual numbers. Two of the seven council members are clearly for the development; two others, against. And the comments on

the numbers gradually become comments on the veracity of the sources of the numbers.

Finally, Kathleen O'Houlihan, the oldest member of the council, takes the floor.

"I for one wouldn't give two ants for either side's figures. They just seem to pile things on top of things. Take this multiplier effect: if what is paid to me makes me rich and when I turn around and pay it to another, that makes him rich, why does it ever stop? Why isn't the multiplier ten or one hundred or one thousand? And where are the costs to the town of the high-rise--the police protection, fire protection, sewerage, highway maintenance and schooling? Where, for that matter, are the costs to the town of Daffyland, the police, the parking, the congestion?

"I don't believe the figures in their present form are even worth discussing. I believe we need professional help. George Banks, who lives three doors down from me, works in town at the State Office of Coastal Zone Management. I've talked to him and he has agreed to look at these figures and see what they really mean for the town's economic well-being. I strongly move we take him up on his offer, turn over all the data we have to him, and see what we come up with."

Mrs. O'Houlihan's suggestions meet with little real approval, but after another couple of hours of fruitless wrangling, the council decides they have little to lose and authorizes her to turn over the data to Banks. It is agreed that Banks will give his report to the council in two weeks.

SOME NECESSARY BACKGROUND

The Concept of Real Municipal Income

Let us digress from our story for a moment to think carefully about the problem which the town council faces. The council realizes that the market wealth of the town of Parable Beach-- the amount of market goods which the town as a whole can consume--will almost certainly not be the same with Daffyland occupying the South Beach site as it will with Paragon Park. At this point, however, the council hasn't the foggiest idea whether the town's wealth will be higher or lower with the high-rise rather than with the amusement park. Yet it must make a decision. The council realizes that municipal wealth is only one measure of a community's well-being. It also realizes that it is an extremely important measure. The council knows the people of Parable Beach are extremely concerned about the admittedly poor quality of their schools despite rapidly escalating tax rates. The people of Parable Beach are not wealthy. Almost all the homes of Parable Beach would welcome a little more income and most could ill afford a little less. Therefore, it is imperative that the council have a realistic estimate of the difference in municipal income associated with opting for Paragon Park rather than Daffyland. Once it has such an estimate, it will be in a position to balance this change in market wealth against the differences in environmental quality and scenic values which the alternatives imply before reaching a final decision.

In order to sort out the dollar figures offered by the prodevelopment and antidevelopment forces, we must first define just what we mean by the *real municipal income of Parable Beach.*

Perhaps the easiest way of getting at our definition of real municipal income is to imagine that the town of Parable Beach is owned and controlled by a single personage--Uncle Eph we might call him. Uncle Eph is interested in the total value, at present market prices, of all the goods he can consume with the output of the rather extensive resources he controls. Uncle Eph realizes that he can allocate his resources in an infinite variety of ways, some of which will allow him to consume a higher total value of goods than others. Uncle Eph, for reasons he chooses not to discuss, would like to make this market value of his consumption as large as possible.

His resources include not only the land and water, the buildings and roads, vehicles and vessels of Parable Beach, but also its present human inhabitants. We might regard this latter brand of resource as Uncle Eph's fingers, in that they both produce and consume. Uncle Eph has no particular feelings about his fingers. He isn't interested in whether one finger rather than another consumes a greater share of

the total value of all the goods he consumes. He is only interested in the total. He considers himself better off if this total value is larger, worse off if it's smaller, regardless of the distribution of production and consumption among his fingers.

We define the total value of the goods, priced at current market prices, which Uncle Eph can consume, to be the real municipal income of Parable Beach.[1]

Notice that in attempting to maximize this quantity, Uncle Eph is ignoring the fact that any proposed change in the allocation of his resources will almost certainly make some of his fingers worse off and some better off. Uncle Eph simply doesn't care. He prefers the change if the total value of the consumption of all his fingers is higher after the change than before. He will eschew the change if the total value is less. *Our concept of municipal income ignores the distributional effects of any proposed change within the town.*

This limitation has obvious political implications, for what may be a net increase to the town as a whole can affect a particular set of losers quite adversely. For example, real municipal income will be increased by a change which increases the real income of ninety percent of the town's citizens by ten percent and decreases the real income of one percent of the town's population by seventy percent, virtually wiping out this latter group. Almost all urban renewal schemes have had some such effects. The carnies of Daffyland could be this type of victim for the proposal under consideration. Uncle Eph doesn't care, as long as he comes out ahead overall.

There is another thing to notice about Uncle Eph. His is a provincial and basically selfish character. He only cares about his own ability to consume. He is completely indifferent to any effect, up or down, his choices might have on the income of entities outside the town—the rest of the state, for example, or the rest of the country. Any change in income, no matter how large, to someone who is not a citizen of Parable Beach is given no weight at all by our concept of *municipal* income.

Thus, in order to implement this parochial philosophy, we will have to be quite precise about what we mean by a citizen of Parable Beach. Let us assume that the council is willing to accept all *present* property owners in Parable Beach, both year-round and summer, and all present year-round tenants as citizens of Parable Beach. Notice that this definition applies to the situation *before* development. Changes in income to people who are drawn into Parable Beach by the development will not be counted under this definition.

The Black Box Concept

One way of thinking about this is to imagine that we enclose the town in a black box. We count the changes in real income, up and down, to everybody presently within that black box

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[1]Throughout the book, "current" is taken to be 1974.

and ignore the changes outside the black box.

It should be obvious that in a very real sense the decision to place our black box around the town of Parable Beach is arbitrary. We could have drawn the black box around any political entity. Whether or not the town council of Parable Beach cares to admit the fact, there are human beings outside of Parable Beach whose real incomes will be affected by *some* of the council's decisions. And even if the council is not concerned with these impacts, other, broader portions of society are.

In order to analyze the conflicts which necessarily arise from these varying levels of responsibility, in this handbook we will actually be concerned with three different black boxes (see Figure 3.1):

1. A black box around the town of Parable Beach;
2. A black box drawn around the state in which Parable Beach is located;
3. A black box drawn around the entire nation.[2]

In Chapters 5, 6, and 7 we will be analyzing the same development from the point of view of real municipal income, from the point of view of real state income, and from the point of view of real federal income. This will mean keeping three separate sets of accounts, and in general we will obtain three different answers.

For now, the important point to draw from this is: whenever one is analyzing the economic effects of a development, *one must make one's black box explicit*--whose income are you talking about? Failure to do so is endemic to the coastal zone development debates and results in the meaningless tossing around of numbers--a process which has already started in Parable Beach.

In our calculations, we will also be dealing with developer real income, not so much because of our basic interest in the developer's well-being, but because an increase in his income will be necessary to induce the developer to undertake the project under analysis. For these calculations, we will simply draw our black box around the developer.

The Implications of Accepting Market Prices as a Measure of Value

We have already discussed two of the limitations of real income as a measure of well-being--it does not account for changes in income distribution within the black box and it ignores changes outside the black box. There are some more fundamental limitations. In using real income as a measure of well-being, one is accepting the market's valuation of all goods.

There is some confusion about the philosophical implica-

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[2]Other choices of black box are possible: for example, the SMSA in which Parable Beach is located. However, since most of the political power is focused at these three levels, these are the three most interesting black boxes from the point of view of the coastal zone.
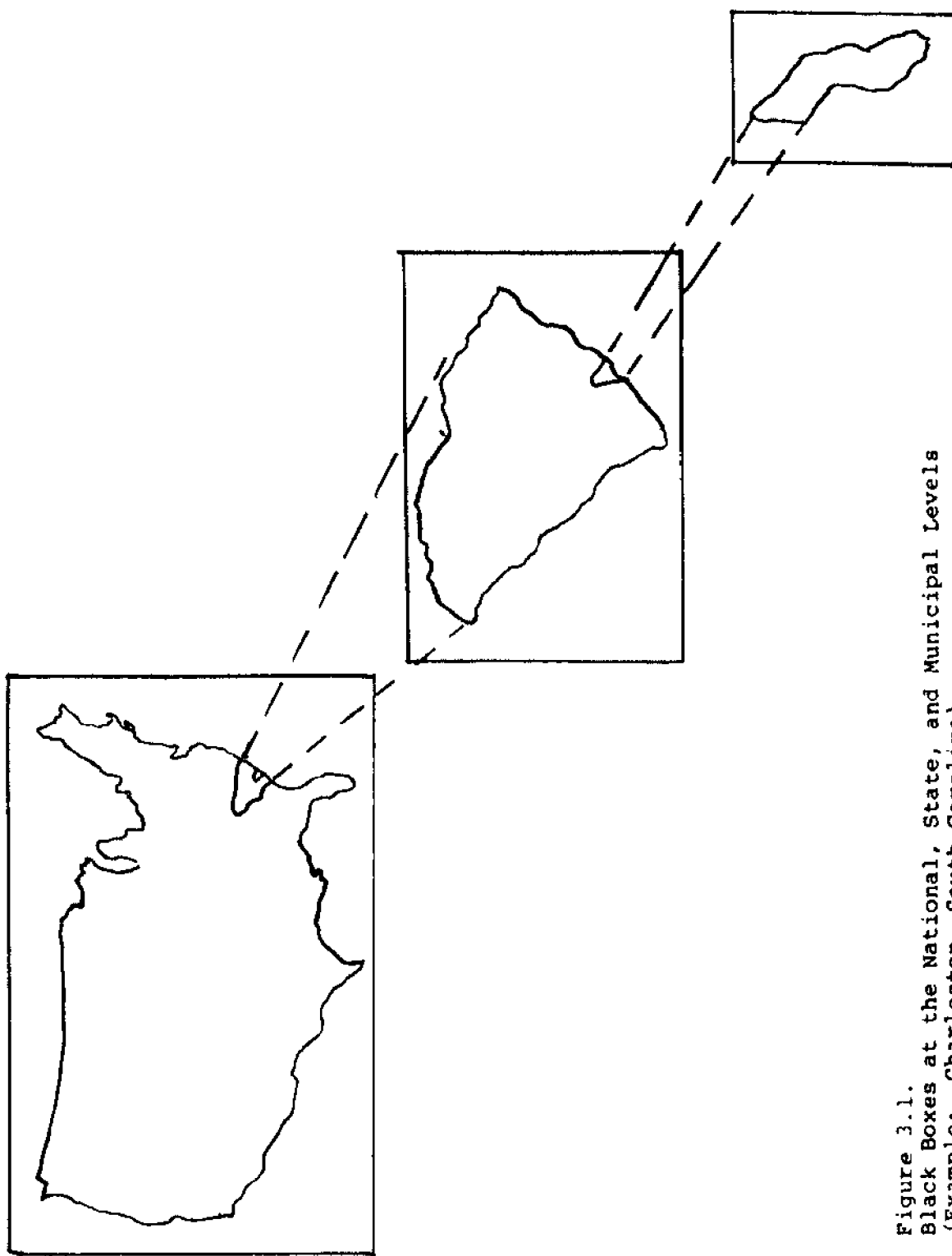
Figure 3.1.
Black Boxes at the National, State, and Municipal Levels
(Example: Charleston, South Carolina).

tions of accepting this valuation--to many it implies appro-
val of the market's valuation of, say, a carton of cigarettes
as equal in value to a symphony ticket. But it's less a mat-
ter of approval than the acceptance of the following reality:
for most smaller black boxes--state, municipality, indivi-
dual--*most market prices are for all practical purposes fixed.*
These entities cannot in general affect prices. Given that
market prices are fixed, there is a clear indication that,
everything else being equal, people would rather be able to
consume more than less. This is not necessarily a crass at-
titude. Ability to consume in this context covers consump-
tion of education, ballet, and museum memberships, as well
as consumption of golf carts, television sets, and beer.
Rather, accepting real income as a measure of well-being in-
volves taking a laissez-faire attitude towards how the entity
within the black box chooses to spend its income. Thus, if
one feels that people's consumption patterns are self-
destructive, one will be quite unhappy with real income as a
measure of well-being.

It is also true that, insofar as the prevailing prices
are set in competitive markets, these prices reflect the rela-
tive willingness to pay of the society's inhabitants for the
goods so priced. Thus, *if one accepts the present income
distribution,* one can make an argument that these prices are
an imperfect but indicative reflection of people's underlying
desires. Further, even substantial changes in income distri-
bution are likely to have little effect on most prices.

This argument holds only for those goods for which a func-
tioning market exists. The fact that no market exists in
which water quality or air quality or scenic values can be
exchanged means that these goods can be severely underpriced
in terms of society's underlying willingness to pay. In this
situation, the fact that the market sets the price of air
quality at zero to someone who would use (diminish) this air
quality does not necessarily imply that the people in the
society are not willing to pay anything to avoid this loss
in air quality. Such environmental issues are ignored by
real income.

In short, real income is only one dimension of an entity's
well-being, albeit an extremely important one. The goal of
this manual is to see that the analysis regarding this dimen-
sion, at least, is fallacy-free and truly informative. We
will not deal directly with other measures of well-being,
such as environmental quality, simply because it is necessary
to take one thing at a time. We must learn to walk before
we can run.

Present Value

Before we can even walk, we must face one more additional
problem associated with changes in income--whether municipal,
state, or federal income--and that is: changes in income
can occur at different points in time. The effects on muni-
cipal income, both positive and negative, of changing Daffy-
land to a high-rise housing complex will be felt at varying

points in time ranging from almost immediately to perhaps
fifty years in the future. Paragon Park will involve con-
struction expenditures over the next few years but little or
no property tax payments in this period. Later on, after
the investment is complete, property tax and expenditures by
residents will grow. Daffyland promises a more even set of
financial flows. How are we to balance income effects now
with income effects further, and in some cases much further,
into the future? To see, let us take our black box for the
moment to be Parable Beach and look at the problem from the
point of view of Uncle Eph.

Uncle Eph is a shrewd old codger. He realizes that there
is considerable difference between receiving one dollar in
additional income now and one dollar in additional income
ten full years from now. The reason, of course, is that
Uncle Eph has the opportunity to invest the one dollar re-
ceived now at some annual interest rate, say ten percent.
After one year so invested, Uncle Eph will have $1.10, which
he can reinvest for a second year, obtaining an additional
ten percent on $1.10, or eleven cents, for a total of $1.21,
which he can reinvest, and so on. If he invests the dollar
received now for ten years at ten percent, he will find that
at the end of the tenth year, his investment will be worth
$2.59, which is quite different from one dollar. The timing
with which he receives the same amount of additional munici-
pal income obviously makes a great deal of difference to
Uncle Eph.

To put it another way, if Uncle Eph has investment oppor-
tunities which can earn him ten percent per year, receiving
one dollar now is equivalent to receiving $2.59 ten years
from now. He would be indifferent between receiving one dol-
lar now and $2.59 ten years from now but he would certainly
not be indifferent between receiving one dollar now and one
dollar ten years from now.

Uncle Eph, therefore, realizes he has to put increases in
municipal income received at varying points in time on a com-
mon temporal basis. He chooses to relate them to an equiva-
lent amount received now (1974). That is, in valuing an
increase of one dollar which will occur ten years from now,
he asks himself what is the amount received now which will
grow to one dollar ten years from now. Mathematically he
is asking:

What number x $2.59 = $1.00?

The number he is after is simply $1.00/$2.59 or 38.6¢. This
number is called the *present value* of a sum of one dollar
received ten years from now assuming a ten percent interest
rate. In general, the present value of a sum x_n received n
years from now at an interest rate i is

$$\frac{x_n}{(1 + i)^n}$$

If we are dealing with a development alternative which will increase municipal income by x_1 in year 1, x_2 year 2, and so on through N years, then the present value of all these increases, V, is simply the sum of the present values of each yearly increase or

$$V = \frac{x_1}{(1 + i)} + \frac{x_2}{(1 + i)^2} + \frac{x_3}{(1 + i)^3} + \ldots \frac{x_N}{(1 + i)^N}$$

Uncle Eph reasons that, given his opportunity to reinvest at an interest rate i, he would be just as well off in terms of his real wealth if he received the sum V now as if he received the entire stream of future increases in income resulting from the development alternative. Thus, in comparing various development alternatives, he will do so on the basis of their present values, that is, on the basis of an equivalent amount of income received in 1974 on a one-shot basis.

The justification for applying Uncle Eph's reasoning to our valuations of Parable Beach's alternatives follows from the fact that the individual citizens of Parable Beach are either borrowers or lenders or both. In so far as they are lenders, they are in exactly the same position as Uncle Eph and therefore future income must be adjusted downward relative to present income according to the interest rate at which he can lend. In so far as a citizen who could be a lender does not do so, he is making a clear statement that he prefers $1.00 worth of consumption now to $1.00(1 + i) worth of consumption a year from now. In both cases, future increases in income must be present valued at the interest rate available to these citizens. By the same token, to the extent that the citizens of Parable Beach are borrowers, they are making a clear statement that they are willing to exchange ($1.00 + i) a year from now for a dollar's worth of consumption now where i is the interest rate at which they are borrowing. The town itself as a municipal entity is a borrower. Obviously, an additional dollar of net public revenues received now could be used to pay off a portion of the town debt which will cost ($1.00 + i) to pay off a year from now. In all these cases, a dollar received now is worth more than a dollar received a year from now by an amount which depends on the relevant interest rate. Putting things in terms of present value, that is, equating future increases in income to an equivalent amount received now, accounts for these differences. Therefore, in evaluating the alternatives before Parable Beach, we must estimate the net increases or decreases in municipal income in each year associated with the alternative and then convert this time stream of revenues and outlays to an equivalent amount received now by means of present value.

Choice of Interest Rate

Our use of present value raises the problem of how to choose the interest rate we use in our analyses. Clearly, some of

the inhabitants of Parable Beach have different investment
and borrowing opportunities from others. From the point of
view of the town as a whole, what we require is a weighted
average of the highest rates being paid by individual bor-
rowers and the lowest rates being obtained by individual len-
ders where the weights would depend on the degree to which
each individual is affected by the development alternatives.
Unfortunately, accurately estimating such an average is a
hopeless task. Fortunately, it's also usually unnecessary.
As we shall see, it is usually possible to obtain all the
insight we require by running our analyses over a range of
interest rates and examining the results in aggregate. When
an estimate is required, a ballpark value can often be ob-
tained by using the highest rate of interest being paid by
the town on its borrowings.

Inflation

At this point, we had better say a word about inflation.
All our analyses are based on 1974 prices. Thus, for example,
if a particular policeman's services were priced at $5.00 an
hour in 1974, we will assume that his wage is $5.00 an hour
in 1984. In reality, the general price level may have risen
so that *in 1984 figures* the policeman is earning, say, $6.00
an hour in 1984. However, we will implicitly deflate these
prices back to 1974 dollars to put everything on the same
basis. This holds for all future prices and costs. In par-
ticular, this procedure requires that we use inflation-free
interest rates in obtaining present values. For instance,
if an investor's best employment of capital is to buy a bond
at a market interest rate of ten percent for a given period
during which price levels rise at three percent per year,
the investor will realize a seven percent growth in his in-
come in real purchasing power (in constant value dollars).
Thus, in this book, when we speak of an interest rate of
eight percent, we are talking about eight percent net of in-
flation, which at present would correspond to a market in-
terest rate of twelve percent or more.

The Crucial Importance of Net Rather Than Gross

The final and in some ways the most important point to make
about a decision to measure municipal well-being in terms of
municipal income is that in assessing any two alternative
developments, the only thing that counts is the *net differ-
ence* in real income between the two within the black box
we've drawn around the municipality. This is an obvious
statement but one that is frequently ignored in the public
debate concerning potential developments.

To see what we are driving at, consider what is, in the
present context, a reasonably neutral example. Our black
box is some well-defined region. This region is contempla-
ting the construction of an office building on a particular
plot of land which is currently devoted to an intensively
cultivated truck farm. The potential developers have deter-
mined to their satisfaction that the building is at least as

good an investment for their capital as they could make else-
where. Having done this, they approach the region to con-
vince it that it is in the region's interest to have this
project undertaken.

Potential developers usually concentrate on the *input*
side, that is, with regard to the resources which will be
employed in their proposal. In this case, they note that
the building will cost them $10 million, of which half will
be spent within the region. They point out that the bulk of
this $5 million will be respent within the region; the re-
spent money will in turn be again respent; and so on. In
this manner, the initial expenditure will be "multiplied".
Further, upkeep and maintenance of the building will involve
expenditures of $500,000 a year; these expenses are also sub-
ject to respending. Depending on the multiplier assumed,
they conclude that the building will have an effect on the
region's economy several--and sometimes many--times larger
than the gross expenditures associated with the project.

Opponents of new developments generally argue on the *out-
put* side, that is, with regard to the value of the goods the
current use of the land produces.[3] Thus, the opponents of
the proposed building point out that the gross revenues of
the truck farm are $2 million a year, most of which goes to
the farm's 200 workers who will lose their jobs. They argue
that not only will the region's economy lose $2 million a
year directly, but also farm equipment, fertilizer, and seed
suppliers and others throughout the region whose livelihood
depends on the respending of the farm workers will be ad-
versely affected, starting a multiplier chain. The multi-
pliers assumed by opponents of a development are usually of
roughly the same size as those of the proponents; the dif-
ference is that these multipliers are usually applied to the
gross value of the outputs of the present use of the site
rather than the gross value of the inputs.[4]

Both sides are making a basic error in talking gross
rather than net changes. Assuming that the developers' and
opponents' underlying figures are current, let's examine this
decision about resource allocation from the point of view of
our concept of black box income. That is, let's attempt to
determine the *difference* in real regional income (as defined
earlier) between constructing the office building and leav-
ing the site as a truck farm. Start with the developers' $5
million to be spent within the region. For simplicity, assume

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[3] In reality, both opponents and proponents of new develop-
ments often mix input-side and output-side arguments. How-
ever, we can make our point using the above simplification
without loss in generality since, as we shall see, the same
basic principles refer to both lines of reasoning.

[4] It really doesn't make much difference, for assuming normal
profit levels, the gross expenses of any undertaking will be
approximately equal to the gross revenues.

this all goes to construction labor. The first question we
have to ask ourselves is: what would this labor be earning
if it weren't employed on this building? The market value
of this alternative production measures *the cost to the
black box*--as opposed to the cost to the developer--of using
this resource on the building.[5] If there is nothing else
this labor could be doing, obviously the alternative oppor-
tunity value of the labor is nothing. The transfer of the
labor to this project involves no loss in regional produc-
tion elsewhere and hence the cost to the region of employing
the labor on the building is zero. In this case, the
full $5 million payroll represents a net increase in re-
gional income, as is evidenced by the increase in the pay
the construction workers actually take home. But if the con-
struction workers could be employed elsewhere producing some-
thing else whose value approximates the wage rate--the
situation when we have full employment--then the cost to the
region of diverting this labor to the proposed building is
the loss in output elsewhere.[6] Under full employment
this loss would be about $5 million and the payroll in
itself generates *no* increase in regional income, as is evi-
denced by the fact that whether the construction worker works
on this particular building or somewhere else, his paycheck
is unchanged. In the case of full employment the cost to the
developer of the labor, $5 million, and the cost to the re-
gion are approximately equal. In this situation, the net
increase in regional income due to the construction payroll
is zero.

*The net effect on black box income of expenditures on
black box inputs depends critically on the alternative oppor-
tunities for employment that these resources have.* This cru-
cially important principle is rarely emphasized in the public
debate concerning proposed developments. It applies to all
black box inputs: land, capital, and materials as well as
labor. For any such input, the direct effect of its purchase
on regional income can range from the full expenditure, if
there is complete unemployment of that resource, to zero if
the resource is fully employed, and indeed can even be nega-
tive if the market price of the input is lower than the mar-
ket value of its output.[7]

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[5]To see this, look at it from Uncle Eph's point of view.

[6]Full employment means no excess supply of labor, which in
turn implies that regional employers find that the wage rate
is low enough that the market value of what each laborer pro-
duces is at least as great as the wage rate. Therefore,
under full employment, the market price of labor is no higher
than the value of what that labor can produce elsewhere.

[7]This happens when a good is priced at less than the oppor-
tunity value of its use to the region due to regulatory con-
trol (as with natural gas and foreign currency) or the lack

However, in applying this principle we will concentrate on the input labor. The reason for this is that it is ordinarily difficult for the market price of land or equipment or fuel to rise much above their opportunity value for a variety of reasons: mobility, antitrust legislation, ability to be stored. But the input labor is often in partial unemployment; that is, the opportunity value of labor is often somewhat less than the market price, though rarely is it a great deal less. Setting the wage rate too high above opportunity cost generates unemployment, which generates people willing to work for less than the prevailing wage; this willingness puts a limit on how far above the opportunity cost of labor the wage rate can rise.

Now let's turn to the multiplier. If we have full employment and there is no change in construction workers' income with and without the building, then the net effect on regional income of the multiplier effect is zero, since there is no difference to multiply. But let's say we are facing a partial unemployment situation such that the direct effect on construction workers' take-home is twenty percent of the gross payroll, or $1 million. Then we can properly apply a multiplier *to this difference*, for there will be a difference in the workers' expenditures.

However, in so doing we must once again be careful to obtain the *net effect* of this additional respending on regional income. Let's suppose that as a result of his increase in income, the construction worker spends an additional $5.00 a week on, say, clothing. The clothing retailer sees an increase in his gross revenues of $5.00. Does that mean there is a net increase in regional income of that amount? Obviously not. The worker's expenditures require the employment of certain resources: the retailer's help, the labor, and the capital required to manufacture the apparel and bring it to market. Even if all these resources are found inside the region, the cost to the region is again the alternative opportunity value of these resources--the value of what they could be producing if employed elsewhere. It is true that, due to fluctuations in demand, service industries tend to operate at less than capacity much of the time. Thus, if the worker happens to spend his extra clothes money at a time when retail capacity is in oversupply, then the additional cost to the store owner and to the region of selling these additional items is little more than the wholesale cost of the clothes. The rest is profit and this, less the bulk of extraregional taxes, is a true increase in regional income due to the increase in the store owner's net income. If, on the other hand, the money is spent during the Christmas

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of a market (as with air and water quality). Such a situation is known as *rationing*, for at the market price the supply of the good will be less than the demand. Rationing (a shortage) is the opposite of unemployment (a surplus).

rush, then either the store owner will be forced to hire additional help or the quality of service to the rest of his customers will decrease (they will bear some of the cost). If retail capacity was correctly set before the increase, the store owner will find that his net income has increased very little as a result of the additional expenditures.[8] In short, the same kind of partial unemployment we find in the direct labor markets we also find in the markets in which respending occurs. The net increase due to first-round respending is some percentage of the actual expenditures; this percentage depends on (a) the amount of black box labor input to the good or service; and (b) the degree of unemployment in the black box respending market. For most respending markets, twenty percent would be a generous estimate of the fractional increase in black box income. The same kind of argument holds for the second round of respending (the store owner's additional purchases of clothing and help) and so on ad infinitum, except that if full employment obtains in any of these markets or all the resources used are extraregional then the chain is broken and the increases in black box income stop at that point.

For the sake of argument, let us assume that the chain is never broken, that goods in all markets are priced at twenty percent more than the opportunity cost of their inputs to the region. What is the net effect of this entire multiplier chain on black box income? It is $1 million (first round, twenty percent of $5 million) plus $200,000 (second round, twenty percent of $1 million) plus $40,000 (third round) plus $8,000 (fourth round) and so on. If one adds up these rapidly decreasing amounts for as many rounds as one wishes to consider, the total approaches $1.25 million or twenty-five percent of the original $5 million payroll. In short, the *net* effect of the multiplier phenomenon on black box income is generally much overstated. Moreover, its influence drops off rapidly in two or three rounds. Multiplier effects are rarely anywhere near as striking as commonly claimed. Of course, we knew this. If the multipliers of three and five that developers often claim actually affected black box income by that amount, then we would have invented the money tree. By simply undertaking more and more expenditures, we could increase black box income indefinitely. The developers' arguments are based on the implicit assumption that the resources used by their project cannot be used in any other way.[9] This is rarely, if ever, the case.

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[8]Or the store owner may respond to the increased demand by raising prices, which will have no net effect on regional income, for the increase in real income of the seller will be matched by a decrease in real income of the buyer.

[9]More precisely, we must distinguish between the gross multiplier--the total amount of economic activity required to

The arguments against the proposed building must be examined from the same point of view: what is the difference in black box income? It is true, of course, that if the office building is constructed the region will lose the output of the truck farm, and the farm's total revenue is the *gross* market value of this loss. Does this mean that regional income will decrease by this amount? Not necessarily, for as the opponents themselves have pointed out, if the farm goes, several other things will happen as well. First of all, 200 farm workers will lose their jobs. This means that 200 more people will now be available for employment elsewhere. If we have full employment, the workers will, after a time, find employment elsewhere at wages (producing output whose value is) approximately what they were earning and the net effect on regional income due to the job loss will only be the difference in their pay during the transition period plus any *net* multiplier effect on this difference. Similarly, the land will find employment elsewhere as building space; the truck farm owners will not sell the land unless they feel they are at least as well off after the transaction as before.

In short, from the gross loss in output we must subtract the value of what the farm's workers will produce elsewhere, the resale value of the farm's equipment, and the payments to the farm's owners for the land to obtain the direct loss in regional income associated with the demise of the truck farm. In a perfectly competitive economy, this difference would be zero, both the landowner and the truck farmer being indifferent to the change. In actual fact, it's rarely zero; ordinarily the displaced labor will suffer a real loss in income, at least during a transition period, and the landowner will experience a gain. The net effect can be either positive or negative but it rarely approaches anything like the gross value of the former output.

To this difference we must apply a multiplier to account for partial unemployment elsewhere in the economy, but exactly the same line of reasoning holds for this multiplier effect as for the multiplier effects resulting from changes in construction workers' take-home pay. That is, the indirect change in regional income is a fraction applied to a fraction of the gross value of the output of the truck farm.

In short, the same kind of "let's look at the difference" viewpoint applies to the present use of the resources as well as the proposed new development, and the same kind of differential magnitudes obtain. Our concentration on the *net* effects on black box income of a proposed change is a two-edged sword biting deeply into *both* the usual "economic"

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support a specified investment--and the net multiplier effect, which deducts from this total the value of the output of these resources in alternative employment. It is the latter concept that is relevant to regional income discussions.

arguments for development as well as the "economic" arguments against.

When one takes this differential point of view in analyzing two alternative allocations of some resource, attention necessarily becomes focused on those areas where the real *changes* in black-box income generally reside, rather than on the gross expenditure or gross revenues associated with the various alternatives. These areas are:
1. The difference in the cost of the outputs to black box consumers--will the alteration result in any changes in market prices within the black box?
2. The difference in private profits to the black box investors affected;
3. The difference in public profits (tax revenues minus additional cost of services occasioned by the developments under consideration) to the black box public bodies affected;
4. The difference in take-home pay to all the black box labor affected;
5. The net effect due to respending of all the above differences.

Notice that, when considering two alternative uses of a resource, Items 4 and 5 generally are counterbalancing: if there is full employment, there will be little difference in take-home pay of the labor involved under either alternative and hence very little net multiplier effect. On the other hand, if there is extensive unemployment, then there may be a sizable difference in take-home pay for the two sets of laborers, but it will be a sizable difference for the laborers involved in *both* alternatives. If we build the office, the truck farm labor suffers a sizable loss; if we keep the farm, construction labor suffers a sizable loss. The two individual losses may be substantial and the net effect on black box income, their difference, still be small. The same is true of the multiplier effect. With extensive unemployment, it may be considerable for *both* the proposed development and its alternative, but those two effects have to be subtracted to obtain the net effect on black box income. It's only when
 • there is substantial unemployment which is actually reached by the development, and
 • one alternative employs little or no black-box labor resources and the other a lot,
that differences in black box income due to changes in labor income and respending become noticeable on net.

Of course, this cancellation phenomenon is not going to mollify either the farm workers or the construction unions, who will continue to lobby vigorously for their respective options. They, unlike Uncle Eph, are quite concerned about which fingers do the consuming. The point is that this activity, however vociferous, does not necessarily imply that any net black box income is at stake.

By the same token, prodevelopment and antidevelopment economic arguments are generally not serious analyses, but rather sales pitches. The Parable Beach town council is not

completely naive. They know that neither Ithaca Development Corporation nor the South Beach Businessmen's Association is truly interested in the real municipal income of Parable Beach. These groups are interested in the real income of Ithaca Development Corporation and the SBBA respectively. Therefore, if the council wants an unbiased estimate of the change in Parable Beach income associated with the high-rise, it will have to make this estimate itself or obtain it from a disinterested, competent third party.

ANALYSIS OF THE PRODEVELOPMENT AND ANTIDEVELOPMENT
ARGUMENTS

George Banks, at Mrs. O'Houlihan's urging, is attempting to
estimate the present-valued difference in Parable Beach real
income which would result from the town's opting for the Para-
gon Park development rather than the present use of the site.
He realizes his job is to count all the *changes* in income in-
side the Parable Beach black box *once and only once*. Banks
further realizes that this is easier said than done. From
sad experience, he knows that analyses which involve doubly
and triply counting certain effects while completely missing
others are the rule rather than the exception.

The First Step--A Set of Accounts
In order to avoid these pitfalls, it is extremely good prac-
tice--indeed necessary--to set up a comprehensive, consis-
tent set of accounts to keep track of the various real income
changes within the black box currently under analysis. Usual-
ly, this can be done a number of ways. The most appropriate
choice of accounts will depend on the alternatives under anal-
ysis *and* the black box whose income is being analyzed.
    For his problem, Banks decides to break down the Parable
Beach income effects for each of the two alternatives as
shown in Table 4.1.
    The set of accounts must be collectively exhaustive and
mutually exclusive. That is, the accounts must include all
entities within the black box whose real income is likely to
be materially affected by the alternatives under considera-
tion, and the accounts must be defined such that the same
effect is not counted twice. Thus, if a presently unemployed
Parablite will be hired as a policeman by the town for

Table 4.1
Individual Accounts for Paragon Park Analysis

Paragon Park	Daffyland
Δ Town Hall*	Δ Town Hall
Δ Parable Beach construction labor	Δ PB employees
Δ PB employees	Δ PB concessionaires
Δ PB concessionaires	Δ PB customers
Δ PB customers	
Δ PB tenants--apartments	
Δ PB tenants--marine	
Δ Respending	Δ Respending

*Throughout this paper, the Greek letter "delta" (Δ) is used
to signify change. Thus, "Δ Town Hall income" means "change
in town hall income."

Paragon Park with municipal revenues obtained from the development, one must not end up counting these municipal revenues twice--once when they are paid to the town and again when they are paid to the new policeman. The straightforward way to do this is to keep careful track of *all* the revenues and *outlays* associated with the alternatives for each account. In other words, in the Town Hall account, count all the public revenues associated with the development, but from this deduct all the public outlays associated with the development, including the payment to the new policeman. In the PB employees account, count the policeman's pay, and from this deduct what he would have been earning or receiving in state and federal welfare. The various accounts should be chosen in such a way as to make this bookkeeping as easy as possible.

Some shortcuts are permissible and will not get the analysis into trouble as long as they are done carefully. For example, the formerly unemployed policeman will *involuntarily* transfer a portion of his new-found income outside the black box in the form of federal and state income tax. Thus, a true measure of his increase in income as a result of his new job is the difference in his pay after federal and state income tax and what he was receiving on welfare. The strictly correct way of handling this is to show the income tax payments as an outflow in the employees account, but often we will be a little sloppy and work directly with the after-tax income in the employees account.

The Second Step--Choice of a Baseline

Our basic goal is to determine the *change* in municipal income resulting from opting for one development rather than another. In order to do this, *it is extremely important that one work from a consistent baseline*--the situation against which changes are measured. Sometimes it is most convenient to use the status quo or a carefully defined projection of the status quo as a baseline. However, in situations where one is explicitly analyzing all the possible alternative uses of a particular site, it is often most convenient and instructive to work from a fictitious baseline--to assume that if the site is not used for the alternative currently under analysis, it will simply disappear.

The advantage of this fictitious construction is that with it one can analyze each possible alternative independently. Let us illustrate this procedure with the Paragon Park problem.

Analysis of the Town Hall Account

The first element in Table 4.1 accounts for the changes in the revenues and outlays of the Parable Beach body politic, i.e. those changes which are reflected in public revenues and expenditures for public services. In the case at hand, George Banks has decided to assume the site must go to either Paragon Park or Daffyland. There are no other possible uses. Under this assumption, as we shall see, it is permissible

and useful to generate the financial flows associated with each alternative acting as if, were that alternative not undertaken, the site would disappear. Thus, in Table 4.2, which shows Banks's estimates for the Town Hall account under the Paragon Park alternative, Banks has put in the property tax column his estimate of the *gross* property taxes which Paragon Park will pay in each year through the future. By the same token, in the Δ Police column, the figures should be the difference in Parable Beach police expenses between what they would be with Paragon Park and what they would be if the site disappeared, that is, the *additional* expenses occasioned by Paragon Park rather than nothing. Similarly for fire, sewage, and street maintenance.

The idea is that Banks will operate under the same assumption in analyzing Daffyland. After we have completed similar analyses for all accounts and all alternatives, we can obtain the *change* in real Parable Beach income by deducting the total present value for all accounts under one alternative from the total under the other.

It is also possible to work with one of the alternatives as a baseline. In that case, in each column of Table 4.2, for example, the entry should be the difference in revenues or outlays between Paragon Park and Daffyland. However, experience indicates that the fictitious baseline leads to fewer errors, makes all the assumptions used in the analysis more visible, and is a construction which lends itself better to delegation of the analysis of various alternatives to a number of people. The important thing to keep in mind is not the choice of a baseline, but rather, *whatever baseline is chosen must be maintained consistently throughout the analysis.* This is crucial.

Returning to Table 4.2, let's see how Banks arrives at some of these estimates. His first step is to try to gather from those involved in the development some figures which would indicate the timetable of the development. After a number of interviews with representatives of different facets of the construction industry, he is able to come up with a rough estimate on which to base his calculations. This timetable is shown in Table 4.3. Table 4.4 is a breakdown of the individual phases.

The property valuation estimates shown in Table 4.3 are based on conversations with the assessors of Parable Beach, who indicate that the projects would probably be assessed at fifty percent of present investment while under construction and at ninety percent of replacement value after completion. Then Banks, using the town's past tax reports, constructs what he feels would be a realistic tax rate schedule for the next ten years for three specific cases: with nothing on the site; with the Paragon Park development; and with the amusement park, Daffyland (see Table 4.5). Thus, using these figures, it is a relatively straightforward matter to arrive at yearly property tax bills for the Paragon Park developers.

The basic assumption Banks uses here is that Parable Beach will wish to spend the same amount overall on public services

Table 4.2
: Town Ball Under Paragon Park Development

	Revenues			Change in	Outlays					Net
Year	Property Taxes	Sewerage Fees	Licensing Fees	Cherry Sheet	Police/ Property Protection	Fire Protection	Sanitation Costs	Street Costs	School Costs	Net Cash Flow
1974	5,990	0	0	0	0	0	0	0	0	5,990
1975	190,554	1,700	0	0	0	0	-5,000	-10,000	0	177,244
1976	406,499	2,200	0	0	0	0	-5,000	-10,000	0	393,699
1977	699,069	57,720	0	870	-18,547	-9,273	-14,592	-6,000	-82,840	626,407
1978	1,053,608	88,420	7,200	896	-28,824	-19,146	-14,592	-1,500	-82,840	1,002,812
1979	1,200,597	90,720	7,200	896	-28,824	-19,146	-15,072	-1,500	-82,840	1,115,631
1980	1,590,310	92,620	7,200	896	-28,824	-19,146	-15,072	-3,000	-82,840	1,510,604
1981	1,725,100	161,920	10,500	2,114	-56,644	-49,693	-34,272	-1,500	-191,840	1,565,683
1982	1,810,501	163,420	10,500	2,114	-56,644	-49,693	-34,272	-10,000	-191,840	1,644,084
1983	1,935,729	163,420	10,500	2,114	-56,644	-49,693	-34,272	-1,500	-191,840	1,777,812
1984	2,016,033	163,420	12,000	2,244	-56,644	-49,693	-34,272	-1,500	-191,840	1,861,615
1985	2,069,086	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	1,914,668
1986	2,157,509	161,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,003,091
1987	2,228,247	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,073,829
1988	2,281,300	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,126,882
1989	2,369,723	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,214,305
1990	2,422,776	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,268,358
1991	2,491,514	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,339,096
1992	2,546,568	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,392,150
1993	2,617,306	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,462,888
1994	2,688,044	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,533,626
1995	2,758,782	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,604,364
1996	2,811,836	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,657,418
1997	2,882,574	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,728,156
1998	2,953,312	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,798,894
1999	3,006,365	163,420	12,000	2,144	-56,644	-49,693	-34,272	-1,500	-191,840	2,851,947

Table 4.3
Timetable for Development of Paragon Park

Year	Action	Duration During This Year (Months)	Land Utilized (Acres)	Land Improved (Square Feet)	Costs for Land ($ x 10^-6)	Construction Costs ($ x 10^-6)	Individual Property Valuation ($ x 10^-6)	Total Valuation ($ x 10^-6)
1974	Acquire land for Project One*	3	4.07	251,600	0.2664		0.2398	0.0599
1975	Begin construction, Project One	12					1.5750	1.8148
1976	Acquire land for Project Two	12	1.49	41,500	0.0945		0.0851	
	Begin construction, Project Two	12				0.73	0.3650	
	Continue construction, Project One	12				3.14	3.1450	3.8359
1977	Complete Project One						5.6610	
	Continue Project Two	12				0.73	0.6570	6.6578
1978	Complete Project Two						1.3140	
	Acquire land for Project Three	12	5.00	430,000	0.3259		0.2943	
	Begin construction, Project Three					5.2700	2.6350	10.2292
1979	Continue Project Three	12				2.6300	3.9500	11.5442
1980	Continue Project Three	12				2.6300	7.9050	15.4992
1981	Complete Project Three						9.4860	17.0802
1982								17.0802
1983	Acquire land for Project Four	12	1.00	27,000	0.0585		0.0508	17.1310
	Begin construction, Project Four					0.6150	0.3080	17.4390
1984	Complete Project Four						0.5535	17.6845

*See Table 4.4 for project composition.

Table 4.4
Composition of Individual Projects in Paragon Park
Development

Project	Description	Land Utilized (Acres)	Total Cost ($ Million)
One	262 unit high-rise apartment	2.62	5.4119
	42 garden apartments	1.45	1.1445
Two	First increment, shopping center (15 stores)	1	0.8445
	Marina (500 slips)	0.49	0.7100
Three	Second increment, shopping center (10 stores)	1	0.8445
	400 unit high-rise apartment	4.00	10.0214
Four	Third increment, shopping center (6 stores)	0.34	0.2610
	Motel (70 units)	0.56	0.4125
Project Total		11.46	19.6503

Table 4.5
Tax Rate Schedule Estimates for Varying Alternatives (Figures in Millions of Dollars;
Tax Rate per $1,000)

Year	Parable Beach Property Valuation Without Any Development	Tax To Be Raised	Tax Rate Without Any Development	Paragon Park		Daffyland	
				Total PB Valuation	Tax Rate	Total PB Valuation	Tax Rate
1974	47.728	4.777	100	47.788	100	51.3227	93
1975	48.028	5.255	109	49.843	105	51.5927	102
1976	48.228	5.518	114	52.063	106	51.8227	106
1977	48.528	5.794	119	44.186	105	52.8227	106
1978	48.728	6.094	125	59.007	103	52.5217	116
1979	50.028	6.438	129	61.572	104	53.8517	120
1980	52.228	6.760	129	67.727	100	56.1837	120
1981	52.528	7.060	134	69.600	102	56.4537	125
1982	52.728	7.413	141	69.808	106	56.8337	130
1983	53.028	7.783	147	70.209	111	57.1787	136
1984	53.228	8.083	152	70.913	114	57.4237	141
1985	53.528	8.383	157	71.213	117	57.7267	145
1986	53.728	8.733	162	71.513	122	58.0287	150
1987	54.028	9.030	167	71.813	126	58.3289	155
1988	54.228	9.330	172	72.113	129	58.6292	159
1989	56.528	9.683	171	72.413	134	58.9292	164
1990	56.728	9.983	176	72.713	137	59.2122	168
1991	57.028	10.283	180	78.013	141	59.5152	173
1992	57.228	10.586	185	73.313	144	59.8182	177
1993	57.728	10.919	189	73.613	148	60.1185	182
1994	58.028	11.219	193	73.913	152	60.4188	186
1995	58.228	11.549	198	74.213	156	66.7488	190
1996	58.528	11.882	203	74.513	159	61.0491	195
1997	58.728	12.182	207	74.813	163	61.3791	198
1998	59.028	12.515	212	75.113	167	61.6791	203
1999	59.228	12.815	216	75.413	170	71.9824	207

with Daffyland as with Paragon Park. Notice that it would be double counting to count both the property tax paid by Paragon Park and the resultant cut in tax rate to other Parable Beach property holders. Notice also that Parable Beach could increase its municipal income under the Paragon Park alternative by increasing public services rather than cutting the tax rate. Banks, however, assumes that the town would take the increase in municipal income in the form of a property tax cut.

The second column in Table 4.2 accounts for the income the town would receive in installation, property betterment, and monthly usage fees in connection with the town's central sewage treatment system. These figures are based on a six dollar per foot installation charge, a six dollar per foot betterment assessment, and a fifteen dollar per unit monthly usage fee. A unit is considered to be the equivalent of one full-sized home bathroom and kitchen unit, or any fraction thereof.

Banks uses previous years' licensing fees as relatively reliable figures on which to judge the contribution in this area that Paragon Park's commercial endeavors would make to the town coffers. With an estimate of twenty future stores opening, as indicated in the timetable, and an average of $330 per year in fees for a business person engaged in the type of endeavor that would be planned for Paragon Park, these figures, too, are straightforward to derive.

In the state in which Parable Beach is located, a portion of the state revenues collected from each municipality is returned to the town in a document known as the "cherry sheet." Banks makes a back-of-an-envelope calculation of the state taxes paid by Paragon Park and takes a historical fraction of this revenue to obtain the increase in the cherry sheet. Since the numbers come out small, more detailed analysis is not indicated.

On the outlay side, the areas involving police and fire protection require some value judgments on Banks's part. First, he assumes that with an average of 3.1 people per new apartment and a one hundred percent increase in harbor use resulting from the marina, the town will be forced to add new employees as outlined in Table 4.6. These estimates are

Table 4.6
New Municipal Employees Under Paragon Park Alternative

Year	New Police	Summer-Only Police	New Fire-fighters	New Part-Time Firefighters	Average Salary
1977	2		1		$9,916/yr
				1	$400/yr
1978	1 (harbor patrol)	2	1		$128/wk $9,916/yr
1981	3		2		$9,916/yr
				2	$400/yr

compared against crime rate and fire incidence increases in
the area as a function of population density and property
value, and Banks feels reasonably sure that they are accurate
enough for the purposes of his study. Sanitation and street
cost figures are arrived at also from the analysis of the im-
pact of undertakings of similar scale in the area, and Banks
finds that in the sewage treatment area, a five dollar per
linear foot installation cost and a four dollar per unit
treatment cost are representative. By study of the archi-
tect's layouts for the total Paragon Park development and
the knowledge that street construction costs are running at
about ten dollars per foot while maintenance of the streets
planned for this area will run around $1,500 per year, Banks
is able to come up with an estimate for street costs associ-
ated with development.

Banks finds that the development would have a large im-
pact on the school budget. After talking with members of the
area's planning council, Banks decides that, in spite of what
the developers are saying, it would be realistic to expect
that ten percent of the new town inhabitants would be school-
age children. This, combined with an average annual cost of
$1,090 per child for schooling, led to the entries shown in
Table 4.1. A more accurate computation would involve esti-
mating the cost of any *new* buildings and teachers required
by the *additional* schoolchildren. If the town's school re-
sources are underutilized, the unit cost of additional chil-
dren will be lower, possibly much lower, than the average;
if the school system is operating at or above capacity, for-
cing new construction and hiring, the cost can be much larger
than the average.

Having generated all the town hall revenues and outlays
under the Paragon Park alternative in each year, Banks simply
sums them up to obtain the final column of Table 4.2.

The present value of the change in Town Hall income under
Paragon Park as opposed to the fictitious option "site disap-
pears" can be obtained by simply summing the elements of the
last column of Table 4.2 weighted by the proper compound in-
terest factor. Suppose we assume that the relevant interest
rate is ten percent real; then we have the sum

$$5,990 + \left(\frac{1}{1.10}\right) 177,244 + \left(\frac{1}{1.10}\right)^2 393,699 + \left(\frac{1}{1.10}\right)^3 626,407$$

$$+ \text{etcetera} \ldots + \left(\frac{1}{1.10}\right)^{25} 2,794,894$$

which equals $11.5 million.

Notice that Banks has cut the analysis off after twenty-
five years. The present value factor for year 25 is

$$(1/1.10)^{25}$$

which is only .09, and those for ensuing years are still
lower. Thus, it would take extremely large differences

between alternatives for income changes past year 25 to materially affect the overall present values. This fact allows the computation to be cut off at a moderate number of years into the future. In the case at hand, since the residual value of the land will not be all that much different under either of the alternatives, twenty-five years is not an unreasonable choice. For a more massive project, longer cutoff dates might be appropriate. Whatever cut-off date is chosen, it should be employed consistently across alternatives.

Δ Town Hall--Daffyland

The corresponding set of figures for the alternative to Paragon Park, Daffyland-by-the-Sea, is shown in Table 4.7. The basic assumption here, as before, is that if the site is not used as Daffyland, it will disappear. Therefore, Banks uses his estimates of the gross municipal public revenues generated by Daffyland and its tenants and, on the outlay side, the differences in municipal expenses associated with Daffyland relative to the site's simply not being there.

Again, Banks has derived his estimates of property taxes from the assessor's estimates of valuation assessment for the amusement park and surrounding businesses which would be displaced by Paragon Park. As mentioned earlier, this involves the amusement park, thirty-three concessions, and eighteen small commercial endeavors.

As can be expected, the amusement concessionaires contribute relatively large licensing fees and, since the amusement park is already in existence, these flows begin immediately at the beginning of our analysis period. Sewerage fees and sanitation costs are, again, based on the same figures used for Paragon Park.

The estimated outlays for added police protection are based on Banks's assumption that due to the nature of the industry, Daffyland necessitates the hiring of one more full-time police officer and six provisional (summer only) police officers than would be required if the site disappeared. Banks also estimates that in the beginning, two added full-time firefighters and two extra call people (volunteers) are needed to provide adequate fire protection; further, by 1979, because of the aging of the structures and increasing number of people using the park, this requirement will double.

The street construction costs are based on the ten dollar per foot estimate, but the maintenance costs are substantially less, since there is far less pressure from the Daffyland residents to perform all the cosmetic maintenance necessary on higher-rent residential parkways.

After a little research, Banks finds that the existence of Daffyland has a negligible effect on both the state revenue redistribution plan and the local school system. This completes his table and he is ready to make his first comparison.

At a ten percent interest rate, the present value of Table 4.2 is $11,517,300, and that of Table 4.7 is $4,380,130. Since we are operating from a consistent baseline, this

Table 4.7
Δ Town Hall Under Daffyland Alternative

| | Revenues | | | | Outlays | | | | | Net |
Year	Property Taxes	Sewerage Fees	Licensing Fees	Change in Cherry Sheet	Police/ Property Protection	Fire Protection	Sanitation Costs	Street Costs	School Costs	Net Cash Flow
1974	328,727	0	13,300	0	-16,906	-19,748	0	-10,000	0	295,373
1975	363,599	23,600	13,300	0	-16,906	-19,748	-5,600	-10,000	0	320,245
1976	381,038	12,600	13,300	0	-16,906	-19,748	-6,200	-3,000	0	360,984
1977	416,883	12,600	13,300	0	-16,906	-19,748	-1,200	-500	0	401,329
1978	440,069	12,600	13,300	0	-16,906	-19,748	-1,200	-500	0	428,185
1979	458,884	12,600	13,300	0	-16,906	-19,748	-1,200	-500	0	427,202
1980	474,684	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	443,002
1981	496,463	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	461,467
1982	533,741	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	500,745
1983	564,495	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	532,499
1984	591,594	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	559,598
1985	608,811	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	576,815
1986	629,805	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	597,809
1987	650,798	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	618,802
1988	667,593	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	635,597
1989	688,587	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	656,591
1990	705,382	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	673,386
1991	726,375	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	694,379
1992	743,170	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	711,174
1993	764,163	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	732,167
1994	780,958	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	748,962
1995	797,753	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	765,757
1996	818,746	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	786,750
1997	831,342	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	799,146
1998	852,336	12,600	13,300	0	-16,906	-39,596	-1,200	-500	0	820,340
1999	869,131	12,600	13,300	0	-16,906	-39,596	-1,200	-1,500	0	837,135

implies that the estimate of the change in *Town Hall income* associated with opting for Paragon Park rather than Daffyland is the difference between these two numbers of $7,137,170. This number is not the change in Parable Beach black box income, for we have not yet addressed the non-public accounts, but it is the difference in public income under Banks's assumptions and a ten percent interest rate. At a fifteen percent interest rate, Δ Town Hall for Paragon Park is about $4,750,000, while that for Daffyland is $2,400,000, for a difference of about $2.3 million.

The Other Accounts

Paragon Park will affect entities other than Town Hall within the black box, as Table 4.1 indicates. Table 4.8 shows the expanded account for the Parable Beach citizens who will be employed on the site under the various hypotheses. As emphasized in Chapter 3, this account should include only the change in take-home pay of these employees between their jobs on the site and what their income would be if the site didn't exist. This difference depends critically on their alternative employment opportunities. Banks knows that at present, 132 of the 170 jobs on the site during the summer months are held by Parablites, while during the winter, forty-seven of the fifty-nine jobs available are filled with locals. On this basis, as well as employment trends in the general area, Banks assumes that the jobs connected with the apartment and marina parcels will contribute twenty percent local hire, while ninety percent of the jobs available in the first fifteen stores to open will go to Parablites. After this, a figure of forty percent local hire is more realistic.

But he has no idea of what the value of the alternative employment opportunities are. Therefore, he decides that the most insightful approach would be to explore the effect different levels of employment would have on his final figures. In order to get a representative view of the full scope of this effect, he chooses to investigate three levels of employment: full employment in the area, a degree of partial unemployment, and complete unemployment. Under conditions of full employment, Banks realizes that whatever wages Parable Beach workers would receive in jobs provided by either alternative would be approximately equal to the wages they would receive elsewhere if neither Paragon Park nor Daffyland existed. As such, neither alternative would contribute anything to Banks's overall analysis. Now, at the other extreme, complete unemployment in the area would mean that any new jobs provided to local inhabitants would provide income to otherwise nonproductive town members. Thus, the total after-tax payrolls of each alternative should be included in the final analysis of the overall impact on the local community.[1]

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[1]Less any loss in state and federal welfare payments as a result of the increase in employment.

Table 4.8
Parable Beach Employees' Account

		Paragon Park				Daffyland			
			Addition to Local Revenue				Addition to Local Revenue		
Year	Season	Jobs Available	Full Employment	30% Unemployment	Full Unemployment	Jobs Available	Full Employment	30% Unemployment	Full Unemployment
1974	Winter	0	0	0	0	47	0	49,350	164,500
1975	Summer	0	0	0	0	132	0	108,225	360,750
1975	Winter	0	0	0	0	48	0	49,560	165,200
1976	Summer	0	0	0	0	134	0	109,395	364,650
1976	Winter	0	0	0	0	48	0	49,560	165,200
1977	Summer	2	0	2,001	6,670	136	0	109,665	365,550
1977	Winter	2	0	5,799	19,330	49	0	49,560	165,400
1978	Summer	44	0	6,712	22,375	139	0	110,145	367,150
1978	Winter	44	0	9,398	31,325	50	0	49,980	166,600
1979	Summer	44	0	6,712	22,375	142	0	110,550	368,500
1979	Winter	44	0	9,398	31,325	50	0	49,980	166,600
1980	Summer	48	0	9,963	33,210	145	0	110,953	369,850
1980	Winter	48	0	13,953	46,510	52	0	50,400	168,000
1981	Summer	61	0	11,638	38,715	148	0	111,360	371,200
1981	Winter	61	0	16,298	54,305	53	0	50,610	168,700
1982	Summer	61	0	11,638	38,795	151	0	111,765	372,550
1982	Winter	61	0	16,298	54,305	54	0	50,820	167,400
1983	Summer	61	0	16,298	38,795	154	0	112,170	373,900
1983	Winter	61	0	13,314	54,305	54	0	40,820	169,400
1984	Summer	70	0	18,638	44,375	157	0	112,575	375,250
1984	Winter	70	0	31,952	62,125	55	0	51,030	170,100
1985	N/A	70	0	31,952	106,500	212	0	163,605	545,350
1986	.	70	0	31,952	106,500	212	0	163,605	545,350
1987	.	70	0	31,952	106,500	212	0	163,605	545,350
1988	.	70	0	31,952	106,500	212	0	163,605	545,350
1989	.	70	0	31,952	106,500	212	0	163,605	545,350
1990	.	70	0	31,952	106,500	212	0	163,605	545,350
1991	.	70	0	31,952	106,500	212	0	163,605	545,350
1992	.	70	0	31,952	106,500	212	0	163,605	545,350
1993	.	70	0	31,952	106,500	212	0	163,605	545,350
1994	.	70	0	31,952	106,500	212	0	163,605	545,350
1995	.	70	0	31,952	106,500	212	0	163,605	545,350
1996	.	70	0	31,952	106,500	212	0	163,605	545,350
1997	.	70	0	31,952	106,500	212	0	163,605	545,350
1998	.	70	0	31,952	106,500	212	0	163,605	545,350
1999	.	70	0	31,952	106,500	212	0	163,605	545,350

For the conditions of partial unemployment, Banks decides to assume that the employees on either project would average thirty percent more working on the site than if the site disappeared. Using this assumption and recent data on local salaries, Banks is able to arrive at the figures shown in Tables 4.9 and 4.10. As could be expected, the more employment-intensive Daffyland contributes more to this account.

In considering the account for the construction labor employed by the alternative developments, Banks again has to arrive at some reasonable assumptions concerning alternative employment opportunities. In addition, he must estimate how many Parablites are employed in the construction industry and are fluid enough in their jobs to work in the locale of their choice. He decides on the basis of recent planning council figures that employment will run as shown in Table 4.9 on the Paragon Park construction site.

Again, Banks faces the problem of alternative employment and again he chooses to perform the analysis for the same three hypotheses used earlier. Since Daffyland already exists, there is no contribution from construction on its side of the ledger. The revenue additions in the case of the Paragon Park development are shown in Table 4.10.

In relation to concessionaires--the persons owning and operating commercial establishments in each of Banks's two alternative uses--Table 4.11 is the summary of his findings. For this account, Banks must assume how many of the concessionaires are Parablites. Changes in income to non-Parablites are ignored. Further, he must assume how much the Parablite concessionaires would make elsewhere if the site disappeared.

These figures again necessitate a number of assumptions on Banks's part. First, research he conducts into the economic base in the area shows that with the Daffyland alternative, fifteen of the eighteen businesses stayed open year-round, while only three of the thirty-three concessions were open a full twelve months. Using a five-month summer season and the assumptions shown below, Banks is able to arrive at his entries for this case. Those for Paragon Park are made using the openings of the businesses scheduled as in Banks's original timetable.

The Parable Beach Customers' Account

The next account in Table 4.1 covers changes in real income which would result from market price changes to Parable Beach customers of the establishments in the alternative development. For example, if one development included a hardware store which priced its products lower than those in the hardware store of the other development, this would be an increase in real income to the Parable Beach customers of the lower-priced store. However, Banks sees no reason to believe the prices will be very different and comes to the conclusion that the Δ Parable Beach customers' account will be negligible in both cases.[2]

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[2]A change in real customer income could also arise if one

Table 4.9
Employment Estimates for Construction of Paragon Park

Year	Project	Number of Employees			
		State		Local	
		Skilled	Unskilled	Skilled	Unskilled
1974	Clearing	4	12	0	5
1975	Construction, 304 apartments	60	40	2	20
1976	Construction, 304 apartments 15 stores Marina	40 30 30	15 20 10	2 1 5	8 10 5
1977	Construction, 15 stores Marina	30 30	10 10	1 1	5 5
1978	Construction, 10 stores 400 apartments	30 60	10 30	1 3	5 15
1979	Construction, 10 stores 400 apartments	30 50	30 20	1 1	5 10
1980	Construction, 400 apartments	40	10	1	5
1981		0	0	0	0
1982	Clearing	4	12	0	6
1983	Construction, 5 stores Motel	20 30	10 15	1 1	5 8

Table 4.10
Δ Construction Labor on Paragon Park

Year	Addition to Revenues		
	Full Employment	30% Unemployment	Full Unemployment
1974	--	$ 5,940	$ 19,800
1975	--	24,300	81,000
1976	--	40,770	135,900
1977	--	14,400	48,000
1978	--	28,800	96,000
1979	--	19,350	64,500
1980	--	7,200	24,000
1981	--	--	--
1982	--	5,940	17,800
1983	--	17,270	57,900
1984	--	--	--

The Parable Beach Apartment Tenants' Account

Some of the Paragon Park apartments will undoubtedly be occu-
pied by Parablites who will feel they are at least as well
off as before as a result of the opportunity to rent at Para-
gon Park. If they consider themselves much better off--for
example, if a family would have been willing to pay $500 for
an apartment for which they actually have to pay $250--this
is an increase in real municipal income. However, Banks
knows the apartments will be competitively priced, with per-
haps a premium for the view, which means it is unlikely that
many such Parablites exist, for they could have purchased
equivalent space elsewhere. Therefore, he puts the Δ Parable
Beach tenants' account down as negligible.

The Parable Beach Boatowners' Account

Parablites who choose to moor their boats at the proposed
marina may experience real income changes. However, since
the local price of mooring space is likely to change drasti-
cally with the provision of the marina, the analysis of
these income changes requires the introduction of a couple
of new concepts. Banks decides to put off the analysis of
this account for the moment, and to act as if it were

development included a hardware store and the other did not,
necessitating a longer trip for hardware purchases on the
part of Parablites if the local store did not increase its
price to the point where Parablites were indifferent to the
longer trips. Banks, a long-time resident, has noted that
local stores invariably follow the latter course.

Table 4.11
Δ Concessionaires

Year	Development Owners Out-of-State		Development Owners State Residents	
	Paragon Park	Daffyland	Paragon Park	Daffyland
1974	0	41,400	0	41,400
1975	0	197,800	0	197,800
1976	0	197,800	0	197,800
1977	0	197,800	0	197,800
1978	45,000	197,800	45,000	197,800
1979	60,000	197,800	60,000	197,800
1980	90,000	197,800	90,000	197,800
1981	150,000	197,800	150,000	197,800
1982	165,000	197,800	165,000	197,800
1983	180,000	197,800	180,000	197,800
1984	210,000	197,800	210,000	197,800
1985	210,000	197,800	210,000	197,800
1986	210,000	197,800	210,000	197,800
1987	210,000	197,800	210,000	197,800
1988	210,000	197,800	210,000	197,800
1989	210,000	197,800	210,000	197,800
1990	210,000	197,800	210,000	197,800
1991	210,000	197,800	210,000	197,800
1992	210,000	197,800	210,000	197,800
1993	210,000	197,800	210,000	197,800
1994	210,000	197,800	210,000	197,800
1995	210,000	197,800	210,000	197,800
1996	210,000	197,800	210,000	197,800
1997	210,000	197,800	210,000	197,800
1998	210,000	197,800	210,000	197,800
1999	210,000	197,800	210,000	197,800

	Business	Concessions
Net summer earnings	$900/month	$1000/month
Net winter earnings	$1300/month	$400/month

negligible. He makes a note to himself to later go back and check this assumption. (See the appendix to this chapter.)

Putting It All Together

Banks also decides to ignore for the moment the change in Parable Beach real income associated with the respending of the direct effects he has estimated. In a moment, we will see why.

Ignoring for the moment, then, the boatowners and respending, Banks is ready to put all his estimates together. Table 4.12 shows the total yearly change in Parable Beach income for each alternative for each of the three employment hypotheses relative to the site's disappearing. These figures are simply the sum of all the accounts for each year for each alternative.

Table 4.13 shows the present value of each column in Table 4.12 for a range of interest rates, and Figures 4.1 a, b, and c plot these present values for each employment hypothesis. The vertical difference between the solid lines (Paragon Park) and the dotted lines (Daffyland) in these figures are Banks's estimate of the present value change in Parable Beach income associated with opting for Paragon Park rather than Daffyland for the corresponding employment hypothesis and interest rate before consideration of the boatowners and respending. This change ranges from a high of +$12.6 million (low interest rate, full employment) to a low of -$1.1 million (high interest rate, complete unemployment). "Plus" here means town has higher real income with Paragon Park; "minus" indicates higher real income with Daffyland. The figures show the break-even points. The lower the interest rate and the lower the unemployment, the more Paragon Park is favored. Notice, however, that the differences are nowhere near as great as some of the figures which the pro-development and antidevelopment forces have been throwing around. For intermediate assumptions about relevant interest rates and unemployment, the difference is in the neighborhood of about $1 million, which corresponds to handing every woman, man, and child in Parable Beach $100 worth of income on a one-shot basis or about twelve dollars per year over the twenty-five year analysis period. Under Banks's assumptions, these are the magnitudes of the income changes with which Parable Beach must be concerned in deciding between the alternative allocations of the sites. Depending on the town's evaluation of the differences in the non-market effects associated with the alternatives, the environmental and aesthetic values, the town might quite rationally decide to forgo such increases in real income and opt for Daffyland.

In any event, it will be basing its decision on a coherent assessment of the change in municipal income rather than on a potpourri of developer and anti-development figures, most of which are only remotely related to this change.

Table 4.12
Cash Flow Table for Parable Beach Black Box

Cash Flows (Local Analysis)

Year	Paragon Park			Daffyland		
	Full Employment	30% Unemployment	Full Unemployment	Full Employment	30% Unemployment	Full Unemployment
1974	5,940	10,930	25,790	336,773	386,123	501,273
1975	177,244	201,544	258,244	548,045	705,830	1,073,995
1976	393,699	434,469	529,599	558,784	717,739	1,088,634
1977	626,407	648,607	700,407	559,129	758,354	1,130,579
1978	1,047,812	1,092,722	1,197,512	621,985	782,110	1,155,735
1979	1,175,631	1,211,091	1,293,831	625,002	785,532	1,160,102
1980	1,600,664	1,631,770	1,704,384	640,802	802,157	1,178,652
1981	1,715,683	1,743,619	1,808,783	659,267	821,237	1,199,187
1982	1,809,084	1,842,960	1,921,984	698,545	861,130	1,240,495
1983	1,957,812	2,003,018	2,108,812	730,299	873,289	1,253,599
1984	2,071,615	2,103,567	2,178,115	757,398	921,003	1,402,748
1985	2,124,668	2,156,620	2,231,168	774,615	938,220	1,319,965
1986	2,213,091	2,245,043	2,319,591	795,609	959,214	1,340,659
1987	2,283,829	2,315,781	2,390,329	816,602	980,207	1,361,952
1988	2,336,882	2,368,834	2,443,382	833,397	997,002	1,378,747
1989	2,425,305	2,457,257	2,531,805	854,391	1,017,996	1,399,741
1990	2,478,358	2,510,310	2,584,858	871,186	1,034,791	1,416,536
1991	2,549,096	2,581,048	2,655,596	892,179	1,055,784	1,437,529
1992	2,602,150	2,634,102	2,708,650	908,974	1,072,579	1,454,324
1993	2,672,888	2,704,840	2,779,388	829,967	1,093,572	1,475,317
1994	2,743,626	2,775,578	2,850,126	846,762	1,110,367	1,492,112
1995	2,814,364	2,846,316	2,920,864	863,557	1,127,162	1,508,907
1996	2,867,418	2,899,370	2,973,918	884,550	1,148,155	1,529,900
1997	2,938,156	2,970,108	3,044,656	897,146	1,160,751	1,542,496
1998	3,008,894	3,040,846	3,115,394	1,018,140	1,181,745	1,563,490
1999	3,061,947	3,093,899	3,168,447	1,034,935	1,198,540	1,580,285

Table 4.13
Net Present Values for Alternative Developments: Local (Parable Beach) Analysis
(Millions of 1974 Dollars)

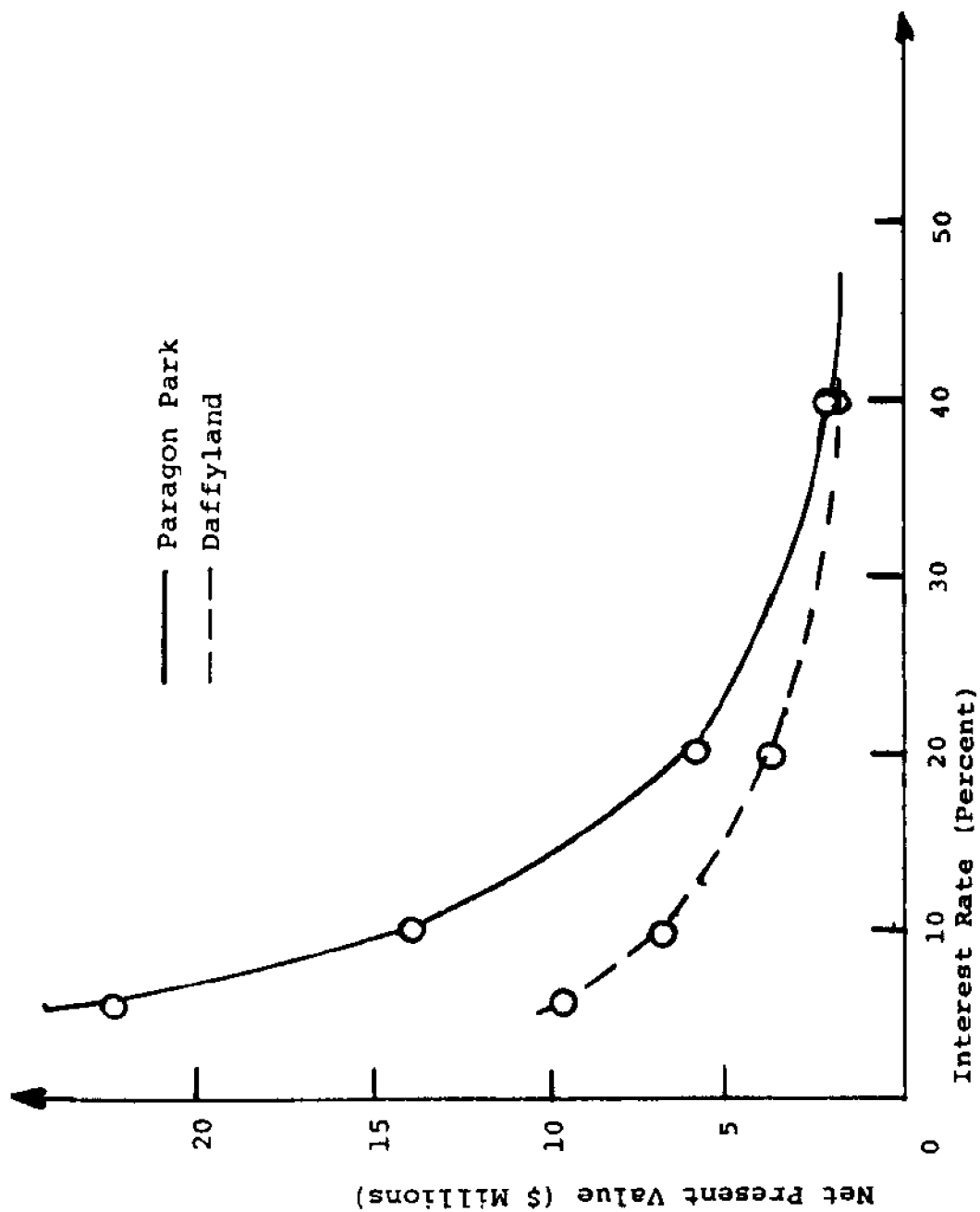| Interest Rate (%)	Paragon Park			Daffyland		
	Full Employment	30% Unemployment	Full Unemployment	Full Employment	30% Unemployment	Full Unemployment
6	22.2356	22.6602	23.6170	9.6320	11.9214	16.9214
10	13.9873	14.2814	14.9720	6.6694	8.2632	11.8368
20	5.7333	5.8898	6.2896	3.5312	4.3870	6.3722
40	1.9149	1.9995	2.1999	1.9819	2.2840	3.3333

Figure 4.1a.
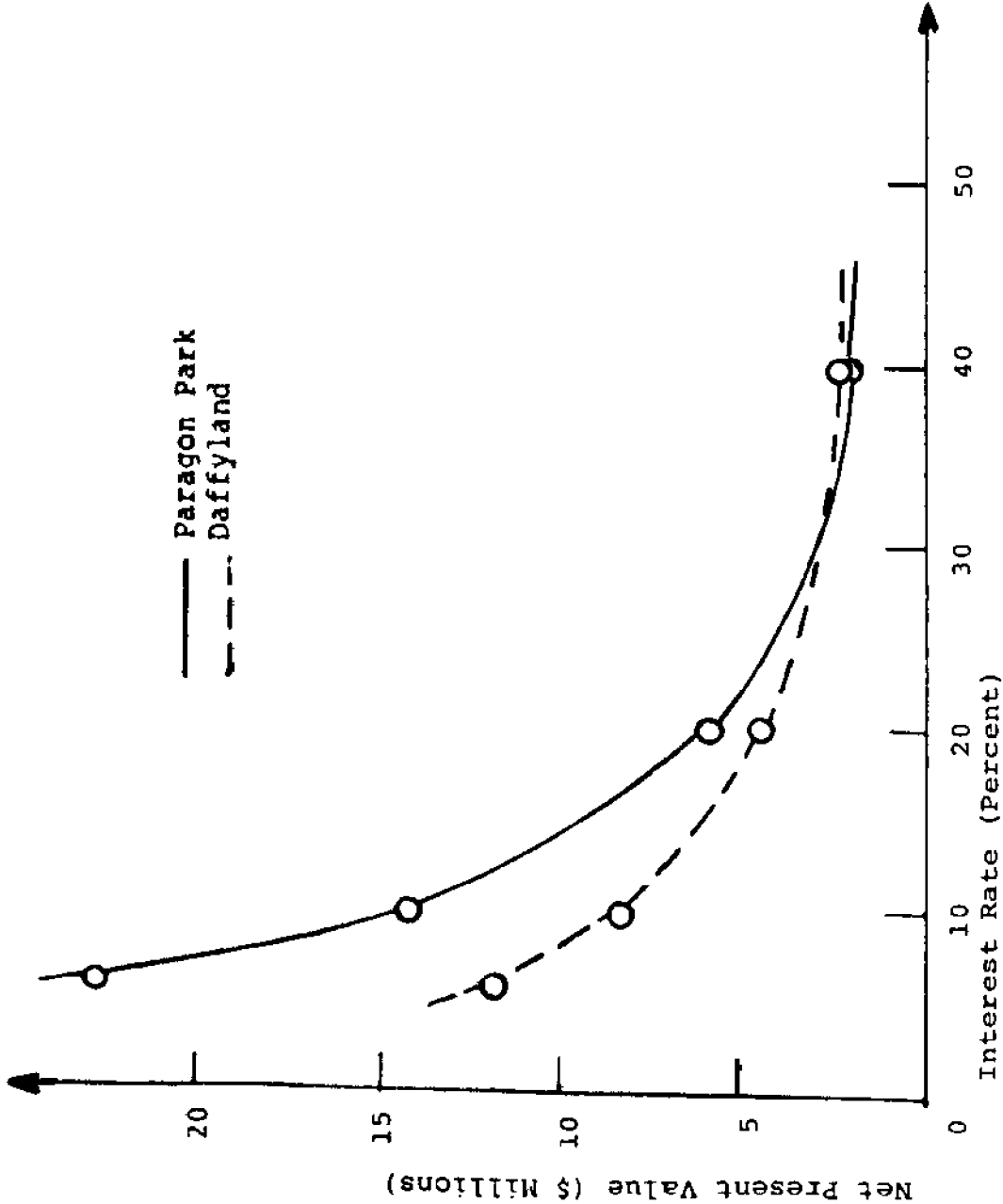Net Present Value of Alternatives Vs. Interest Rate (Full Employment)

Figure 4.1b.
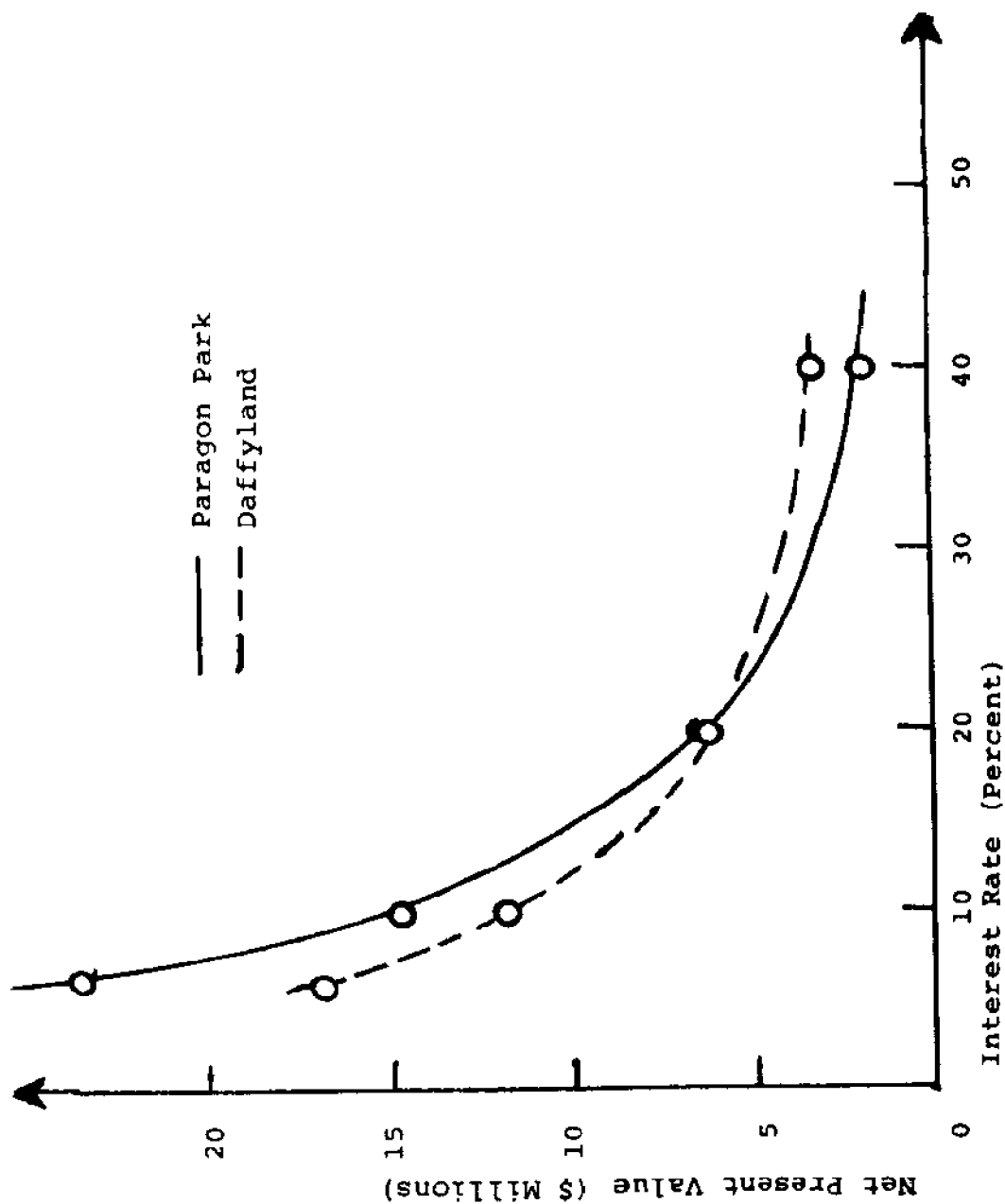Net Present Value of Alternatives Vs. Interest Rate (30% Unemployment)

Figure 4.1c.
Net Present Value of Alternatives Vs. Interest Rate (Complete Unemployment)

The Effect of Respending

Up to this point, Banks has ignored the effect of respending of the direct changes on real income associated with the two alternatives.

The impact of respending on real black-box income depends firstly on the percentage of the changes in direct real income which are spent within the black box and secondly, on the degree of unemployment or underemployment in the markets where this respending takes place. Thus, the smaller the black box and the smaller the degree of unemployment, the smaller the impact of respending.

Notice also that if one is willing to assume that the pattern of respending of all the direct changes in income for each alternative is the same—that is, the percentage of local respending of an increase in Town Hall income is similar to the percentage of local spending of, say, employee income—then *whatever the net multiplier is for a given employment hypothesis, it applies to all the direct increase in municipal income equally*. (Despite this fact, in the public coastal zone debate, people often apply multipliers only to increases in local wages.) This implies, for a given employment hypothesis, we might as well apply the net multiplier to the total difference between the alternatives. In short, for a given employment hypothesis, *the net multiplier, whatever its value, will not change the ranking of alternatives* as long as the pattern of local expenditures resulting from the various direct changes in income is roughly similar for all alternatives. Under this assumption, the multiplier is completely irrelevant to rankings.

Rather, the effect of the multiplier will be to favor the alternative which offers the higher black-box income under conditions of higher unemployment. To see this, let's suppose the increase in local income as a percent of expenditures is zero per round under full employment, twenty-five percent per round under the moderate unemployment hypothesis, and fifty percent per round under the complete unemployment hypothesis. Applying the resulting multipliers to our earlier differences, we arrive at Table 4.14.

From Table 4.14, we see the overall net effect of respending is to somewhat increase the advantage of the alternative which is favored by increasing unemployment, in this case Daffyland. Thus, if we are unsure of what the future employment situation is going to be, respending effects will tend to lead us a little more toward the employment-intensive alternative. This is the germ of truth underlying the use of the multiplier concept in resource allocation problems. Needless to say, in most of the discussion surrounding potential developments, the net effect of respending is much overrated.

The problem still remains. How large is the net multiplier? Unfortunately, this is not easily answered. One can put bounds on it. Under full employment it is zero and under complete and utter unemployment it approaches the percentage value added in the local market multiplied by the

Table 4.14
Impact of Respending Assuming a Ten Percent Interest Rate
(Millions of 1974 Dollars)

Condition	Element	Paragon Park	Daffyland
Full Employment	Δ Direct	13.9873	6.6694
	Multiplier	0	0
	Δ Respending	0	0
	Δ Total	13.9873	6.6694
	Differential	7.3179	
Intermediate Unemployment	Δ Direct	14.2814	8.2632
	Multiplier	1.33	1.33
	Δ Respending	4.7129	2.7268
	Δ Total	18.9943	10.9900
	Differential	8.9943	
Full Unemployment	Δ Direct	14.9720	11.8368
	Multiplier	2.00	2.00
	Δ Respending	14.9720	11.8368
	Δ Total	29.9440	23.6736
	Differential	6.2704	

percentage of direct increases in black-box income which are
respent locally. In those rare cases where the respending
effects will be critical to the allocative decisions, the
analyst has little choice but to actually trace them down.
Fortunately, due to the very rapid fall-off, one almost never
has to trace these effects more than one or two rounds.

THE TREATMENT OF PRICE/QUANTITY CHANGES

The Parable Beach Boatowners' Account

Banks decided, in his first cut at the problem, to ignore any changes in the real income of the Parable Beach residents who would make use of the Paragon Park marina. He now decides to go back and actually work out this account. As we shall see, this analysis will allow us to illustrate several interesting points.

The proposed marina will handle 500 boats. At present, dock space in the Parable Beach area is quite limited--no more than fifty boats. As a result, the available dock space commands premium rates: twenty dollars per boat-foot for the summer six months. Only ten Parablites keep their boats on this expensive space. Several hundred Parablites own boats, almost all of which are presently on moorings for which they pay fifty dollars per season to the town harbormaster.

The developers estimate that in order to fill the marina, the rate will have to drop to ten dollars per boat-foot, at which point they can still make a handsome profit. Banks estimates that at ten dollars per foot, 100 Parablites, whose boats average thirty feet in length, will abandon their moorings and take space at the marina, paying $30,000 a year for the privilege. The question, then, is: does this outlay represent a change in Parable Beach real income?

Whenever a significant change in either the price or quantity of a good is implied by one of the alternatives under analysis, it's a good idea to sketch the demand curve for that good or service. This has been done for the marina case in Figure A4.1.

In this figure, we have assumed that the demand for boat space is inversely proportional to price. Under this assumption, the single-hatched area is the increase in real income of the boatowners who opt to rent at the marina. To see this, consider a boatowner who is at point x on the demand curve. He was willing to pay as much as fifteen dollars per foot for boat space, but no more. Thus, ante marina, at twenty dollars per foot, he didn't purchase space. He now has the opportunity to buy space at ten dollars per foot. In terms of his own willingness to pay, he is five dollars per foot ahead on net as a result of the construction of the marina and the subsequent price reduction. Similarly, the man at y who was almost willing to pay twenty dollars per foot is close to ten dollars per foot ahead, while the man at z who is just barely willing to pay ten dollars per foot essentially comes out even. He gets his boat on a dock but the value he places on the other goods and services he would have consumed if he didn't pay the dockage rates is
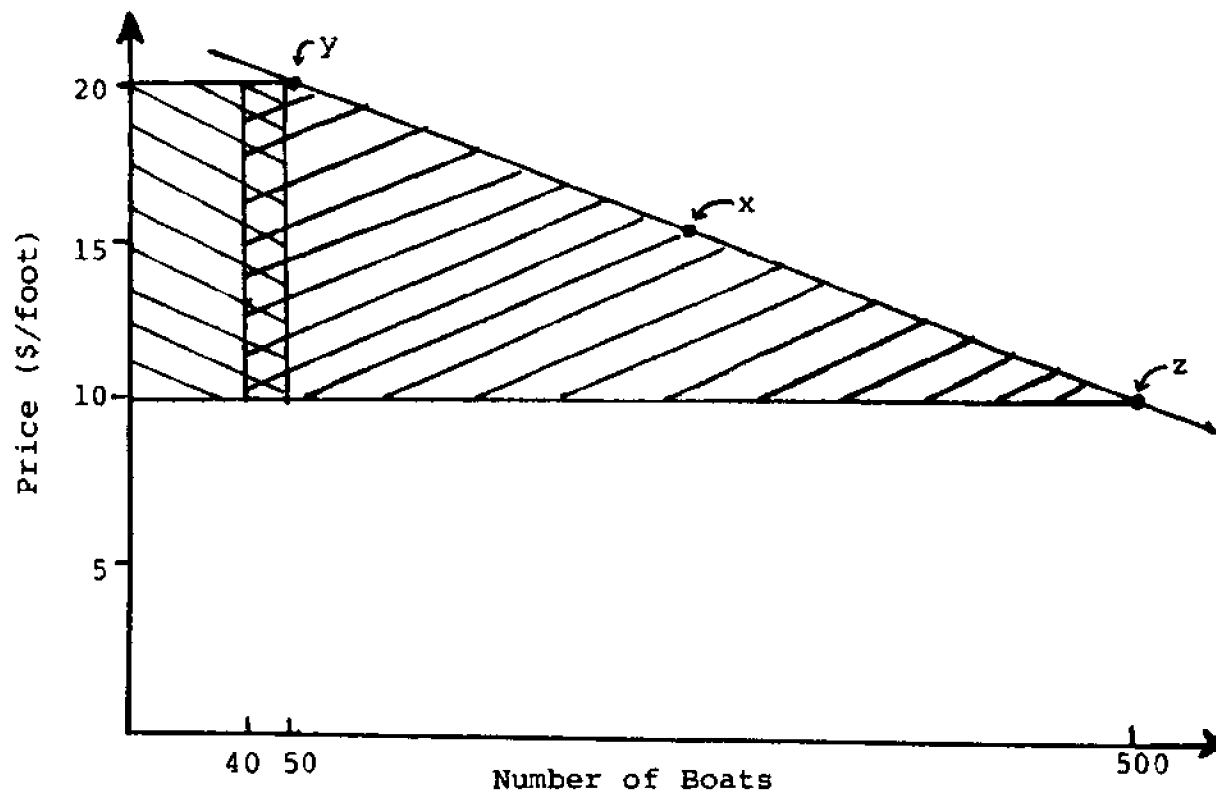
Figure A4.1.
Demand curve for dock space.

such that he is only barely better off in terms of his own
willingness to pay.

The sum of the differences between the maximum of what
the boatowners would be willing to pay and what they actually
end up paying, the single-hatched area, is the total increase
in income to all the boat owners at the marina. Under our
assumptions, this number, annually, is

$10 x 30 feet x 500/2 = $75,000 .

Now 100 of these boatowners are Parablites, so a portion of
this increase in real income accrues to the black box. Banks
knows the Parablite boat owner is on the average poorer than
the outside boat owner, so he assumes the 100 Parablite
owners are concentrated in the rightmost portion of the de-
mand curve, and estimates the Parablites' share of this in-
crease in real wealth at fifteen percent of the $75,000, or
$9,750, two-thirds of what it would be if the Parablites
were spread evenly over the demand curve.

The double-hatched area is the increase in real income to
Parablites who are presently purchasing mooring space at
twenty dollars per foot and who, after the price drop, will
have it at ten dollars per foot, a clear increase in their
real income. However, whether this is a net increase in
real municipal income depends on whether or not the original
fifty spaces were *owned* by a Parablite or not. If not, then

it is an increase. If yes, then the double-hatched area is a wash as far as Parable Beach is concerned--the increase in real income of the Parable Beach boatowners is matched by a decrease in the income of the old marina owner, and further, the dotted area, $10 x 30 x 40 - $1,200, is a net loss, for outside boatowners gain and a Parable Beach citizen loses. In the case at hand, Banks knows the old marina is owned by his father-in-law, and reluctantly takes $1,200 annually off the Δ Parable Beach marina tenants' account.[1] The net annual Parable Beach income due to the marina's output, then, is $8,750 per year, starting four years hence, when the marina is completed. The present value, then, over the twenty-five year analysis period, is

$$\sum_{n=3}^{25} \frac{8,750}{(1 + i)^n}$$

which is $111,854 at six percent and $19,443 at forty-five percent. This amount should be added to the other changes in municipal income associated with the Paragon Park high-rise development.

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[1] Also, if the town moorings are not re-employed, then there is an annual loss in Town Hall income of 100 x 50, less the expenses associated with maintaining the moorings. Banks has assumed they will be re-employed at the old price.

THE ORONOCO REFINERY PROPOSAL

Once More Into the Breach

It is a Monday night six months later. A subdued Parable Beach town council is meeting in closed session. A weary George Banks is also present, fiddling with a balky transparency projector. It has been a difficult six months for the council. Their decision on Paragon Park was not a universally popular one. On top of this, they have just completed a grueling, extremely heated series of public hearings on a much more momentous decision facing the town.

The Oronoco Oil Company has approached the town with a proposal to place a 250,000 barrel per day refinery in the abandoned sand and gravel pit area at the root of the Parable Beach peninsula. At present this 650-acre site is owned by Ephraim Ahab, a one-time resident of the town who has lived in Florida since the gravel pit operations shut down twenty years ago. This land is presently unused except for one corner which contains the town dump, for which use the town pays Ahab an amount equal to his property tax.

The plan involves placing a single-buoy mooring three miles off South Beach through which crude oil will be unloaded and piped to shore. The refined products produced by the installation will be distributed by truck and pipeline to the greater Schrod City market. The bulk of the site will be taken up by crude, intermediate, and products storage tanks totalling over twelve million barrels. The actual process units will occupy less than ten percent of the site, but several of the units will be close to 150 feet tall, and the entire complex will be dominated by a 300 foot stack. The project will also involve a ten-acre wastewater treatment lagoon, the consumptive use of three million gallons of fresh water per day, and the construction of a wastewater outfall just south of South Beach. The debate within the town, the entire state, and the whole region concerning this project has reached a fever pitch. Within the town, people are talking of little else. It has been the cause of domestic quarrels and barroom brawls. An advisory referendum split sixty-forty in favor of the refinery, but the summer residents are crying foul since they were not represented in the voting, which was open only to voters registered in the town. The town council is stuck at the center of this debate.

Simon Montfort calls the meeting to order. He begins, "As you all know, the purpose of this meeting is to receive George Banks's analysis of the effect of the refinery on the town's real income. [Montfort is beginning to learn the jargon.] For tonight, I suggest we concentrate exclusively on the economic aspects of the refinery and wait until Wednesday to begin discussing the environmental

aspects. At Wednesday's meeting we will receive the report of Professors Vachs and Wayne on the atmospheric and marine pollutants associated with the proposal. George, would you begin please?"

George Banks's Report

"Thank you, Simon. As you know, I have been asked to subject the developer's economic figures to the same sort of analysis used in the Paragon Park case to estimate the change in Parable Beach real income associated with accepting the Oronoco refinery in the town. In order to do this, I have talked at length with the developers and, at town expense, have visited several independent refinery experts.

"The Oronoco proposal envisions a rather straightforward fuels refinery, consuming about 250,000 barrels of Persian Gulf crude per day. The general characteristics of this plant are shown in Slide 1.

"Construction would require a six-month detailed design period and two years of site preparation and erection. The construction work crew would be approximately 2,200 people for the first twelve months and 1,000 people for the second twelve months. Total on-site construction payroll will be about $40 million out of a $400 million total investment on the part of the developer. The permanent work force will be approximately 350 people with an annual payroll of about $3.5 million.

"In order to investigate the effect of this proposal on Parable Beach real income, I have set up the accounts shown in Slide 2. For this analysis, I have chosen as my baseline a projection of the status quo. That is, all my computations will be relative to continuing to use the area for a dump. *I have also made the very important assumption that there is no other possible use of the site--it will either be a refinery or a dump.* After completing the analysis under this assumption, we will want to return and re-examine this hypothesis.

"Let us begin with the town hall account. As you know, in our state, towns are only allowed to tax on the basis of real property. What is and what is not real property is a legal question and we can expect litigation and a judicial decision on the matter. However, discussions with a number of tax experts and a review of similar litigation indicates to me that we will not be able to assess the refinery for more than about $70 million, something less than twenty percent of its construction cost. Assuming this to be the case, we must ask ourselves what the tax rate will be in the future, which of course depends on how much the town wishes to spend in municipal services. With respect to this variable, I have studied two extremes:

A. The town decides that each taxpayer will pay the same rate with the refinery as without. In this case, any net impact of the refinery on town hall income will go to increasing the quality and quantity of municipal services.

George Banks's Slide 1
General Characteristics of Oronoco Proposal

Crude
250,000 barrels per day (bpd) of medium sulphur, light
Arabian

Products
  7,000 bpd of LPG
20,000 bpd of lead-free, premium gasoline
30,000 bpd of lead-free, regular gasoline
80,000 bpd of No. 2 fuel oil, .1% sulphur
96,000 bpd of No. 5 fuel oil, .3% sulphur

Refinery fuel
13,000 bpd refinery fuel oil
 4,000 bpd equivalent refinery gas

Sulphur
480 metric tons/day

Storage
Crude   50,000,000 (10 tanks)
Intermediate 25,000,000 (50 tanks)
Oil products 50,000,000 (18 tanks--6 heated)
Gas products   200,000 (20 tanks)
              _____
             125,000,000

George Banks's Slide 2
Accounts for Municipal Analysis of Refinery (Baseline is
Status Quo)

Δ Town Hall

Δ Parable Beach construction labor
Δ Parable Beach permanent employees

Δ Parable Beach landowners
Δ Parable Beach oil consumers

Δ Respending

B.   The town decides it wishes to provide the same level
of public municipal services with the refinery as without.
In this case, any net impact of the refinery on town hall
income will be transferred to the town's property owners in
the form of lower taxes.

"Let's start with Alternative A (Slide 3).   In this case,
the property tax revenue calculation is quite simple. We are
presently taxing ourselves at the rate of $100 per thousand-
dollar valuation and this rate has recently been increasing
at one and one-half percent per year in real terms, that is,
after correction for inflation. This, together with the two
and one-half year construction period, yields the revenues
shown in the leftmost column in Slide 3.
"On the outlay side, the refinery will involve additional
town expenses for:
1.   road construction and maintenance;
2.   sewage construction and maintenance;
3.   replacing the town dump;
4.   police protection and environmental monitoring;
5.   fire protection;
6.   cleaning, painting public facilities.
"With respect to Item 1, the town is fortunate in that
the refinery is located near the southwestern border of the
town, whence all the construction materials and most of the
workers will come. This means that the neighboring town of
Horseham will bear the brunt of this traffic.[1]
"However, the refinery will require the construction of
one mile of four-lane road within the town and approximately
four miles of existing town road will be subjected to about
5,100 additional trips per day by construction workers,
equipment, and material during the construction period. The
refinery's operations will imply about 600 vehicle trips per
day and, since about twenty percent of the refinery output
will be delivered direct by truck, about 1,000 truck trips
daily. This represents an increase in usage of fifty per-
cent on these roads during the construction period and of
fifteen percent during the operating period, much of it
heavy truck traffic. My discussion with the town road
people indicates the overall effect will be to increase main-
tenance costs on these roads about fifty percent over what
they would be without the refinery. This amounts to a little
over $134,000 a year in addition to the initial $470,000 con-
struction bill.
"Sewage disposal will have both a positive and a negative
effect on this account. On the plus side, the town will be
able to assess the refinery the standard sewage fees; on
the negative side, the town will be required to construct
additional conduits and conduit access and accept an increase
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[1]Horseham, a wealthy suburban community, has been adamant in
its opposition to the refinery, and is attempting to mobi-
lize forces at the state level to stop the project.

George Banks's Slide 3
Δ Town Hall--Oronoco Oil Refinery Assuming No Decrease in Property Taxes (Millions of 1974 Dollars)

Year	Property Taxes	Cleaning and Painting	Sewer Fees	Road Construction and Maintenance	Sewer Construction and Maintenance	Replacing Town Dump	Police Protection*	Fire Protection	Net Cash Flow
1974	0	0	0	0	0	0	0	0	0
1975	2.141	0	0.0255	-0.0678	-0.0250	-0.1350	-0.0598	-0.0950	1.7639
1976	5.148	0	0.0255	-0.8847	-0.0250	-0.1364	-0.0678	-0.0700	3.5039
1977	5.936	-0.015	0.0120	-0.1347	-0.0024	-0.1378	-0.0611	-0.1341	5.4638
1978	7.560	-0.015	0.0120	-0.1348	-0.0024	-0.1392	-0.0611	-0.1341	7.0863
1979	7.700	-0.015	0.0120	-0.1347	-0.0024	-0.1406	-0.0611	-0.1341	7.2250
1980	7.840	-0.015	0.0120	-0.1348	-0.0024	-0.1420	-0.0611	-0.1341	7.3635
1981	7.980	-0.015	0.0120	-0.1347	-0.0024	-0.1434	-0.0611	-0.1341	7.5022
1982	8.120	-0.015	0.0120	-0.1348	-0.0024	-0.1448	-0.0611	-0.1341	7.6415
1983	8.260	-0.015	0.0120	-0.1347	-0.0024	-0.1462	-0.0611	-0.1341	7.7794
1984	8.400	-0.015	0.0120	-0.1348	-0.0024	-0.0477	-0.0611	-0.1341	7.9178
1985	8.540	-0.015	0.0120	-0.1347	-0.0024	-0.1492	-0.0611	-0.1341	8.0564
1986	8.680	-0.015	0.0120	-0.1348	-0.0024	-0.1507	-0.0611	-0.1341	8.1948
1987	8/820	-0.015	0.0120	-0.1347	-0.0024	-0.1522	-0.0611	-0.1341	8.3506
1988	8.960	-0.015	0.0120	-0.1348	-0.0024	-0.1537	-0.0611	-0.1341	8.3816
1989	9.100	-0.015	0.0120	-0.1347	-0.0024	-0.1552	-0.9611	-0.1341	8.6204
1990	9.240	-0.015	0.0120	-0.1348	-0.0024	-0.1568	-0.9611	-0.1341	8.7587
1991	9.380	-0.015	0.0120	-0.1347	-0.0024	-0.1584	-0.9611	-0.1341	8.8972
1992	9.520	-0.015	0.0120	-0.1348	-0.0024	-0.1600	-0.9611	-0.1341	9.0555
1993	9.660	-0.015	0.0120	-0.1347	-0.0024	-0.1616	-0.9611	-0.1341	9.1740
1994	9.800	-0.015	0.0120	-0.1348	-0.0024	-0.1632	-0.9611	-0.1341	9.3123
1995	9.940	-0.015	0.0120	-0.1347	-0.0024	-0.1648	-0.9611	-0.1341	9.4508
1996	10.080	-0.015	0.0120	-0.1348	-0.0024	-0.1664	-0.9611	-0.1341	9.5881
1997	10.220	-0.015	0.0120	-0.1347	-0.0024	-0.1681	-0.9611	-0.1341	9.6675
1998	10.360	-0.015	0.0120	-0.1348	-0.0024	-0.1698	-0.9611	-0.1341	.9.8657
1999	10.500	-0.015	0.0120	-0.1347	-0.0024	-0.1715	-0.9611	-0.1341	10.0041

*This includes increased environmental quality control procedures.

in operation and maintenance expenses which will accrue from refinery tie-in.

"The refinery will also require an alternative means of disposing of the town's trash. At present the town generates waste at the rate of five pounds per person per day, or about twenty-five tons per day. Assuming the pits are no longer available to us, the only alternative in the near term involves trucking to a sanitary landfill twenty miles to the southwest. Conversations with local contractors indicate that this will cost fifteen dollars per ton more than our present collection and dumping costs, or about $135,000 per year.

"Discussion with the police chief indicates he would like one additional permanent police officer and two additional provisional police officers. These people would be primarily employed in handling the additional traffic generated by the refinery. In this column, I have also included money for an environmental quality control expert and an assistant along with rudimentary lab and support facilities on the assumption that the town will opt to run its own environmental monitoring program in addition to those conducted by state and federal agencies. In the fire protection column, I have allowed for the addition of a complete pumping unit including one new officer, eight permanent firefighters and eight new callmen, one new firehouse with associated equipment, and a new dual-purpose pumper. My feeling is that these allowances for personal and property protection are generous since they are in addition to the private security and fire protection units provided by the refinery.

"It is possible that the refinery's atmospheric pollutants will require more frequent cleaning and painting of public facilities such as park benches, playground equipment, etc., especially in the southern portion of the town. We are presently spending $15,000 on these services. In an attempt to be safe, I have assumed that these outlays will be doubled.

"This completes the background to Slide 3, the town hall account under the hypothesis that the town does not reduce present taxes with the refinery. Given all the above assumptions, the present value at ten percent is about +$62 million. The additional property taxes far outweigh the additional cost of municipal services.

"If, on the other extreme, the town decides to maintain municipal services at present levels, then we must refer to Slide 4. Under this option, the outlays for additional street construction and maintenance, trash disposal, etc. will be the same as in Slide 3. When these are added to the other municipal outlays required to maintain the present level of services we obtain the 'tax to be raised' column in Slide 4. This figure, divided by the sum of the assessed value of present town properties plus the refinery valuation yields the projected tax rate. This projected tax rate is then applied to the refinery's valuation to obtain the refinery property tax bill under the assumption that the

George Banks's Slide 4
Oronoco Refinery Impact on Tax Rate Assuming Same Level of Public Services Provided
With Refinery as Without (All Figures Except Tax Rate in Millions of 1974 Dollars)

Year	Base Valuation	Oil Refinery Valuation	Total Valuation	Tax Raised (Includes Added Service Cost)	Tax Rate $/1000	Oil Refinery Property Tax (Cash Flow)
1974	47.728	0	47.7280	4.8770	100	0
1975	48.028	42.0000	90.0280	5.6526	63	1.323
1976	48.228	49.0000	97.2280	6.1924	64	3.136
1977	48.528	56.0000	106.5280	6.2661	59	3.304
1978	48.728	70.0000	118.7280	6.5676	55	3.850
1979	50.028	70.0000	120.0280	6.9129	58	4.060
1980	52.228	70.0000	122.2280	7.2284	59	4.130
1981	52.528	70.0000	122.5280	7.5377	62	4.340
1982	52.728	70.0000	122.5280	7.8922	64	4.480
1983	53.028	70.0000	123.0280	8.2635	67	4.690
1984	53.228	70.0000	123.2280	8.5649	70	4.900
1985	53.528	70.0000	123.5280	8.7833	71	4.970
1986	53.728	70.0000	123.7280	9.0847	73	5.110
1987	54.028	70.0000	124.0280	9.3861	76	5.320
1988	54.228	70.0000	124.2280	9.6875	78	5.460
1989	54.528	70.0000	124.5280	9.9889	80	5.600
1990	54.728	70.0000	124.7280	10.2889	82	5.740
1991	55.028	70.0000	125.0280	10.5904	85	5.950
1992	55.228	70.0000	125.2280	10.8919	87	6.090
1993	55.528	70.0000	125.5280	11.1934	89	6.230
1994	55.728	70.0000	125.7280	11.4959	91	6.370
1995	56.028	70.0000	126.0280	11.7974	94	6.580
1996	56.228	70.0000	126.2280	12.0999	96	6.720
1997	56.528	70.0000	127.5280	12.4016	98	6.860
1998	56.728	70.0000	127.7280	12.7033	99	6.930
1999	57.028	70.0000	128.0280	13.0050	102	7.140

level of municipal services is not increased with the refinery. The annual tax bill is shown in the last column of Slide 4. Comparison of this column with the first column of Slide 3 will reveal that the refinery will pay considerably less property taxes if municipal services are maintained at present levels. The overall effect of opting for this alternative rather than maintaining tax rates at what they would be without the refinery is to reduce the net present value of the town hall account at ten percent from about $62 million to about $35 million. Of course, it is not clear that the town can usefully spend the additional $28 million in present value on public services, but it certainly should be aware of the decrease in Parable Beach income associated with using the refinery's revenues to decrease the tax rate. The town may very well decide to take some middle course, reducing taxes less than implied in Slide 4, but increasing public services less than envisioned in Slide 3, with intermediate results with respect to municipal income.

The Labor Accounts

The net set of accounts I examined involved the possible changes in income of Parablites who would be employed in either the construction or operation of the refinery. Let's start with the construction labor. An estimate of the labor skills required is shown in Slide 5. A check with the local unemployment office indicated that there are essentially no Parablites in the higher skilled trades who are also unemployed, but that there are approximately 160 presently unemployed Parablites who would qualify as laborers and helpers. Discussion with the developers indicated that they would like to hire Parablites but that I should check with the relevant unions, which I did. Union officials were adamant that:
1. This was to be a union job.
2. The unions had no intention of adding new members to their ranks.

A check of the Parablite unemployed revealed that not one of them was a member of the subject unions. My conclusion is that at most a handful of presently unemployed Parablites

George Banks's Slide 5
Refinery Construction Skills Needed

Skill	Number Needed
Pipefitter	700
Electrician	250
Insulator	250
Laborer	200
Ironworker	150
Boilermaker	150
Operating engineer	100
Millwright	50

will be employed in the refinery construction. Those that do will be runners and the like for the developer. The effect on town income of the construction payroll appears to be nil.

"The case of the permanent operating personnel is somewhat different. For one thing, we don't have the problem of already-established unions. For another, the developer has promised to conduct a training program to prepare local people for operating jobs. Finally, the developer has indicated that where possible, he will give preference to Parablites in hiring, and it's in his interest to do so.

"My estimate of the breakdown of the refinery labor force is shown in Slide 6. Studies of similar projects elsewhere indicates that the refinery will transfer in about fifty-five top people from other installations. These people will occupy the bulk of the supervisory and key management jobs and command the top salaries.

"With respect to the impact of the remaining 295 jobs on Parable Beach income, it is of interest to study the structure of Parable Beach income. State unemployment figures indicate that there are currently 400 Parablites unemployed and seeking work. Forty-two percent of these people are female, and thirty-five percent of these women have not completed high school. This leaves some sixty apparently trainable women, which would be more than enough to occupy the thirty or so clerical jobs to which they seem to be in effect limited. In my calculations, I have assumed that all these clerical jobs, paying an average of $7,000 after state and federal income taxes, go to Parablites who would otherwise be earning nothing. This is a little extreme, but we shall see that any errors introduced here are small overall.

George Banks's Slide 6
Refinery Labor Breakdown

Category	Transfers	Locals*
General management	10	
Operations		
Supervisors	30	
Operators		115
Maintenance		
Supervisors	5	10
Welders		15
Electricians		25
Mechanics		25
Pipefitters		25
Carpenters		15
Engineering	5	10
Quality control	3	10
Fire and safety		15
Accounting, personnel	2	10

*Assumes six-month training program.

"The breakdown of the unemployed males, Slide 7, is interesting. The state last-job categories are not very informative and I have not been able to get the State Unemployment Agency to give me a simultaneous breakdown of age, education, and skill, but roughly it appears that there might be something like 150 presently unemployed male Parablites who could be trained for refinery operating and maintenance jobs. I think it's a little too optimistic to think that, even with preference, all of these people will land and keep refinery jobs. In my estimates, I have assumed that 100 of these jobs, averaging after training $9,000 per year after state and federal taxes, will go to otherwise unemployed Parablites. These people would otherwise be on welfare. The average value of welfare payments I have estimated at $3,200 per year. Thus, the increase in real income of these 100 people would be $5,800. The remainder of the jobs go to non-Parablites or Parablites who would be earning something like $9,000 after taxes without the refinery.

"Under these assumptions, the annual increase in Parable Beach employee income after start-up is $790,000. Assuming these people are paid at seventy-five percent of their working salary during a six-month training period commencing a half-year prior to refinery operation, the present-valued increase in Parable Beach employee income at ten percent is $5,651,420 and at twenty percent is $2,587,340. This estimate of the increase represents about twenty percent of the refinery's gross payroll.

The Parable Beach Consumers' Account

"There has been considerable talk around town that the refinery will decrease the price or increase the quantity of oil consumed by townspeople. If this happened, it would

George Banks's Slide 7
Structure of Parable Beach Male Unemployment

Skill (Last Job Held)	
Professional	8
Sales and clerical	5
Craftsman	45
Operative	67
Non-farm labor	115
Age	
Under 22	36
22-35	59
35-45	61
45-55	37
55-65	35
Over 65	12
Education	
Less than 8 years	32
Less than 12 years	85
High school graduate	74
Less than 16 years	41
College graduate	8

represent an increase in real income to Parablites. After discussions with a number of industry officials, my judgment is that any such effect is very likely to be insignificant. The amount of oil consumed is rather insensitive to price, so that even if there were a price change, there would be little effect on quantity consumed. Further, in the absence of price controls, in order to affect price, the refinery would have to affect the cost of the most expensive oil consumed in the whole region. A 250,000 barrel per day refinery represents only a small proportion of the overall regional consumption. With the refinery, the region would still be consuming oil products from distant foreign refineries; this more expensive oil will determine the market price. To put it another way, this refinery will have no trouble selling all its output at the present market price and, absent of controls, the refinery owner would be mad to sell the oil for less. I suggest we not count on any gasoline or heating oil price decreases as a result of the refinery. There may be some decrease in retail price as a result of the shortening of truck hauls of present gasoline and heating oil distributors who are now operating from terminals in Metacomet, ten miles away, but this will not amount to more than a cent or two a gallon. This would mean a savings of less than $50,000 per year. That is quite small compared to some of the other numbers with which we are dealing.[2]

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[2]More precisely, whether or not there will be downward pressures on local products prices will depend on whether or not this refinery pushes all the products from the most expensive refinery source off the regional market. Assume for the moment that Parable Beach is in New England. Then the possible sources of refined products can be grouped into five categories:
1. Europe
2. Eastern Canada
3. U.S. Gulf
4. Puerto Rico-Virgin Islands
5. Mid-Atlantic
Assuming each of these areas had the capability of receiving deep-draft tankers, a rough estimate of the differentials in refiners' cost of landing products in New England relative to those of a local refinery is given by:

	Crude Transport	Tariff	Refining	Products Distrib.	Total
Europe	0	55¢	-20¢	40¢	75¢
Eastern Canada/ Bahamas	0	55¢	-30¢	15¢	40¢
Gulf	5¢	0	-15¢	45¢	35¢
Puerto Rico/ Virgin Islands	-10¢	0	-15¢	45¢	20¢
Mid-Atlantic	0	0	0	15¢	14¢

These numbers imply that if New England must import some of its products from Europe the regional price of all products

will be determined by the landed cost of European fuel and, absent of price control, the local refinery will be able to make something like 75¢ per barrel in pre-tax profits. If, on the other hand, domestic refining expands to the point where all European products are pushed off the East Coast market, then there will be downward pressures on prices which could lead eventually to price drops of about 35¢ per barrel. The following figure sketches the process.
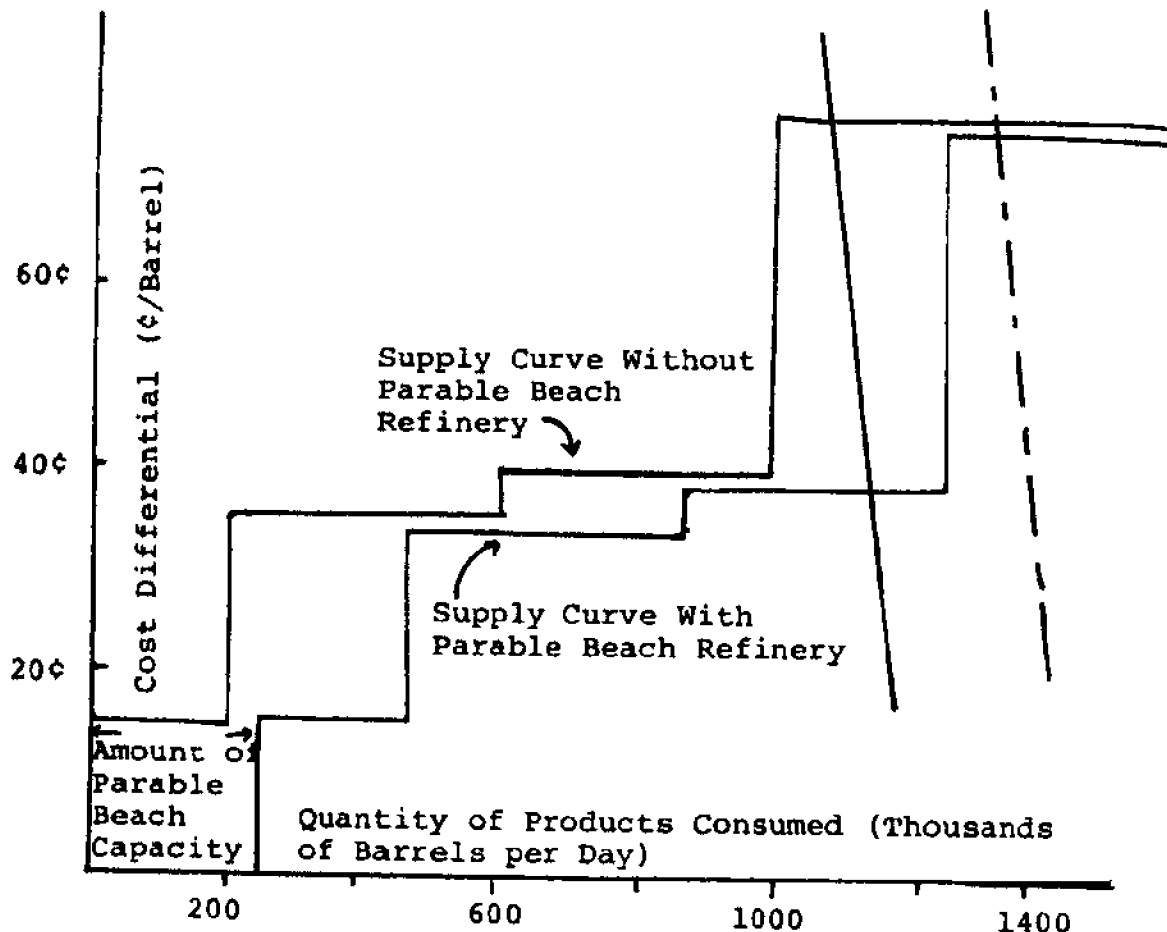
The addition of 250,000 barrels per day of local refining shifts the supply curve to the right by this amount. If the intersection of demand and supply was originally as that shown by demand curve D_1 then this shift will force all the most expensive products off the market and there will be downward pressure on all regional products prices--not just those produced by the refinery. If the East Coast was originally importing more than 250,000 barrels per day from the most expensive source, as depicted by D_2, then the new refinery will not push all the highest-step oil off the market and there will be no changes in prices even under free competition. Thus, the actual shape of the regional supply curve of products becomes a very important factor in determining whether there will be any price change. George Banks is assuming the situation is similar to that shown for the D_2 curve.

The Parable Beach Landowners' Account

"The landowners' account raises an interesting problem. The local landowner most directly affected by the refinery is Ephraim Ahab, who still maintains a legal residence in the town. Now we don't know what deal Mr. Ahab has made with Oronoco, but knowing old Eph, we can be sure he is making out all right. My guess is in the neighborhood of $10,000 per acre for land that had a market value of perhaps $3,000 per acre until the refinery came along. The difference is about $4.6 million. The question is, should we count this increase in Ahab's income as an increase in Parable Beach income?

"Under the rules with which we have been operating, we probably should. Ahab has been and is a legal resident of the town and a long-time property owner. Strictly speaking, he qualifies. However, for the last twenty years we have only seen Ahab for a day or two a year, and it is quite clear that his only interest in the town is this piece of property. He is not even a part-time resident, in the every-day meaning, of the town. I suggest we make an arbitrary exception to our rules and not count him as a Parablite for the purposes of municipal income, but I will be guided by your judgment."

Banks looks questioningly at the Council and receives seven affirmative nods or grunts in return.

"Okay, Ahab's increase in income is out. Now Ahab is not the only property owner in Parable Beach whose land value might be affected by the refinery. Fortunately, the access road will all be on town-owned or refinery-owned land so no private property takings are required. However, property values in the neighborhood of the refinery and perhaps in a wider area may be affected by the environmental and aesthetic effects of the installation.

"The process units would be placed in the center of the site so noise does not appear to be a problem. However, there will be some glare, some smell, and certainly some visual impact.

"It is simply impossible to estimate with any degree of accuracy how large the effect of these impacts on neighboring property values will be. Oronoco claims these effects will be insignificant and points to refineries elsewhere which coexist more or less peacefully with residential neighbors. But I'm not so sure. It's true that if people turn out not to mind the refinery the property values won't go down much. But at this point it would be foolhardy to predict how Parablites and the local property markets are going to react to the refinery. At the other extreme, it could effectively preclude Parable Beach's being regarded as a desirable residential community, just at the time when the region appears to have reawakened to the town's unique location.

"Despite this uncertainty, one can obtain some insight into the problem by examining Slide 8. In this slide, I have shown an estimate of the current market value of all

George Banks's Slide 8
Current Value of Neighboring Parable Beach Property

Band (miles)	Acreage	Average Value/Acre	Total Value
Under 1/4	275	$50,000	$17.2 million
1/4 - 1/2	360	48,000	21.8 million
1/2 - 3/4	400	54,000	31.7 million
3/4 - 1	100	60,000	7.5 million
1 - 1-1/4	100	60,000	7.5 million
1-1/4 - 1-1/2	120	54,000	6.5 million
1-1/2 - 1-3/4	130	54,000	7.1 million
1-3/4 - 2	150	48,000	7.2 million

the town land within a quarter-mile of the refinery's boundaries, between a quarter-mile and a half-mile, and so on, out to two miles. Many people feel that a refinery of this size requires a site of a thousand or more acres in order to allow for sufficient buffer zone. This would be about 400 acres more than the abandoned sand and gravel pit allows. If one takes an extreme view and believes that as a result of the refinery, the property within a quarter-mile of the refinery will have zero market value, then the first element of the last column represents an estimate of the loss in Parable Beach income associated with this drastic drop in prices. If one is even more pessimistic and believes that all the land within a half-mile of the refinery will become valueless, then the loss grows to $39 million.

"The point is that these numbers are not small. If realized, they would put a very healthy dent in the $62 to $34 million present value increase in town income we have computed up to this point, depending on how severe and how far-reaching the actual effect of the refinery on surrounding property values is.

"Further than this I cannot help you. I can only suggest you visit some similar refineries elsewhere. And I might suggest that if you do decide to accept the refinery you either

1. obtain a clause in the agreement with the refiner that he agree to buy any surrounding property at the present price in real terms that is offered him through, say, the next five years. If Oronoco really believes the effect will be small, they will have little to lose by signing. Or,

2. set up a transfer system by which neighboring property owners whose property values do turn out to be negatively affected can receive compensation for at least a portion of the loss. This compensation might take the form of, for example, complete abatement of property taxes or an outright grant. As long as the town as a whole came out ahead, as long as we actually experience an increase in real municipal income, it is at least theoretically possible to redistribute this increase so that everybody in the town comes out ahead in terms of each Parablite's real income.

From the point of view of municipal income, 1 is preferable to 2, for in the first case the refinery will bear the loss in income associated with the drop in property values, while the second simply spreads the loss more evenly over the town.

"The problem is further compounded by the offshore crude terminal and its pipeline. The developer has already quietly made deals for pipeline right-of-way with the twelve private property owners along the route. While we do not know the amounts involved, since there was no compulsion, it's safe to assume that these property owners will be at least as well off with the line as without. I have conservatively assumed that they broke even. The developer is asking for a permit to build a portion of the line under town roads with the stipulation that the streets will be left in their original condition.

"The real problem is with the possibility of spills at the terminal, particularly a large spill, which later oiled the shore. I understand that Dr. Wayne will be giving you some input on the probability of such spills next meeting. For now, I simply want to mention that the possibility of spills will have some effect on shoreline property values. How much, I don't know. If a bad spill actually occurs, property values will be further depressed, again how much and for how long I don't know. Realtors in Santa Barbara interviewed after the large spill there estimated that shoreline property values dropped twenty-five percent in the areas directly affected after the spill and offered the opinion that in five years, assuming no more spills, these values would return to what they would have been without the spill. At a ten percent interest rate this would be equivalent to a present value loss of about six percent of the property's value. This figure was obtained by assuming that the property owner rents his property out at rents which are reduced proportionally to the transitory loss in property value. Under these assumptions, such a drop in property value would result in an equivalent one-short loss in town income of about $1.2 million at the time of the spill.

"Other losses in Parablite income in the case of a large spill coming ashore might result from actual cleanup expense. It should be borne in mind, however, that the great bulk of the cleanup expense will be borne by the oil company and the federal government and not the town. In this regard, you might want to read Mead and Sorenson's study of the economic impact of the Santa Barbara spill.[3]

"Other losses could accrue from the destruction of lobsters. There are presently eight full-time lobstermen and about six part-time lobstermen in the town plus three Parablites employed at the Bay Lobster Company. I estimate the take-home income of these Parablites at $150,000 per year.

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[3]W. Mead and P. Sorenson, "The economic cost of the Santa Barbara oil spill," _Proceedings Santa Barbara Oil Symposium_, December 1970.

In the very extreme case that the lobstering was wiped out, and these people could not find alternate employment, and no portion of this loss could be recovered in the courts, an upper bound of the present valued loss at ten percent interest rate would be about $1.4 million. In reality, it is unlikely that lobstering would be completely wiped out in the case of even a very large spill. Further, at least a portion of any such loss should be recoverable from the oil company. However, once again the team might want to set up some form of compensation system for those townspeople most directly affected by a large spill. Perhaps a portion of the refinery property tax should be invested in a reserve fund for this purpose.

Summary

"The last two slides are summaries showing my estimates of the change in Parable Beach income associated with the refinery under a number of hypotheses about property tax policy and neighboring land value effect. These estimates are before respending.

"With respect to respending, whatever the net municipal multiplier is, it applies to the entire differential since, *assuming the dump is the only other possible use of the site*, these are true differentials. However, since under our assumptions the refinery puts a healthy dent in the unemployment in the town and since the numbers are so large that there is no way any but a small portion of the differences can be respent within the town, we can be sure the net municipal multiplier is quite small, especially if the refinery doesn't have any significant depressing effects on surrounding property values.

"Remember also our assumption that the only alternative use of the site is a town dump. It is, of course, possible that five years from now someone will come along who would like to use the site for, say, a light manufacturing plant. Having accepted the refinery, we will have effectively precluded ourselves from accepting this plant. While the present market value of the site indicates that people believe the likelihood of this happening is low, the possibility should enter your thinking. I could work up some other example alternatives, but frankly I ran out of time. Thank you."

Montfort: "Thank you, George. Any questions?"

Beatrice Cenci speaks up. She is a local lawyer and insurance agent, thought to be leaning toward the refinery. "Yes, I have one. George, it seems to me you violated one of your own rules on this property value business. Back in the Paragon Park analysis you pointed out that a drop in price was not necessarily a loss in municipal income since the loss in seller income would be matched by a gain in the buyer's real income and as long as both buyers and sellers were Parablites, this was a wash: is that right?"

George, warily: "Yes."

George Banks's Slide 9
Summary of Accounts for Refinery Impact on Parable Beach (Millions of 1974 Dollars, 10%
Interest Rate)

Account	Net Present Value	
	No Decrease in Property Tax Rates	No Increase in Municipal Services
Δ Town Hall	+62.0	+34.0
Δ Parable Beach construction labor	nil	nil
Δ Parable Beach permanent employees	+5.6	+5.6
Δ Parable Beach oil consumers	+0.5	+0.5
Δ Parable Beach landowners		
No adverse effects on neighboring property	0	0
Property values within 1/4 mile reduced to zero	-17.2	-17.2
Property values within 1/2 mile reduced to zero	-39.0	-39.0

George Banks's Slide 10
Present Value of Increases in Parable Beach Income
Associated with Refinery Rather than Town Dump
(Ten Percent Interest, Before Respending, Millions
of 1974 Dollars)

	No Decrease in Taxes	No Increase in Municipal Services
No adverse effects on neighboring property	$68.1	$40.1
Property values within 1/4 mile reduced to zero	50.9	22.9
Property values within 1/2 mile reduced to zero	29.1	1.1

"Well, then, what if the neighboring property values drop and these properties are then picked up for a song by other Parablites? Then this change in property values would have no net effect on municipal income, right?"

"Oh, I see what you're getting at," answers George, stalling for time to collect his thoughts, "and I should have spent more time on it in my presentation. No, there is a difference. The key question is, is the object whose price has changed still the same object as far as the Parablite buyer is concerned? For example, let's assume that as a result of a shift away from beer drinking in the region, a Parablite barowner finds he has to reduce his beer prices, with a loss in income to himself of five cents a bottle. A Parablite customer who enjoys this beer in this tavern just as much after the price drop as before gains five cents. Then we have a wash. On the other hand, let's assume that there is a report that the brewery's beer is contaminated, and the barowner is forced to lower his price a nickel to get any business. Now our Parablite customer is not sure the report is true but as a result he is willing to pay less for this beer. If before, he was willing to pay forty cents for the beer, he is now willing to pay only thirty-five cents. Then at forty cents he was just breaking even buying the beer before the report, and at thirty-five cents he is just breaking even after the report. He has seen no increase in his real wealth. The bartender's loss would not be compensated, and we'd have a net drop in real municipal wealth.

"In the case at hand, I have assumed that if the refinery acts to lower the price of surrounding property it also lowers the price that Parablites would be willing to pay for this property. To the extent that the drop in market value is not matched by a drop in willingness to pay, then some deductions from the property losses in the last slide are in order. Basically, it's a common-sense proposition. Is the object really the same object after the price change as

before? Is a piece of land the same piece of land with a
refinery nearby as without? This is the kind of question
that must be answered whenever one is dealing with a buyer-
seller transaction within the black box after a price
change."

Mrs. O'Houlihan: "George, I have two questions. One is
I thought you said that these real income analyses generally
indicate that the changes in black-box income are much lower
than usually claimed by proponents. But here this doesn't
seem to be the case. You're estimating that, if the refi-
nery doesn't affect property values adversely and we don't
reduce taxes, the town could make over $62 million present
valued. That's equivalent to handing every person in the
town $6,200 on a one-shot basis."

George: "Yes, this is an exception. And in my opinion,
the reason it's an exception is the ecological and aesthetic
pollution associated with the refinery. Notice the $65 mil-
lion is almost all property taxes. Refineries in our situa-
tion pay a lot more in property taxes than they cost the
town in monetary terms in additional municipal services,
while other types of development proposals usually break
even. This is a reflection of the environmental disbene-
fits associated with a refinery. If there were none, you
could be sure that towns all up and down the coast would be
falling all over each other trying to get a refinery. Refi-
neries would go from town to town asking who would give them
the lowest property taxes. Tax abatement offers would begin
coming in in a hurry. It wouldn't be long before the com-
peting towns would knock the refinery's tax bill down to the
cost of additional public services. Then, even from a
purely monetary point of view, the refinery would be a
break-even development as far as the town is concerned.
It's the environmental disbenefits which are restraining the
other towns from competing for the refinery by cutting their
property taxes. I'm afraid the operation of the market
tends to almost always leave us with difficult choices."

"Thank you, George. There's no such thing as a free
lunch, is there? My last question is a simple one. The
things you are saying seem to me to make sense. Why in all
the economic analyses I have heard about or seen discussed
before this council have I never seen such things as real
black-box income?"

George: "Well, partially it's lack of training. Prob-
lems such as ours tend to be ignored by economists as too
trivial to be of interest. And in truth, there isn't any
great secret to it. Anybody who is reasonably careful to
keep track of both the plusses and the minusses can do it.
Partially, it's laziness. Sometimes people who should know
better are simply too lazy to carry their estimates through
to the bottom line, the net effect on black-box income. So
they'll make some estimates of number of jobs, gross pay-
rolls and the like and stop there. This is akin to going
before a corporate board of directors with an analysis of an
investment which indicates only what the investment's

revenues will be. The immediate question would be, 'Yeah, but how much money are we going to make?' Unless you addressed the bottom line, you would be kicked out on your tail. Without similar tailkicking in coastal zone analysis, people tend to get lazy and don't work things down to the bottom line.

"Of course, the really important reason for the poor quality of coastal zone economics is that invariably the people who are doing the work are not doing it in order to shed light on what should be done. Rather, they have already decided what should be done and they are doing the work to convince someone else that what they want done should be done. This is not economics. It is not analysis. It is salesmanship."

Simon Montfort: "Thank you again, George. I don't think you've made our decision any easier, but I'm sure you've made it a better informed one. The council will meet at eight p.m. on Wednesday to receive the presentation on the environmental impacts of the refinery. May I have a motion to adjourn?"

THE ORONOCO REFINERY FROM THE POINT OF VIEW OF THE STATE

The Governor's Problem

The next morning, George Banks receives a call from his superior, the State Commissioner of Natural Resources, E. Kyle Renick.

"George, I understand you've been doing some work on the Oronoco refinery on the side."

"Yes, sir."

"Is the town really seriously considering awarding the necessary permits?"

"Yes, sir. I think they are."

"Hmm. I hadn't realized it had gotten that far. The governor just called me and expressed concern on the project and asked my advice. She's evidently beginning to get a lot of pressure from Horseham and some of the other towns in the area. Frankly, she doesn't know what to do and needs guidance. I understand you have just prepared a report for the Parable Beach town council and I thought we could give her your report."

"We could, but I don't think it would be appropriate. You see, my report addresses the real income dimension of the refinery from the point of view of the town of Parable Beach. The governor presumably is interested in the effect of the refinery on the real income of the entire state, which is quite a different matter. If she were to interpret the results for Parable Beach as applying to the state as a whole, we would be grossly misleading her."

"I'm not sure I see the difference. But the key question is how long it would take you to generate a report which would not be misleading."

"About a week."

"Okay, drop what you've been doing and get me this report. It will delay the Phase VI-B review of the comprehensive coastal zone land use plan a week, but since that plan has already been under review for two years, I don't suppose that will be critical."

"Yes, sir."

George's Analysis for the State

Banks realizes he is now dealing with a new enlarged black box encompassing every citizen of the state. Once again he decides to accept as a postulate that the site can only be used as a town dump or for the refinery. Further, he decides to assume that if the refinery is not built in Parable Beach, it will not be built anywhere in the state. The basic point is that in doing black-box income analyses one must *explicitly lay out all the alternatives open to the black box.* Given these assumptions, George decides to use

Table 6.1
Accounts for Analysis of Refinery From the State's
Point of View

Δ State construction and operating employees
Δ Parable Beach Town Hall
Δ Horseham town hall
Δ State property owners
Δ State refinery owners
Δ State House
Δ State consumers
Δ Respending

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a projection of the status quo as his baseline. Relative to this baseline, he sets up the accounts shown in Table 6.1.

George decides it's reasonable to assume that ninety percent of the construction employees will be state residents. He already knows essentially all of them will be people who are already members of the construction trade unions. Talking with people at the state labor office, he finds that, except for some seasonal fluctuations, there has been little long-term unemployment among these union members. The labor officials offer the opinion that the refinery would put a real pinch on the local construction labor market, causing some other projects to be deferred or extended. The officials also indicate that they think it quite unlikely that the unions would open their ranks to presently unemployed people in order to accommodate the additional demand. On the basis of these discussions, Banks decides that there would be little difference in the take-home pay of the labor actually utilized and thus the overall effect of the construction payroll on state income would be nil.

With respect to the operating personnel, George assumes that all the 295 non-expatriate jobs would go to state residents and that on the basis of Oronoco's promise to train and hire presently unemployed state residents, he can count on 200 of these jobs with an average pay of $9,400 after federal income tax going to otherwise unemployed people presently averaging $2,600 on federal welfare.[1] Under these assumptions, the annual increase in state income due to the payroll will be equivalent to a present value increase of $124 million at ten percent interest rate over twenty-five

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[1]Notice that for the enlarged box, we now include the formerly unemployed employee's state income tax as part of his income since when he transfers this income to the state it stays within the black box. We are also assuming that the cost of state services does not rise as a result of this income tax payment. By similar reasoning, we no longer count the state welfare he was receiving as part of his pre-refinery income since this was a transfer from other entities within the black box.

years. *This is a net increase if and only if the capital
which would be invested in the refinery would not be in-
vested in the state otherwise.*

The Parable Beach Town Hall account remains unchanged.
George decides it is unlikely that Parable Beach will not
reduce its tax rate markedly if the refinery is built and
therefore uses the lower $34 million estimate for the pre-
sent value of this account.

Horseham will be affected by the refinery in a number of
ways. There will be additional travel, much of it truck
traffic, especially on the road from the Parable Beach town
line just south of the refinery to the interstate five miles
away--all of this travel on Horseham town roads. Applying
the data gathered in the Parable Beach study, Banks esti-
mates the additional cost of this maintenance and repair to
Horseham at $512,000 annually. Since the present terminals
are located both closer to the center of the market and
closer to the main highways, this is a net effect as far as
the state is concerned rather than simply a shift in main-
tenance costs from one locality within the state to another.

The property owner account raises the same question as in
the Parable Beach case relative to Ephraim Ahab. George de-
cides that while Ahab is for all legal purposes a resident
of the state, he will not count any increase in Ahab's in-
come with the sale of the property to the refinery on the
grounds that he is no more an actual resident of the state
than he is of Parable Beach. With respect to the property
owners who might be adversely affected, the analysis is the
same as that for Parable Beach, except now Banks must in-
clude property owners on the Horseham side of the refinery
as well. Doing so yields the losses shown in Table 6.2 as
a function of the severity of the effect.

The Refinery Owners' Account

Banks has taken the precaution of including a refinery
owners' account in his list, since this refinery will enjoy
transport cost and tariff advantages over the more distant
refineries with which it will be competing which will trans-
late into profits.[2] Insofar as state residents share in

Table 6.2
Losses in State Income as a Result of Decrease in Property
Values (1974 Dollars)

	0
No effect	
Property values within 1/4 mile reduced to zero	-$54,000,00(
Property values within 1/2 mile reduced to zero	-$99,000,00(

[2]Once again, "profits" in this context means returns to
shareholders *above* what they could have received if they
invested their money elsewhere, returns above the normal
interest rate.

these profits, this will be an increase in income for the
people. Therefore, Banks will have to obtain an estimate on
the refinery's profits. He also needs this estimate to com-
pute the state's take in corporate income tax. Finally, the
refinery's profits are intimately linked with the price of
the refinery's products; this price, in turn, will be the
key input to the consumers' account.

Through a search of the literature and discussions with
the developer and several independent refinery engineers,
Banks comes up with the estimates of the operation's outlays
shown in Table 6.3, exclusive of crude cost and state and
federal taxes. The equivalent unit cost per barrel of out-
put can be offered by solving for C in the following equa-
tion.

$$927,000,000 = \sum_{n=3}^{25} \frac{1}{(1 + i)^n} (C \cdot 233,000 \cdot 365 \cdot .95)$$

In this equation, 927,000,000 is the present value of the
outlay at ten percent interest rate, $233,000 \cdot 365 \cdot .95$ is the
yearly output in barrels, and i is the interest rate. C is
the price per barrel the refinery would have to obtain to
just break even on its expenses exclusive of crude cost and
state and federal income taxes. At ten percent this figure
is $1.48. The yearly output of this refinery is about
eighty-five million barrels.

On the revenue side, George realizes that, assuming no
price controls, the market price of the refinery's output
will be determined by the cost of the most expensive oil
products landed and consumed in the region. With respect to
this *marginal* oil, there are several possibilities. At pre-
sent, the most expensive products consumed in the region are
those refined at European refineries. This oil suffers both
from a 40¢ per barrel disadvantage in transport costs and
about a 55¢ per barrel disadvantage in tariff due to higher
tariffs on products than on crude. The actual cost of refi-
ning is slightly less in Europe, about $1.25, so the European
refinery has an edge there.

The next most expensive oil landed in the region is that
refined in closer foreign refineries in eastern Canada and
the Bahamas. These refineries suffer the same tariff dif-
ferential, about a 15¢ product transport differential, and
are about 30¢ per barrel cheaper in unit refinery cost. The
next most expensive competitor is domestic Gulf Coast refi-
neries, which suffer no tariff differential and are about
15¢ per barrel cheaper in actual refining but suffer a 45¢
per barrel product transport differential. The next best
alternative is domestic Caribbean refineries which have an
edge over the Gulf. The final possibility is a refinery
complex 500 miles down the coast, which suffers a 15¢ trans-
port differential. Differences in Persian Gulf crude cost
landed at the various refineries are not really significant,
generally less than 5¢ per barrel, assuming all the

Table 6.3
Refinery Account (Millions of 1974 Dollars)

Year	Construction Costs	Operating Labor Costs	Vendor Costs*	Property Taxes**	Total Flow
1974	-25	0	0	0	-25.0
1975	-300	0	0	-3.0	-303.0
1976	-75	-30	-20	-3.1	-128.1
1977	0	-40	-40	-3.2	-83.2
1978	0	-40	-40	-3.8	-83.8
1979	0	-40	-40	-4.0	-84.0
1980	0	-40	-40	-4.1	-84.1
1981	0	-40	-40	-4.3	-84.3
1982	0	-40	-40	-4.5	-84.5
1983	0	-40	-40	-4.7	-84.7
1984	0	-40	-40	-4.8	-84.8
1985	0	-40	-40	-5.0	-85.0
1986	0	-40	-40	-5.1	-85.1
1987	0	-40	-40	-5.2	-85.2
1988	0	-40	-40	-5.5	-85.5
1989	0	-40	-40	-5.6	-85.6
1990	0	-40	-40	-5.7	-85.7
1991	0	-40	-40	-5.9	-85.9
1992	0	-40	-40	-6.1	-86.1
1993	0	-40	-40	-6.2	-86.2
1994	0	-40	-40	-6.4	-86.4
1995	0	-40	-40	-6.5	-86.5
1996	0	-40	-40	-6.7	-86.7
1997	0	-40	-40	-6.9	-86.9
1998	0	-40	-40	-6.9	-86.9
1999	0	-40	-40	-7.1	-87.1

Note: Negative numbers again represent outlays.

*Purchased goods and services.
**Assuming tax rate is decreased.

contenders are served by a deepwater terminal. Table 6.4 summarizes the situation relative to the competitors.

The "Total" column represents the unit profits above those required to obtain a normal return on invested capital available to the refinery depending on who its marginal competitor is. For example, if the region is forced to import some of its products from European refineries, this differential is estimated at 75¢ per barrel or about $60 million per year in profits in excess of normal return on capital. However, if refining capacity in eastern Canada or the Bahamas expands to the point where all European products are forced off the regional market, assuming effective competition, the price of products could drop about 35¢ per barrel and the excess profits would drop to about 35¢ per barrel, or about $30 million per year. In this context, the term "excess profits" is used not in a pejorative sense but rather in a technical sense--profits in excess of the interest rate the refinery's investors could obtain elsewhere. Thus, excess profits relate to a true increase in investor income relative to what the investor could have had without this project. If domestic refining capacity expands to the point where all imported products are forced off the regional market, then the differential drops to perhaps 25¢ or even 15¢ in the extremely unlikely case that any excess of refining capacity in the Middle Atlantic region occurs.

Inquiries to Oronoco indicate that state residents own two percent of the company, and thus two percent of the after-corporate-income-tax profits will go to people within the black box. Also, the state corporate income tax is six percent, which yields the estimates of the increase in state income associated with shareholder profits and state corporate tax revenues shown in Table 6.5 as a function of marginal competition.

George assumes that additional State House expenses associated with the refinery will match the additional expenses suffered by the Parable Beach and Horseham Town Halls, which come to $9.1 million present valued at ten percent for twenty-five years. George is not too worried about errors introduced by this rather casual assumption, since he can already see that any error introduced will be small in the overall picture.

The State Oil Consumers' Account

The state oil consumers' account is, in a sense, the inverse of the refinery owners' account. If the price does not drop, the refinery owners' take is maximized and the consumers see no increase in real income. To the extent that the price of products does drop, the real income of the refiners decreases and the income of the consumers increases. There are, however, two complicating factors:
1. Not all refinery owners are state residents.
2. A products price decrease, if it occurs, will decrease the price of all products consumed in the state, not just those produced by this refinery.

Table 6.4
Estimates of New England Refinery Vs. Outside Refinery, Developer Differentials
(Price Per Barrel)

Marginal Competitor	Δ Crude Transport*	Δ Tariff**	Δ Refinery	Products Distribution	Total
Europe	0	55¢	-25¢	40¢	75¢
Canada/Bahamas	0	55¢	-30¢	15¢	40¢
Gulf of Mexico	5¢	0	-25¢	45¢	35¢
Puerto Rice/Virgin Islands	-10¢	0	-15¢	45¢	20¢
Mid-Atlantic	0	0	0	15¢	15¢

*Assumes deep-draft terminal in all six refinery locations, including Parable Beach. Marginal crude is Persian Gulf oil.
**41¢ per barrel crude-products differential plus 20¢ per barrel crude tariff.

Table 6.5
Changes in State Income Associated With Shareholder Profits and State Corporate Income
Tax, and Additional State House Expenses (Millions of 1974 Dollars, 10% Interest Rate)

Marginal Competitor	Estimate of Present Value Pre-Tax Profits	Present Value State Income Tax	Present Value of State Shareholder Profits	Δ State House Expenses
European refinery	555.5	+33.6	+10.9	-9.1
Bahamas/Canada	303.6	+18.1	+6.4	-9.1
Gulf Coast	192.4	+11.8	+3.6	-9.1
Mid-Atlantic	116.2	+7.3	+1.8	-9.1

The first problem we have already handled in the refinery owners' account. Tackling the second, George knows that currently 600,000 barrels per day of oil are being consumed in his state. He doesn't know how much people in the state are going to consume in the future, but he notes that the lowest projections put out by the State Energy Office call for no growth through the next twenty-five years, while the highest call for a four percent annual growth rate. He decides to study these two extremes as a function of who the marginal competitor is. The results are shown in Table 6.6 for a ten percent interest rate. George notes that these numbers can be quite large. He also knows that the entire East Coast is presently importing somewhere in the vicinity of 350,000 barrels per day of oil from Europe, so the refinery is unlikely to push all this oil out of regional markets, even at zero percent growth, and still less likely to keep European oil off the market in the face of a four percent consumption growth. There is certainly no chance a single refinery can push not only all the European oil off the East Coast market but also all the Canadian-Bahamian oil, and George decides to no longer consider the Gulf, domestic Caribbean or mid-Atlantic as potential marginal competitors. Finally, George knows that even if all the European oil were forced off the market, the impediments to competitive forces, especially in the gasoline markets, would make the price drop a gradual and possibly nonexistent phenomenon. Nonetheless, Table 6.6 makes the rather obvious point that if a products price drop could somehow be effected, the increase in state income associated with this drop could be quite large and certainly much larger than the resultant loss in state refinery owners' income and state tax revenues with the price drop.[3]

Table 6.6
Present Valued Increase in State Oil Consumer Income as a Function of Twenty-Five Year Price Drop and Future Consumption Growth (Ten Percent Interest Rate, 1974 Dollars)

Marginal Competitor	Drop in Prices (Dollars/ Barrel)	Present Value Increase in Consumer Income at 0% Growth	Present Value Increase in Consumer Income at 4% Growth
Europe	.00	0	0
Bahamas/ Canada	.30	+$482 million	+$844 million
Gulf	.45	+$723 million	+$1267 million
Mid-Atlantic	.60	+$964 million	+$1690 million

[3]We are assuming there are no other refineries already in the state which would also be affected by the price drop and that state residents do not own extra-state refineries which

Putting It All Together Again

Having culled all this data, George is in a position to pre-
pare his summary, Table 6.7, to present to the governor his
estimates of the direct increase in state income associated
with opting for a refinery in Parable Beach as opposed to
the status quo as a function of both the refinery's marginal
competitor and the extent of the effect on neighboring prop-
erty values. The table shown gives only the results of
George's analyses for the low consumption growth hypothesis.

George notes the increase in consumer income with a price
drop, if it occurs, is the overwhelmingly large figure.
George also knows that the price drop is a very iffy propo-
sition depending on both the event that this refinery pushes
all the European oil off the market and the event that there
is sufficient competition among refiners to drive the price
of all products down by the drop in the cost of the marginal
oil. George realizes the individual petroleum products mar-
kets vary in the degree to which competitive pressures are
allowed to operate. In the residual fuels market, there is
considerable competition. The buyers, utilities and large
industrial plants, are individually strong, well-informed
shoppers who can obtain their needs from a large number of
alternative sources if local suppliers do not offer com-
petitive prices. Brand names mean nothing. Historically,
prices have been quite flexible. At the other extreme is
the gasoline market. The majors are vertically integrated
down to the retail level, controlling prices directly in
eighty percent of the retail market. Brand preference in
consumers can be and is being maintained by intensive adver-
tising. Prices in the majors' outlets are relatively in-
flexible, set on a centrally administered basis, and
historically have not been responsive to momentary changes
in supply and demand. In short, George chooses to regard
the consumer savings in Column 2 of Table 6.7 as an upper
bound, a best-of-all-possible-worlds estimate, and to con-
centrate on the no-price-drop (leftmost column) case. None-
theless, upper-bound numbers such as the consumers' savings
under general price drop are insightful in that they point
us toward potential areas of large increases in state income
and thus have important, obvious implications for state pol-
icy.

In the leftmost no-price-drop column, the total present-
valued numbers range from a high of +$86 million (no adverse
effect on neighboring property) to a low of -$13 million.
If these changes were spread evenly over the state, the up-
per number would be equivalent to handing each of five mil-
lion citizens in the state about $47 on a one-shot basis;
the lower number is equivalent to taking away $2.50. Of

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would be adversely affected. As can be seen from the rela-
tive magnitudes, even if all the state's products were re-
fined internally, these effects would be much smaller than
the increase in consumer income.

Table 6.7

Summary of accounts for refinery impact on state before respending (Net present value, 25 Years, Millions of 1974 Dollars, 10% Interest Rate, Low Consumption Growth)

Account	Marginal Competitor	
	Europe	Bahamas/Canada
Δ State construction and operating employees	+12.4	+12.4
Δ Parable Beach Town Hall	+34.0	+34.0
Δ Horseham Town Hall	-4.6	-4.6
Δ State property owners	0	0
Δ State refinery owners	+10.9	+6.4
Δ State House	+24.5	+9.0
Δ State consumers	0	+482.0*
(Note: The above assumes no adverse effect on neighboring property.)		
Δ Total	+77.2	+548.3
Property values within 1/4 mile reduced to zero	-54.0	-54.0
Δ Total	+23.2	+485.2
Property values within 1/2 mile reduced to zero	-99.0	-99.0
Δ Total	-21.8	+443.4

*This column assumes competition sufficient that prices drop to cost of marginal products. If this is not the case, then the numbers in the leftmost column hold even if no European oil is landed.

course, these changes will not be spread evenly over the state. In fact, as long as no price drop occurs, a large portion of the changes will be concentrated in Parable Beach, as we've already seen. And even within Parable Beach these changes will not be spread evenly unless an explicit system for compensating abutting property owners is set up.

In general, as one moves to larger and larger black boxes, the average unit effect of a given project on market wealth becomes smaller and smaller, despite the fact that the aggregate effect is larger. This presents a very difficult problem for our political system. It will pay a small group of people, who on a per-unit basis are affected severely, to join together and devote time and money to lobby for the particular alternative favorable to their parochial interests. On the other hand, it will not pay a much larger, more diffuse group to make the same individual effort, despite the fact that, in aggregate, their loss in market wealth may be much greater than the gain in income to the smaller black box. Hence the frequency of decisions at every governmental level which are inconsistent with total black-box income at that level.

The above figures refer to the direct increases in income. These increases in income will, of course, be respent in a variety of markets, some of which will be within the state. As we argued earlier, a generous estimate of the average difference between the market price and what these resources could earn in other employment would be twenty percent of the resource's values. Such a number would imply a much higher ratio of market price to alternate opportunity value for labor, for non-labor resources are rarely subject to unemployment.

An infinite net multiplier chain based on an average twenty percent differential between market price and opportunity value would add twenty-five percent to the above final summary figures; a thirty percent differential would tack on forty-three percent to the above figures; a ten percent differential would tack on eleven percent. Thus, if we concentrate on the leftmost, no-price-decrease column of Table 6.7, then as a function of the net multiplier assumed, we have the final numbers shown in Table 6.8. Once again, the policy implication of the increases in income associated with respending, whatever the actual value of the net multiplier, are hardly striking.

Table 6.8
Impact of Varying Net Multiplier on State Income for the
No-Price-Decrease Hypothesis

| | Average Percentage Differential Between Market Price and Opportunity Value in Respending Markets | | | |
	0%	10%	20%	30%
No change in neighboring property values	+77.2	+85.7	+96.5	+110.2
Property values within 1/4 mile reduced to zero	+23.2	+25.8	+29.0	+33.1
Property values within 1/2 mile reduced to zero	-21.8	-24.2	-27.3	-31.1

THE REFINERY FROM THE POINT OF VIEW OF THE NATION

It is one week after George has submitted his report to the governor. George is having his regular monthly meeting with the regional coordinator of the Office of Coastal Environment in Washington, Martin Abkowitz. They have broken for lunch and the topic of the Parable Beach refinery has come up.

George: "Well, I don't know what's going to happen. My guess is that Parable Beach may well approve it but that the neighboring towns, who will not share in the property tax income, will be able to muster enough strength to block it at the state level."

Martin: "Where does the national interest lie in this?"

George: "I don't know. All the work I've done on the issue has focused exclusively on either the real income of Parable Beach or the real income of the state."

Martin: "Can't you tell what the real income impact on the country will be from that?"

George: "Not really. I'd have to go back and rework the figures to get the national income impact."

Martin: "I'd appreciate it if you would. We've been having quite a discussion of the national interest clause in the Coastal Zone Management Act and the Secretary is thinking about taking a position on some of these large-scale projects."

George: "Well, national income is only one dimension of the national interest."

Martin: "I know, but I still think it would be useful."

George, wearily, and mentally cursing Mrs. O'Houlihan: "Okay." George's office is funded largely by federal coastal zone management funds. He is in no position to refuse a request such as this. "I'll have it to you in a week."

George goes back to his office and begins the process anew.

FIRST STEP: What is the black box?

Answer: All U.S. citizens.

SECOND STEP: What are the alternatives to be analyzed? George decides to look at:

1. Additional domestic refining in Parable Beach.
2. No refinery in Parable Beach; instead, equivalent amount of products is imported from Bahamian refinery. Capital which would have been invested in Parable Beach refinery is invested in Bahamian refinery.[1] Site remains town dump.

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[1] As we shall see, it is extremely important that we specify exactly what happens in the absence of the project directly under analysis. In the case at hand, it is reasonable to assume that the amount of products consumption is independent

Table 7.1
Accounts for National Income Analysis

Δ U.S. construction and operating employees
Δ Parable Beach Town Hall
Δ Horseham Town Hall
Δ State House
Δ U.S. consumers
Δ U.S. property owners
Δ U.S. refinery owners
Δ Federal government
Δ Respending

THIRD STEP: What is the baseline?
Answer: Status quo, Alternative 2 in second step.
FOURTH STEP: Set up accounts.
George decides to break down his accounts as shown in Table
7.1.

The U.S. Construction and Operating Employees

The refinery construction and operating employees are the
same as in the case of the state income analysis, except now
all the employees including the people who will be trans-
ferred to Parable Beach by Oronoco count as long as they are
U.S. nationals. However, if as before, the actual construc-
tion labor is already near full employment, the same thing
will be true of U.S. manufacturers of process equipment.
The fifty-five people who are being transferred are highly
skilled, fully employed people who, through promotions, will
see some increase in income as a result of the refinery.
However, this is unlikely to be more than one or two thou-
sand dollars per person. George estimates the total at
$50,000 per year. Except for this, then, the increase
through employment is the same as in the state case. How-
ever, George now counts the formerly unemployed operating
personnel's increases at their gross average pay, $10,000
per year with no deductions for federal income taxes or
federal welfare, for these are transfers within the enlarged
black box. More precisely, the loss of welfare payments and
the loss to income taxes of these people would show up as
plusses in the federal government account--if we had worked
everything through carefully.

Notice that Banks's assumption that, if the refinery is
not built at Parable Beach, the released capital would be
invested outside the country, is critical to this account.
If Banks had assumed that the capital would be invested in-
side the country in some other use, then that use would un-
doubtedly have required some U.S. labor. And if that labor
were unemployed, the increase in income of that labor would

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of whether or not there is a refinery in Parable Beach, in
which case our non-Parable Beach alternatives must be con-
sistent with this assumption.

have had to have been deducted from this account. Since re-
fining is a very labor-extensive business, it is quite pos-
sible the net effect of investing in refining rather than
some other domestic capital improvement on employee income
would be negative.

The Town Hall and State House Accounts

The Town Hall accounts are unchanged from the state analysis.
Banks assumes that no other town halls are significantly in-
volved. Once again, the assumption that the capital would
not be invested domestically if the refinery is not built is
critical. The State House account is also unchanged. Thus,
we have from Table 6.5, the figures in Table 7.2.

The U.S. Property Owners' Account

The property owners' account is the same as in the state
case, except now there is no ducking our friend Mr. Ahab.
On a long shot, George calls Ahab in Florida and is mildly
surprised to find that Ahab is quite willing to tell him the
deal he has made with the refinery. It's $12,000 per acre.
Ahab opines that if the refinery did not buy the land, he
could still sell it for $5,000 per acre. George adds the
differential to the property owners' account.

The U.S. Consumers' Account

Whether or not there will be any impact on U.S. consumer in-
come with the building of the Parable Beach refinery will
depend on whether or not there will be any products price
changes. George decides to examine two cases:
    1. The Parable Beach refinery is not large enough to
force all the most expensive European oil off the East Coast
market. In this situation, there will be no change in con-
sumer income.
    2. The refinery forces all European oil off the market
and competitive forces are strong enough to drive the prod-
ucts prices down to the landed cost of the next most expen-
sive alternative source, Canadian/Bahamian refineries--a
drop in landed cost which George estimates at 30¢ per bar-
rel.
The price drop in Case 2 would affect at a minimum all East
Coast consumers. However, George realizes that if all the

Table 7.2
Δ Town Hall and State House Accounts (Net Present Value,
Millions of 1974 Dollars, 10% Interest Rate)

Marginal Competitor	Parable Beach Town Hall	Horseham Town Hall	State Income Tax	State House Expenses
Europe	+34	-4.6	+33.6	-9.1
Bahamas/ Canada	+34	-4.6	+18.1	-9.1

other refineries which will serve the East Coast while a
Parable Beach refinery is in existence are owned by Ameri-
cans, then the increase in income to consumers of products
not produced in Parable Beach will be matched by decreases
in income in gross excess American refiners' profits. From
the point of view of the national black box, the overall ef-
fect will be a wash.[2] Thus, George can concentrate entirely
on those Americans who would consume the output of the Para-
ble Beach refinery. From his earlier work on the state
problem, he already knows that the present-valued increase
in consumer income with a 30¢ per barrel drop in prices at
ten percent over twenty-five years is $246.9 million. Thus,
for the consumers' account, he has the figures in Table 7.3.

The Refinery Owners' Account

George already knows that the Parable Beach refinery is
likely to be a rather profitable investment for its owners,
thanks largely to the tariff differential. Thus, this re-
finery's owners could enjoy some substantial increases in
income. With respect to Parable Beach refinery ownership,
Banks decides to study two extremes:
1.   An entirely U.S. citizen-owned Parable Beach refinery.
2.   An entirely foreign-owned Parable Beach refinery.
Oronoco is practically all American-owned, but Banks believes
it will be instructive for the Secretary of Commerce to see
the results for a foreign-owned refinery.

Table 7.4 shows an estimate of the net present value of
pre-tax profits for the Parable Beach refinery. Deducting
estimated state and federal corporate taxes, which will be
counted in other accounts, leaves the shareholders the
amount shown in the rightmost column before federal indi-
vidual income taxes. If the shareholders are all foreign
and reciprocity laws allow them to escape individual income
taxes, then the increase in U.S. shareholder income is ob-
viously zero. If, on the other hand, the shareholders are
all American, then from what they could have earned on the
Parable Beach refinery we must deduct any excess profits
which they would have earned on the Bahamian refinery which

Table 7.3
Changes in U.S. Consumer Income* (10% for 25 Years, Millions
of 1974 Dollars)

No change in price	0
30¢ per barrel drop in price	246.9

*Net of consumers of non-Parable Beach refined products, for
the reasons given above.

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[2] If some of these other American-owned refineries are lo-
cated in foreign countries, foreign taxpayers may, depending
on local tax laws, bear a share of the decrease in the prof-
its of these refineries. To the extent that this happens,
the net impact will not be a complete wash. George decides
to ignore this effect.

Table 7.4
Disposition of Refinery Profits (Millions of 1974 Dollars, 10% Interest Rate)

Marginal Competitor	Estimate of Present Value Pre-Tax Profits	State Taxes	Federal Taxes	Shareholder Net Present Value
Europe	555.5	33.6	250.3	271.4
Bahamas/ Canada	308.6	18.1	139.4	151.1

otherwise would have been the target of their capital. If they had not invested in the Parable Beach refinery, then the Bahamian refinery would have been earning 30¢ per barrel in excess profits or some $246.9 million present valued. If we assume the Bahamian tax structure is such that it takes sixty percent of these profits in excise duties, then the shareholders would retain about $10.0 million, which as long as they don't repatriate it, is free of U.S. tax. Thus, from the rightmost column in Table 7.4 we need to deduct $100 million to obtain Table 7.5 for the U.S.-owned refinery alternative.

Notice that once again our assumptions about what happens if the project doesn't take place have to be as complete as our assumptions about what happens if the project does take place. If we had assumed, for example, that the refinery owners invested their capital in a European refinery, then we would obtain rather different numbers for this account.

The Federal Government Account

The federal government account will be affected in four principal ways by the refinery as opposed to the status quo and capital otherwise invested in a Bahamian refinery.

1. There will be an increase in federal private income taxes on formerly unemployed employees' and domestic shareholders' earnings, and a decrease in welfare payments to formerly unemployed employees. All these effects have already been counted by basing the employees' and refinery shareholders' earnings increases pre-federal individual income tax rather than after federal tax. We don't want to count them again.

2. There will be an increase in federal pollution monitoring expense. Banks roughly estimates this at $130,000 per year.

3. From Table 7.4, the refinery owners will pay federal corporate income taxes the present value of which is $250.5 million if the marginal competitor is a European refinery, or $139.4 million if the Parable Beach refinery pushes all European oil off the regional market and competition forces prices down to the landed cost of Bahamian oil.

4. In a situation where the refinery is replacing foreign refined products, there will be a change in the federal

Table 7.5
Δ Refinery Owners* (Net Present Value, Millions of 1974
Dollars, 10% Interest Rate)

Marginal Competitor	Non-U.S.-Owned	U.S.-Owned
Europe	0	+171.4
Bahamas/Canada	0	+ 51.4

government's petroleum tariff revenues. We have seen that
under the assumption of European or near foreign marginal
competition, the refinery's profits are largely the result
of a 55¢ per barrel differential in crude oil tariffs versus
refined product tariffs. In these situations, with the re-
finery, the country will be importing an additional 250,000
barrels of crude per day and importing 233,000 barrels less
of products. Currently (1974) the federal tariff on prod-
ucts is 62¢ per barrel, while that on crude is 21¢ per bar-
rel. On top of this, present federal policy allows a new
domestic refinery a five-year tax holiday on crude tariffs.
Hence, without the refinery, federal tariff revenues on
products which would have been imported in the absence of
the refinery are given by

$$\sum_{n=3}^{25} \left(\frac{1}{1 + i}\right)^n .62(\$/bbl) \cdot 233,000 (bbl/day) \cdot 365 (days/year)$$

which at a ten percent interest rate equals $359 million.
With the refinery and given the five-year holiday, we have
crude tariff revenues of

$$\sum_{n=8}^{25} \left(\frac{1}{1 + i}\right)^n .21(\$/bbl) \cdot 250,000 (bbl/day) \cdot 365 (days/year)$$

or about $81 million. Thus, the provision of this domestic
refinery would involve a loss of about $278 million in pre-
sent value federal tariff revenues.

When the refinery is replacing foreign products, much of
the refinery's profits are not a true increase in national
income, but merely a shift from tariff revenues to private
profits and the taxes on these profits. Of course, if the
refinery were displacing domestically refined products in
the local markets--the case where the marginal competition
is Gulf Coast or Mid-Atlantic facilities--then there would
be no change in tariff revenues.

Adding the change in tariffs to the pollution control ex-
pense and federal corporate taxes leads to the figures in
Table 7.6 for the federal government account. Remember, we
have counted the increase in federal shareholder earnings
income and personal income taxes in other accounts.

Table 7.6
Δ Federal Government (Net Present Value, Millions of 1974
Dollars, 10% Interest Rate)

Marginal Competitor	Loss in Tariffs	Pollution Expense	Corporate Income Tax
Europe	-281	-1	+151.4
Bahamas/ Canada	-281	-1	+31.4

Clearly, the federal government qua government will end up a loser on net as a result of the Parable Beach refinery due to the shift in tariff revenues to private profits and/ or decrease in price.

The Respending Account

If the alternate investment to the Parable Beach refinery were a domestic refinery in an area that had about the same unemployment levels as the Parable Beach region, then the respending account would be a complete wash from the point of view of the national black box. The net increase in national income associated with respending would be nil. However, since we have assumed that, if the capital is not invested in Parable Beach it will be invested outside the country and if we further make the assumption that an insignificant portion of the Bahamian refinery's costs will be spent in domestic markets with substantial unemployment, then the respending computation is quite similar to that in the case of the state. One must make an estimate of the average difference between price and value of alternate opportunities in the domestic markets where respending occurs and add that differential to all the increases in national income.

As noted earlier, if one makes the generous assumption that on the average all goods in which respending occurs are twenty percent overpriced, then the effect of this net multiplier will be to add twenty-five percent to all the final changes in income. George decides that this effect is not particularly striking in view of all the other uncertainties he faces. He decides to complete his analysis on a pre-respending basis and note that fact in his report to the Office of Coastal Environment.

Putting the Whole Thing Together a Third Time

Combining all the accounts leads to Table 7.7, and Table 7.8 summarizes Banks's estimate of the increase in national income depending on who is the marginal competitor and whether or not the facility is domestically owned. Banks notices that the latter possibility is extremely important to over- all national income, especially if products prices don't drop. In this case, most of the increase in *national* income is made up of the refinery profits less any decrease in

Table 7.7
Summary of Accounts for Refinery Impact on Nation (Net Present Value, 25 Years, Millions of 1974 Dollars, 10% Interest Rate)

Refinery	U.S. Construction and Operating Employees	Parable Beach Town Hall	Horseham Town Hall	State House*	U.S. Consumers**	U.S. Property Owners†	Federal Government*	U.S. Refinery Owners Including Shareholders' Income Tax
U.S.-owned								
Europe	+18.6	+34	-4.6	+24.5	0	+4.6	-130.64	+171.4
Bahamas/Canada	+18.6	+34	-4.6	+9.0	+246.9	+4.6	+51.4	+51.4
Foreign-owned								
Europe	+18.6	+34	-4.6	+24.5	+246.9	+4.6	-130.64	0
Bahamas/Canada	+18.6	+34	-4.6	+9.0	+246.9	+4.6	-250.64	0

*Federal individual income taxes included in refinery owners' account.

**This column assumes prices drop to landed cost of Bahamian/Canadian products.

†This column assumes no effect on neighboring property. If property values within one-quarter mile are reduced to zero, subtract 39.4. If property values within one-half mile are reduced to zero, subtract 99.4.

Table 7.8
Direct Increase in National Income Associated with Parable
Beach Refinery (Net Present Value, Millions of 1974 Dollars,
10% Interest Rate, 25 Years)

Marginal Competitor	U.S.-Owned	Foreign-Owned
No loss in property values		
Europe	+117.9	-53.5
Bahamas/Canada*	+109.3	+57.9
Property values within one-quarter mile reduced to zero		
Europe	+78.5	-92.9
Bahamas/Canada*	+69.9	+18.5
Property values within one-half mile reduced to zero		
Europe	+18.5	-152.9
Bahamas/Canada*	+9.1	-41.5

*Assumes price drops full difference in landed cost of
European products versus Bahamian/Canadian products.

tariffs. This is not true of Parable Beach income or state income, since both these latter entities experience a minute proportion of the profits (with the exception of state income taxes, which are not affected by nationality of ownership).

One result of this dependence is that in the case of a foreign-owned refinery in Parable Beach replacing Bahamian/Canadian refined products, national income is estimated to be decreased by close to $53 million on a present value basis, before any loss in neighboring property values, while in the same situation, both Parable Beach and state changes in income are positive. In such a case we have a clear conflict between national income and state and municipal income. On the other hand, consider the case of a U.S. investor-owned refinery under the very severe assumption that all property values within one-half mile are destroyed, and assume the price doesn't drop. National income is increased, due primarily to investor profits and federal taxes on these profits. At the same time, state and local income are decreased because the smaller black boxes experience only a small proportion of the federal taxes on investor profits, but all the losses due to the effect of the refinery on surrounding values. This example makes two very important points:

1. In any income analysis, you must specify whose income you're talking about.

2. Often the conflicts between developer, municipality, state, and federal levels, which invariably is labeled "environmental", is explainable in income terms. This raises the interesting and rarely explored alternative of compensation as a means of resolving some of these conflicts. Conventional land use legislation calling for "balanced, comprehensive planning" will not make these conflicts disappear.

But that's another story. Right now, George Banks is simply happy to breathe a sigh of relief as he puts the finishing touches on Table 7.8, for he realizes that, since the United Nations is certainly too distracted to worry about this investment's impact on world wealth, he is finally through.

Our visit to Parable Beach is over. Perhaps the single most important thing that we can take away from this sometimes difficult and tedious trip is the following set of ground rules.

In order to perform fallacy-free analysis of the impact of a proposed change in the allocation of coastal zone resources on the market wealth of a portion of society, any manipulation of numbers must be preceded by four essential steps:

1. Define the black box: whose change in income is being analyzed? Make the definition explicit.
2. Completely specify all alternatives being considered. Make the specification explicit.
3. Choose a baseline against which changes in black-box income are to be measured. Make the baseline explicit.
4. Set up a complete and consistent set of accounts.

These four pre-analysis steps can be employed as a checklist by officials examining economic analyses put forward by pro-development and anti-development forces. By merely asking the proponent, "What is your black box? What is your baseline?" and so on, many of the more obvious errors in the analysis will be exposed. Better yet, let the proponents know beforehand they will face this checklist. It may improve the quality of the analyses considerably.

Having performed the four pre-analysis steps, the analysis becomes almost mechanical.

5. Estimate the yearly income flow into and *out of* each account for each alternative *relative to the baseline.*
6. For each alternative, aggregate the yearly flows and take present values.
7. Compare the resulting present values across alternatives. The differences will be the estimated changes in black-box income associated with one alternative rather than another. These differences will then have to be compared with differences in non-market effects.

The principal difficulty associated with Step 5, wherein all the work lies, will be in handling uncertainty. When estimates depend in an important way on a variable which cannot be predicted with any degree of accuracy, our advice is to work with a range of possibilities. Assume a low value of the variable and work it through. Then assume a high value and work it through. Present the results for a range of cases. This will in general generate considerably more insight than the much more common practice of using a best guess and tacitly forgetting about the uncertainty.

With respect to Step 7, uncertainty with respect to the interest rate to be used in taking present values will usually make it worthwhile to compute the present values

for a range of interest rates. In general, uncertainty should be tackled head-on rather than swept under the rug.

Some will find the results of such exercises disappointing. Even without uncertainty, the dollar figures will not dictate a particular choice. After all, real black-box income is but one dimension of a problem. There will be many other black boxes, both bigger and smaller than the one chosen. In addition, whatever black box we use, the results ignore non-market effects. Finally, running analyses over ranges of uncertain variables will in general result in a range of results. Often with one hypothesized value of the uncertain variable, the number will point to one alternative; with another hypothesized value of an uncertain variable, the results will point to a different choice. One may well ask, after such an exercise, what have we learned?

In this regard, the analysis will have to speak for itself on a case-by-case basis. But whatever the application, the point of the drill is not to dictate a choice. Rather, it is to obtain insight into the implications of our choices with respect to market wealth. If replacing self-serving, fallacy-prone estimates of these implications with a range of fallacy-free estimates affords us these insights, then we would have to be complete cynics to believe that our decisionmaking with respect to coastal zone resources will not be improved.

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At the time of the writing of the book, Glenn Ashe and Beth Parkhurst were Professor Devanney's assistants.

The book is the ninth in The MIT Press Sea Grant Series.

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Foreword by Henry M. Jackson

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